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Vertical Market Integration and Behavioral Variations of Medium-Quality Rice Prices Before and During Covid-19

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Abstract: The Covid-19 pandemic has put pressure on the prices of food, particularly rice, a strategic commodity for trade across Indonesia. The traditional market and wholesalers face intense price competition for rice, which renders the market ineffective. This study proves the form of rice market integration in wholesalers and traditional markets, as well as the behavior of pricing both before and after the pandemic. The research data are the weekly and monthly prices from the Indonesian National Strategic Food Price Information Center Institute for the years 2018 to 2021. Vector autoregression (VAR) and error correction model (ECM) were adopted for the integration analysis. The results suggest that prices in traditional markets and wholesalers cointegrate, but this does not persist over time. Equilibrium prices in both markets were reached after 4 months. The price trend demonstrates that price changes in both markets before and during the epidemic are not symmetric. Price changes during the Covid-19 epidemic were erratic and dramatic. Government involvement through suitable policies is required in a market environment under intense pressure to stabilize prices. Market participants must accept this policy in order to prevent any party from gaining an undue advantage.

Keywords: Covid-19; Vector autoregression (VAR); Error correction model (ECM); Rice price

1. Introduction

The Covid-19 pandemic's effects are still being felt, and the conflict between Russia and Ukraine has made them worse. This has led to swings in the price of food, particularly staple foods. For the Indonesian populace, rice is a strategic food and one of their staples. In the event that supply is disrupted, the dynamics of rice prices are particularly susceptible to changes in supply and demand. Food distribution and supply lines between countries and regions have been hampered by the Covid-19 outbreak and the wars in Russia and Ukraine. The seamless distribution of food items between regions is impacted by the seasons in Indonesia, a country made up of hundreds of islands, where food is transported between regions by water.

The pattern of rice distribution in Indonesia varies between regions, due to the imbalance in the availability of marketing infrastructure, such as roads and ports, as well as the disparity in the presence of specialized marketing institutions. This situation may have an impact on Indonesia's rice marketing strategy, among other food commodities. In Indonesia, rice prices are consistently reported to be rather steady. In addition to balancing the supply and demand for rice, government policy also sets a ceiling price and floor price to control rice prices. To ensure the stability of supply and demand and prevent price fluctuations, the government places restrictions on certain situations. Because rice is a critical commodity, unchecked price swings can disturb the nation's economic, social, and political stability.

The relationship structure amongst vertical marketing agencies involved in rice marketing has an impact on the dynamics of rice pricing in Indonesia. According to the Low of One Price (LOP) principle, a market is said to be vertically integrated if price changes that occur in the market may be perfectly transferred to the next market [1-

3]. The vertical integration of the market is reflected in an effective marketing system. When the price of rice changes in the traditional market, the connected wholesaler's pricing adjusts accordingly right away. This is known as vertical integration. The pricing link between markets in one region and markets in other regions is what distinguishes it from spatial market integration.

The relationship between a marketing agency and other marketing institutions is viewed through vertical market integration as part of an interconnected marketing chain [4]. According to Vercammen [5], market integration measures changes resulting from supply or demand disturbances in a market area, which might have an impact on prices at different vertical levels of the market. Therefore, this study measures vertical market integration between prices that occur in traditional markets and prices at wholesalers. The vertical market is interesting to reveal because some parties can act as price makers or as price takers.

If the marketing infrastructure is readily available and usable, market participants behave fairly, and the market information system functions properly for all market participants, an integrated market can operate flawlessly. In an emergency like the Covid-19 pandemic, however, this is followed by a policy that limits the movement of persons and goods. The policy would disrupt the supply chain for rice across regions and between markets. At all market levels, the global rice marketing system has been disrupted by the pandemic, affecting rural communities. In producer markets, wholesalers, and conventional markets, rice prices also tend to behave in an unpredictable manner.

Price fluctuations are an issue because it is impossible to predict them, particularly after the Covid-19 epidemic started in early 2020. Covid-19 has caused an economic catastrophe on a worldwide scale. Lockdown measures in a number of nations limited imports and exports. The extensive social restrictions (PSBB) in a number of places have made it difficult for food to move between regions, according to Indonesia's plan for fighting the Covid-19 pandemic. The closure of hotels and restaurants was another factor in the decline in public consumption. Data from BPS 2020 show that food consumption fell from 5.1% in the first quarter to -0.71% (y-o-y) in the second. As a result, the price of basic staples like rice increased across Indonesia.

The inadequate marketing infrastructure of the inter-regional transportation system is one of the main reasons why the market is not linked both spatially and vertically in an archipelagic country like Indonesia, which has 17,491 islands [6]. The implementation of governmental programs like PSBB, plant pests, and production hazards brought on by harsh weather all have a role in the extraordinarily erratic movement of food prices. Huge price dynamics will have an impact on inflation and other economic difficulties, even though somewhat high price dynamics are more challenging to regulate. In several Indonesian cities, inflation increased as a result of price increases for different food types, as discovered by Jusar et al. [7]. According to Saliem et al. [8], the cause of the sharp rise in rice prices was the world crisis.

The FAO claims that the Covid-19 epidemic, increasing pressure from the supply and demand sides, and the widespread global trading of food led to exceptionally dramatic swings in food prices. During the Covid-19 outbreak, food commodity prices at the farm level generally decreased, with the exception of shallots, whose prices increased as a result of a shortage in supply and/or production [9]. Other studies include those by Rahmanta et al. [10], Espitia et al. [9], Karim et al. [11] and De Paulo Farias and de Arajo [12] on the effects of food price fluctuations on inflation in the province of North Sumatra, and on rice fluctuations in Bangladesh. Ullah et al. [13] reported that different areas of Dhaka City, Bangladesh experienced different fluctuations in food costs as a result of the lockdown. They also found that Covid-19 altered how food supplies were distributed across different locations, causing price discrepancies to depend on the location and timing of trade transactions.

Recent research indicates that Covid-19 has influenced farmers' market integration, which can be enhanced by market support [14]. Price discrepancies between markets take two to three months to equalize, and it takes a week for a contribution to transaction costs to move in that direction [15]. Another investigation uncovered robust horizontal price transmission both between and within the districts of Indonesia [16]. Prices do not, however, reach long-term equilibrium as rapidly as they should, and the weakest integration can be observed in domestic market. Thus, it is crucial to avoid employing price support programs in place of market reforms, such as to strengthen domestic market integration.

Some of these studies imply that it is vital to watch and learn about the dynamics of food price swings in diverse situations and throughout multiple time periods, before making the optimal decisions. This information is particularly crucial for the Indonesian government and other economic participants. Because Indonesia is an archipelagic country, the price difference between vertical markets as well as between regions could be magnified by the barriers to marketing infrastructure, lack of cross-country and cross-regional/provincial trade transportation facilities, etc. How can rice prices be tracked early to distribute food fast if there is pressure on the supply and demand sides between surplus and deficit locations to prevent excessive price variations?

This study focuses on rice of medium quality. The Indonesian National Standard (SNI) 6128 of 2015 BSNI RI 2015 serves as the basis for the quality standard for rice in Indonesia. It is this standard that the Ministry of Agriculture of the Republic of Indonesia uses to categorize rice into premium rice (extremely good quality) and medium rice (good quality). In contrast to premium quality rice, medium quality rice is more commonly consumed by Indonesians because it is relatively affordable by the populace. The r ice of medium quality is more dynamically

priced than rice of premium quality. The rice of medium quality was selected because it is the most well-liked variety in the traditional market and is supplied by East Nusa Tenggara wholesalers (NTT). Cracked rice, water content, and the degree of sