

## Dynamics of Shallot Price Fluctuations and Its Disparities in Indonesia

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### Abstract:

A agricultural product called shallots is frequently used to improve the flavor of Indonesian food. This ingredient is only required in trace amounts in a recipe, but price swings can fuel inflation, an ongoing economic disease in Indonesia. The purpose of this research is to analyze the dynamics of shallot price fluctuations in Indonesia and the disparities that may arise. Explanatory descriptive statistics were used to analyze secondary data from the National Strategic Food Price Information Center that was made available online for this research. Unless there are distortions that affect the economy and trade, such as the COVID-19 pandemic in 2020–2021, it appears from the research that the price of shallots fluctuates regularly and in a predictable pattern, with a price increase in the first quarter and a peak at the beginning of the second quarter each year. In provinces which produce shallots, there is a fairly significant price disparity because there are many businesses engaging in the shallot trading system and there are also numerous trade routes, which leads to perfect competition in the market and a relatively cheap base price for shallots. There aren't many shallot business actors in the provinces with a production deficit or importer status, so wholesalers who act as importers can control prices as in a monopoly market, and price disparities are kept small to prevent economic turmoil in the local community. However, the price difference is still fairly high on a per-unit basis.

**Keywords:** *Shallot price fluctuation; shallotprice disparity; shallot market structure*

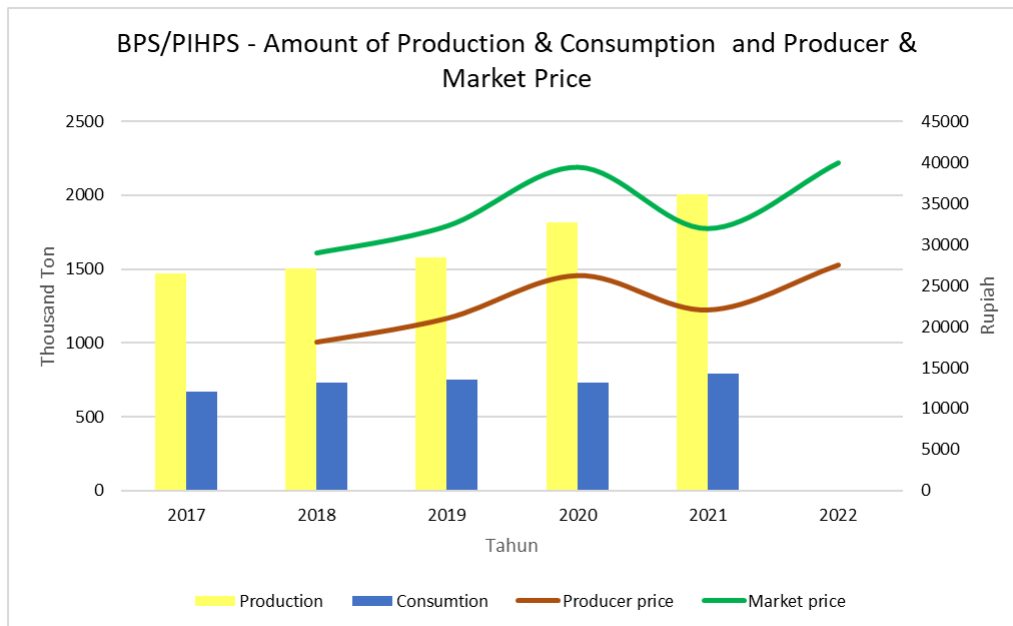
### 1. Introduction

One of the horticultural crops that is widely eaten by people in Southeast Asia and South Asia in general, and Indonesia in particular, are shallots, also known by the Latin names *Allium ascalonicum* and *Allium cepa*. This vegetable has a unique flavor and aroma because it is eaten in small portions as an appetizer.

Regardless of the fact that there is little consumption required due to the large Indonesian population, shallots have nonetheless grown to be an important hub in the agricultural economy of the country. In fact, according to Irmaningrum (2016), who used BPS data from June 2016, shallots contributed the most to the inflation rate, at 0.18 percent, ahead of rice, red chilies, and garlic. BPS Central Java (2022) asserts that the rise in the cost of red chilies, bird's eye chilies, shallots, air travel, and eggs from purebred chickens is the primary factor contributing to inflation in Central Java in June 2022 (BPS Central Java 2022).

BPS data show that since 2015, the amount of shallot production has increased rapidly nationwide, even though consumption levels have not increased significantly. However, this excess production of shallots does not result in a decrease in the price of shallots as if adhering to the market's supply-demand rule (Rinawati, 2021). Ferry Hadiyanto (2020) asserts that in

traditional economics, the quantity of supply (from output, incoming trade transactions between regions, or imports) and demand have an impact on prices. (from the amount of consumption, outgoing trade transactions, or exports). As seen in Figure 1 below, it appears that nationwide, output is almost two times greater than required consumption.



Source: BPS and PIHPS data processed  
 Figure 1. Production, Consumption and Shallot prices in producers and markets between 2017-2022

In accordance to Figure 1, there appears to have been a decrease in price as would have been expected given a rise in production. Based on preliminary research, regional/provincial number of production do not appear to have a major influence on prices at the national level, but in national level the production quantity component does. Regionally or nationwide, the price of shallots is significantly influenced by consumption. According to Farid M (2021), the MPP (trade and freight margin) is the main factor that significantly affects shallot prices across a number of areas.

The main objective of this research is to analyze and determine the dynamics underlying shallot price variations and disparities in Indonesia. The causes of price disparities and fluctuations will, whenever feasible, be hypothesized or predicted. This will be followed by recommendations and remedies to lessen these price fluctuations and close existing disparity gaps. This research will look at PIHPS-BI's secondary data.

This study will be macro in scope, beginning with national data and then narrowing it down to areas where there are anomalies in the available data. Several studies on price fluctuations and disparities have been conducted, but generally only for narrow scales (districts) or markets where

there is an excess of shallot production compared to local needs. Aside from that, the implementation of these studies is typically done in the short term.

## 2. Research Method

This study uses secondary data that comes from PIHPS. Weekly data on shallot prices from PIHPS is used to analyze fluctuations and disparities in shallot prices. The secondary data analyzed were prices in the period January 2018 to early January 2023. Data processing and discussion were carried out using explanatory descriptive statistical methods based on analysis of graphs to analyze patterns that occur.

Analysis of price fluctuations is carried out by depicting data in charts based on time scales and price ranges; Meanwhile, to describe the price disparity, the Coefficient of Variation or the coefficient of variation (CV) of prices is used. The coefficient of variation is the ratio of the standard deviation (standard deviation) to the calculated average and is expressed as a percentage.

The use of the coefficient of variation is to examine the distribution of the data from the calculated average. The smaller the coefficient of variation, the more homogeneous (uniform) the data.

Coefficient of Variation Formula as follow :

$$kv = \frac{s}{\bar{x}} \times 100\%$$

Note :

$Kv$  = coefficient of variance

$\sigma$  or  $s$  = deviation standard

$\bar{x}$  = calculated avarage

$$\sigma = \sqrt{\frac{n \sum x^2 - (\sum x)^2}{n(n-1)}} \quad \bar{x} = \frac{\sum x}{n}$$

$\sigma$  or  $s$  is the standard deviation of the shallot price, and  $\mu$  or  $x$  is the average shallot price. In this study, the disparity analysis indicated by the coefficient of variance was carried out at the national level on the time gap scale. While the disparity between business actors in the shallot trading system in the quarters of the observation year, and disparities in several samples of main cities within the province are observed by year.

## 3. Results and Discussions

### Price Fluctuation

Fluctuations are indicators that show the rise and fall of the price caused by certain factors, such as a changing market mechanism, changes in policies, or changes in the global or regional social,

political, or economic situation. Changes in the form of an increase or decrease in the value of the price itself are generally described graphically in order to facilitate understanding. According to KBBI (2023), fluctuations are changes in prices due to the influence of demand and supply, uncertainty, or due to shocks such as wars. According to the Merriam Webster Dictionary, the notion of fluctuation means a shift, back and forth, or the rise and fall of something at a level or value.

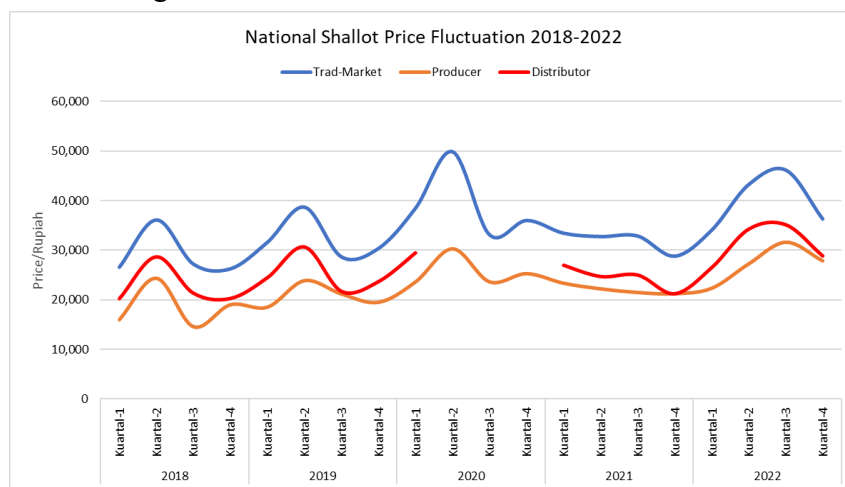
According to Keynesian economic theory cited by Clarke C (2022), the cause of fluctuations is due to a change in the factors that determine national production or economic conditions. An overview of fluctuations is presented in the form of a graph showing changes in national income and economic activity from one time to another. The components of national production that can be factors causing fluctuations are: (1) government spending/G, (2) investment (I); (3) consumption (C), (4) net exports/X-M (Oktaviani, 2020).

According to Anggi (2020), in the field of agricultural products, price fluctuations are usually caused by: (1) changes in agricultural production facilities (saprota) such as fertilizers, seeds, labor wages, and so on; and (2) price increases due to future predictions. (3) price of production technology to help increase cultivation productivity, (4) season.

According to Qothrunnada K (2022), fluctuations can be grouped into:

- 1) Regular Fluctuations (cycles): This type of cyclical fluctuation refers to periods of growth or decline of something distinct that occur over time.
- 2) Irregular Fluctuations: These fluctuations occur without following a pattern that has occurred routinely because of an unexpected or force-major event, but it can be said that the cause of change comes from external factors.

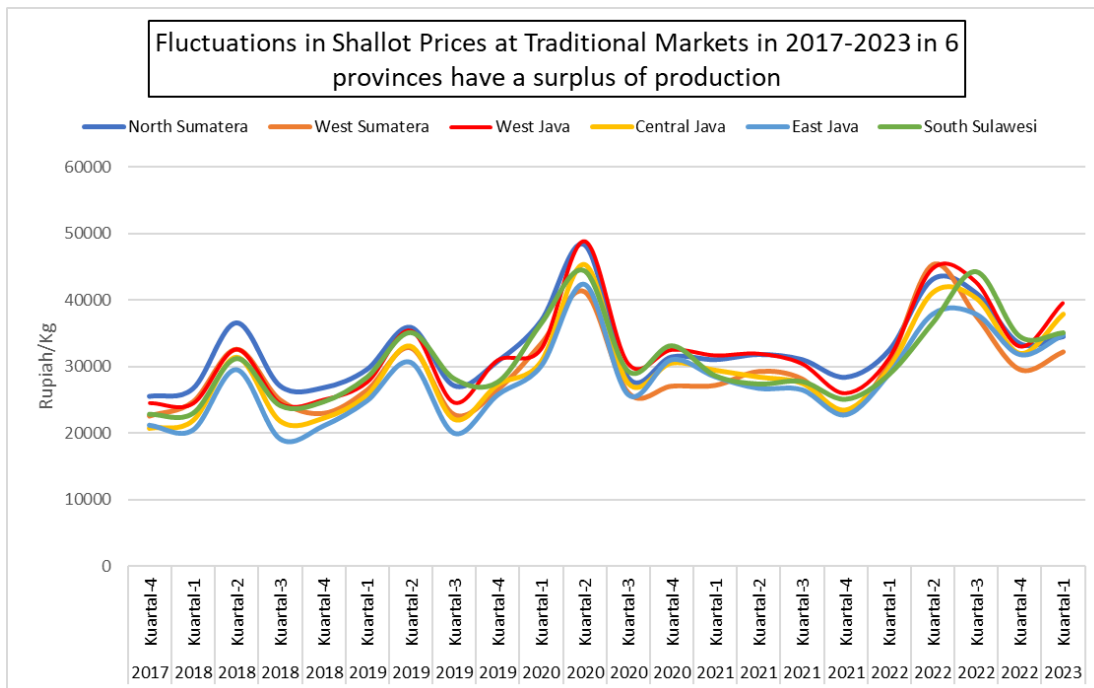
Based on the shallot price level obtained from PIHPS between January 2018 to December 2022, and averaged in quarterly groups (every three months), then mapped onto a line graph, the situation appears as shown in Figure 2.



Source: PIHPS data processed

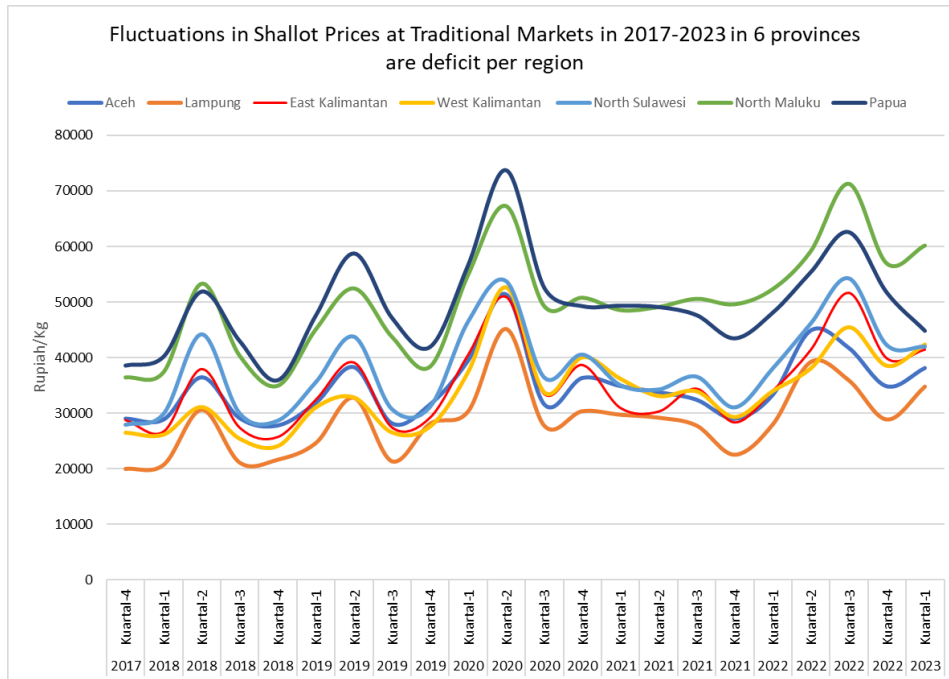
Figure 2. National shallot price fluctuations in 2018-2022 in 3 roles in the trading system (producers, wholesalers and consumers)

From Figure 2, it appears that fluctuations in the price of shallots in Indonesia, on a national basis, are regular, that is, starting at the end of the 1st quarter, they have increased, peaked in the middle of the 2nd quarter, and then decreased again. The price will reach its lowest point in the 3rd or 4th quarter. At the beginning of 2020 (end of the 1st quarter of 2020), the COVID-19 outbreak entered Indonesia, causing economic panic due to uncertainty over the issue of lockdown of all types of transactions involving the population (economic actors). This panic caused price spikes that were quite drastic and exceeded the price peaks that had occurred in previous years. In addition, there is also the unavailability of data from wholesalers because wholesalers cannot carry out trade transactions between provinces or between regions on a large scale, including shallot exports abroad. The certainty over the economic policies shown by the Indonesian government in 2020 has caused the price of shallots to fall close to the normal point. The decline in activity and economic activity has caused the price of shallots to decline relatively in 2021. Perhaps due to the threat of an economic recession caused by the ongoing pandemic outbreak, the price of shallots will remain sloping in 2021. Shallot trading takes place normally, without any fluctuations. Since in 2021 there are still restrictions on economic transactions between countries (exports), the amount of shallot produced in an area can meet their respective needs, so that the price of shallots is relatively stable at a low number.



Source: PIHPS data processed

Figure 3. Shallot price fluctuations in 2017-2023 in provinces with a surplus in production

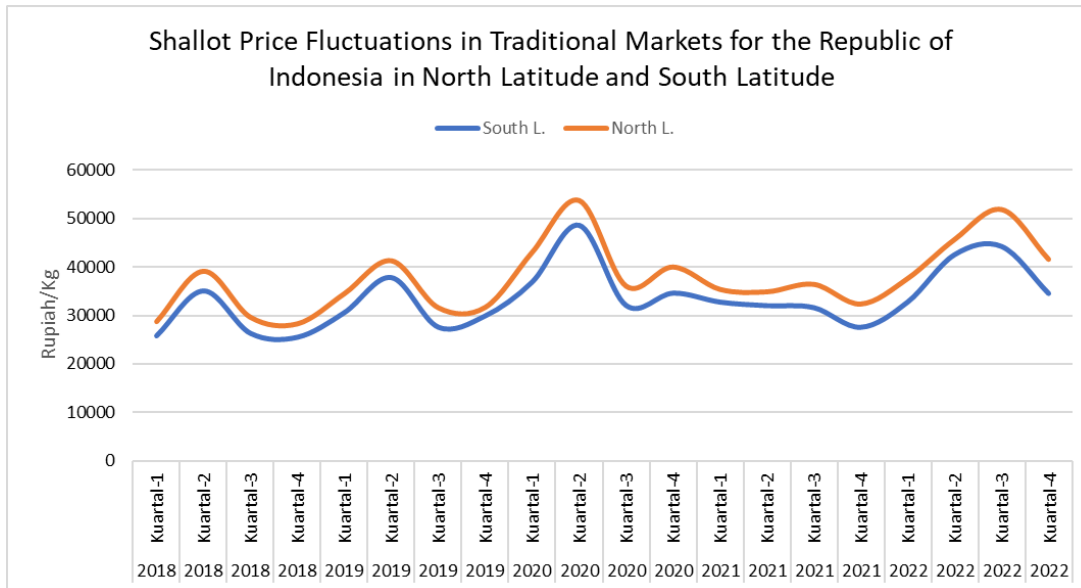


Source: PIHPS data processed

Figure 4. Shallot price fluctuations in 2017-2023 in provinces with deficits in production

In Figures 3 and 4, Provinces with production surpluses and deficits show the same thing nationally, namely that there was a price increase in the 2nd quarter and a fall in the 3rd quarter. It is suspected that the price increase was triggered by the increase in demand for shallots in the shallot production areas as the shallot planting season began. This situation resulted in a decrease in the amount of supply in areas with a deficit, so that the price of shallots in those areas increased.

In Figure 3, it can be seen that in producing areas that had a surplus, the difference in prices between regions/provinces was not too high (the gap/disparity was low); whereas in areas, of provinces (Figure 4), it appears that price disparities are quite large due to product transportation costs and escalating transaction margins between traders depending on the distance from the area to the source of production and the number of canals that act as mediators.



Sumber : Data PIHPS diolah

Figure 5. Fluctuations in the price of shallots in 2018-2022 in the provinces of North Latitude and South Latitude of the Republic of Indonesia

Figure 5 also shows that the price of shallots in the producing areas in the North Latitude of the Republic of Indonesia (North Sumatra) has fluctuations similar to those in the production areas in the South Latitude. This may indicate that these regions have almost the same main growing season (In-Season). If, for regions in northern latitudes, Indonesia can take advantage of the benefits of changing the time of the main season and shallot production areas can be expanded through agricultural extension, the price of shallots in Indonesia will be more stable due to a stable supply on the market. This situation takes advantage of the impact of the west-east monsoon wind difference. The monsoon climate is strongly influenced by seasonal winds, which change every 6 months. The southwest monsoon (west monsoon) and the northeast monsoon (east monsoon). The West Monsoon wind blows around October to April, which is wet, so that it brings the rainy/rainy season in the southern latitudes, and vice versa in the northern latitudes, while the East Monsoon wind blows around May to September, which is dry in nature, which results in Indonesia experiencing a dry/dry season in the south and vice versa in the northern latitudes.

### Disparity

Price disparities are price gaps between regions or between periods that occur due to changes in the economic sector, be it the real sector or due to government policies. The disparity is expressed in the form of a percentage figure (%), which is the result of dividing the deviation (price deviation) by the average price and is referred to as the coefficient of variance.

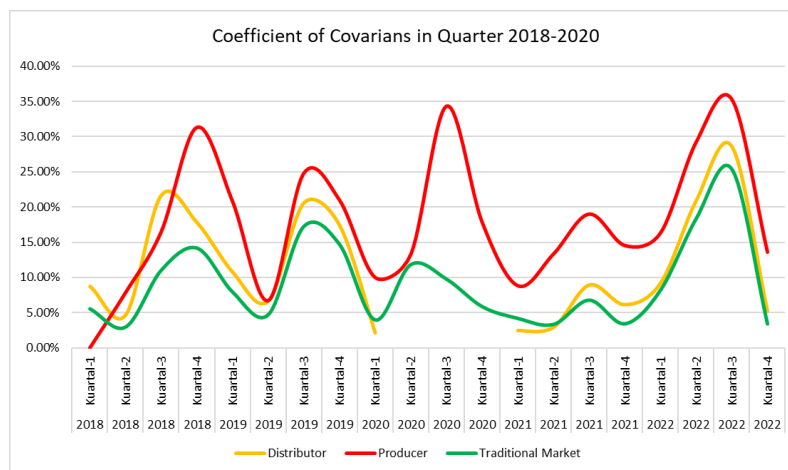
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There are three types of price disparities, namely:

- 1) Comparison of the coefficient of variance of commodity prices in the same area or one area in different time periods with the same interval and the same entity level
- 2) Comparison of the covariance coefficient of commodity prices in different regions over the same period at the same entity level.
- 3) Comparison of the covariance coefficient of commodity prices in the same or one area in different time periods with the same intervals and different levels of actors, which are producers, wholesalers, and traditional markets.

The coefficient of national variation for 3 actors in the trading system (manufacturers, wholesalers, and traditional markets), for each quarter between 2018-2022 is shown in the following figure.



Source: PIHPS data processed

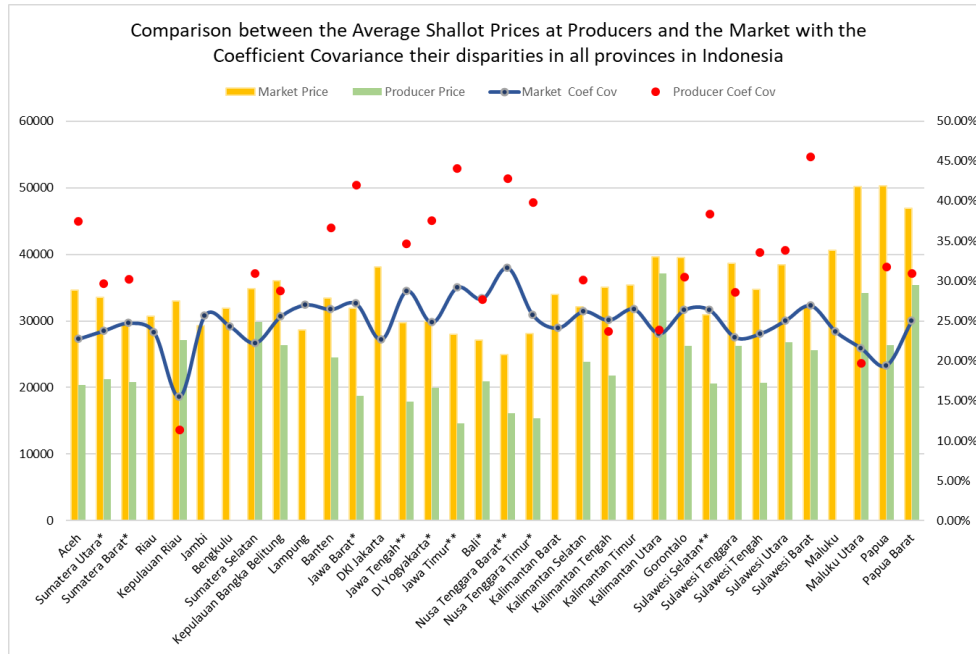
Figure 6. Coefficient of variance on National Disparity, for three actors in the trading system (producers, wholesalers, traditional markets), for each quarter between 2018-2022

Figure 6 shows the price disparity of shallots in traditional markets, which is relatively smaller and less volatile than at the producer level. Price fluctuations for producers were extremely high, especially in 2020 when Indonesia was starting to be hit by the COVID-19 pandemic, because at that time producers were panicking about the certainty of a lockdown policy by the government. At that time, wholesalers also experienced a situation of uncertainty, so they did not have a value that could be used as a benchmark for prices.

As is the case with price fluctuations, in the annual period, on a national scale, it appears that disparities will increase in the 2nd quarter of each year and then decrease at the end of the 3rd quarter. Sometimes there is a shift backward in the period of turmoil, which may be due to the delay in the planting season due to climatic influences.



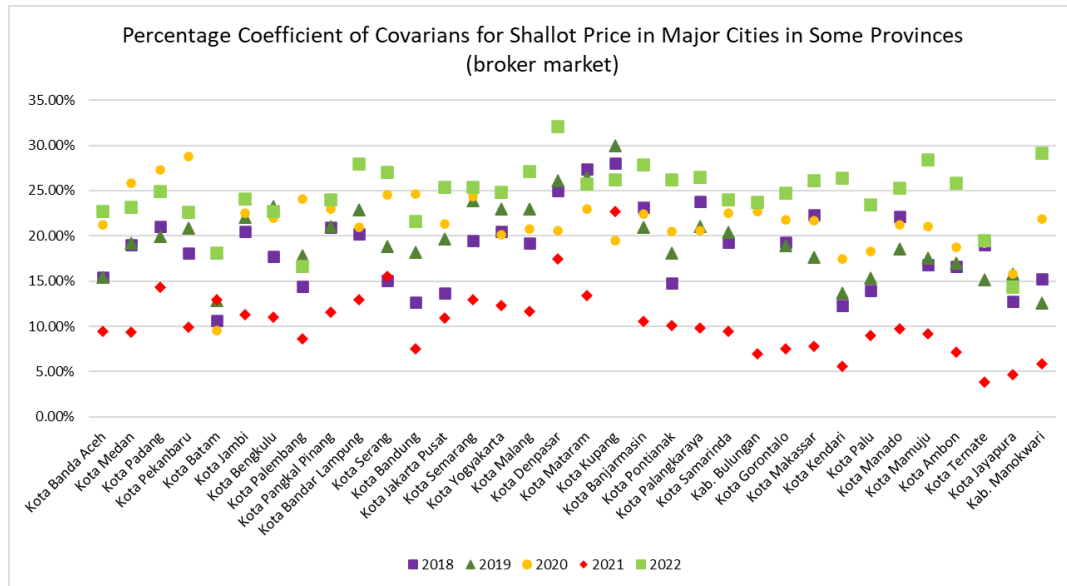
The coefficient of covariance percentage of shallot prices in the province's major cities (broker market) is shown in Figure 8 below.



Source: PIHPS data processed

Figure 8. Shallot price coefficient of covariance in major cities within the provinces which represents prices in wholesale/traditional markets in 2018-2022

Figure 8 shows that there is no discernible trend of change in covariance coefficients in each province's wholesale markets. At first glance, it appears that the lowest covariance coefficient happens in 2021, and the highest in 2022. However, if one examines closely, it appears that cities with factors of production (producing provinces) will have a higher coefficient of covariance than provincial cities that depend on shallot supplies from outside the province. This could be interpreted as local wholesalers or shallot suppliers in the region keeping the price of shallots stable at a certain level.



Source: PIHPS data processed  
 Figure 9. Comparison between the average price of shallots at producers and the market compared to the coefficient of covariance  
 Note: \*\*: the province is a large producer, \*: the province is a moderate producer

Figure 9 indicate that the covariance coefficient in large and sufficient producing provinces (surplus production) is higher than in provinces with low production (deficit) at the market level. At the producer level, it denotes that the higher the covariance coefficient, the lower the producer price. This situation can be interpreted to mean that in regions with high levels of output, there are many business 'actors' who can influence market prices or producer prices. This economic scenario can be classified as business competition nearing a perfectly competitive market structure. The covariance coefficient appears to be relatively low in areas with a supply deficit, implying that there are no significant fluctuations, but the price of shallots does.

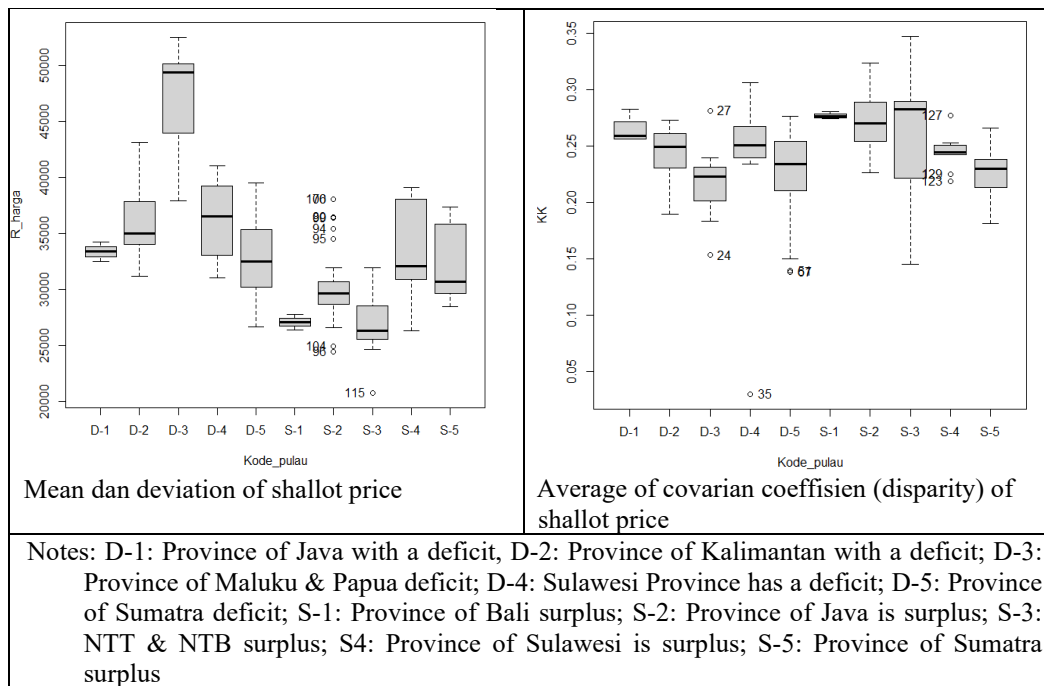
### Compilation And Problem Analysis

This research denotes that the price of shallots in Indonesia usually fluctuates in a predictable pattern, rising in the second half of each year, peaking between the second and third quarters, and decreasing in the third quarter. Prices rose significantly at the start of the Covid-19 pandemic, then fell and slumped until the end of 2021, when economic activity started to flourish. Prices for shallot are beginning to revert to normal, albeit at a higher level.

Price increases fluctuate in the second half of each year, ostensibly due to greater market demand. In this instance, farmers require high-quality shallots to be used as seeds during that year's planting season. Price fluctuations in each area follow the same time pattern. Price fluctuations in

areas with a product surplus and a product deficit follow the same pattern, but on a different price basis.

The findings of analyzing the data using a box-plot related to the average price, deviation, and maximum and minimum prices for island units are shown in the figure below.



Source: PIHPS data processed

Figure 10. Boxplot map of price distribution and covariance coefficients of provinces within the islands in Indonesia and their status

From Figure 10, it appears that on the islands of Bali, NTB and NTT where the shallot production is surplus, while on the islands of Kalimantan, Maluku and Papua all provinces experience production deficits. On the islands of Java and Sumatra, there are several provinces with deficits and several surplus statuses. Figure 10 shows that in D-3 (Provinces of Maluku and Papua) the price of shallots has the highest average price including its distribution, but the covariance coefficient is the lowest. This situation indicates that there are business actors who control the price of shallots so that they remain in the desired position. This situation can be achieved because there are only a small number of entrepreneurs who are suppliers of shallots in the region from provinces which are producers. This situation causes the two regions to experience monopoly market structure conditions.

In terms of shallot output, regions with the codes S-3 (NTT & NTB) and S-1 (Bali) have surplus status. These regions' prices are at the lowest market level with the smallest deviations, but they also have the largest coefficient of covariance, which indicates the greatest disparity. This is due to the fact that there are a lot of market participants, as well as a lot of different and expansive shallot trading systems in the area, which gives traders a lot of options.

A rather difficult situation to analyze is the condition on the island of Java (D-1 & S-2), where there is a very large surplus but prices are relatively high compared to those in Bali, NTB, NTT (S-1 & S-3). If examined in depth, it appears that the price in Lampung province (outlier D-5) is lower than the price in the producer province on the island of Java. This situation raises suspicions that there is dumping of products from Java to Lampung in order to maintain prices on the island of Java, but traders do not suffer losses due to transportation costs. The same thing happened in the province of South Sumatra where the price at the wholesaler level was often lower than the price at the local producer level. Consequently, it can be said that the shallot trading market on the island of Java, particularly in Central and East Java, is comparable to a market with an oligopsony structure, where a group of wholesalers band together to control the purchase price of farmers, then send the majority of their products to other provinces in an equitable or unreasonable manner (product dumping), or export them abroad, in order to maintain a limited supply in the area so that prices remain high in accordance with plan commercial. (wholesalers).

#### 4. Conclusions

The price of shallots varies frequently across the country, beginning to increase in the first quarter of every year, peaking at the start of the second quarter, and then starting to fall. In the third and fourth quarters, the price is relatively modest. Provinces with excess producer status and those with deficit producer status both exhibit the same pattern, but the latter differs due to the fluctuating price level. The price level for the provinces in the northern latitudes is also slightly greater when a mapping is done for those in the southern latitudes and those in the northern latitudes. This indicate that producers in the southern latitudes provide the bulk of the shallot supply in the northern latitudes. All commercial entities, including traditional markets, wholesalers, and producers, follow the same formula, but each has a distinct price point.

The opposite pattern can be seen in the coefficient of covariance (= deviation/average), which is used as a benchmark for the occurrence of disparities. It is low in quarters 1 and 2 and increases in quarters 3 and 4, suggesting that traders tend to be cautious when the price of shallots is expensive (rising). There is a significant price increase when the covariance coefficient is high and the average price is high. When determining the covariance coefficient, a high price indicates that the dividing factor will be large, resulting in a relatively small price difference from the average price. However, when shallot prices drop (become cheap), the percentage difference increases because the dividing factor is tiny. Due to the large number of participants in the shallot trade, where competition is subject to the whims of the market, regions with producer status typically have quite significant price disparities. The covariance coefficient values are lower in regions that rely on shallot imports from other provinces because wholesalers, who rule the market, set the prices. While the patterns of covariance coefficient fluctuations in large cities are generally consistent, there are some places where the patterns diverge.

Because of the restrictions and restrictions on human movement patterns that were in place at the time of the Covid-19 pandemic in 2020 and 2021, transactions, activities, and trade activities

were hampered. As a result, the price pattern for shallots changed and no longer followed the general pattern. The pattern will almost completely return to normal in 2022, but there will be an acceleration of the pattern, which will result in a price increase at the end of the 2022 fourth quarter, and it will begin to grow in the first quarter of 2023. Several parties have started to store goods with the calculation that shallots are needed for seeds at the end of the first quarter and the beginning of the second quarter, and at the same time there is an increase in demand due to the month of Ramadan and Eid 2023. This raises the suspicion that this has happened as a result of an increase in demand. Future price forecasts have an impact on the dynamics of this price rise.

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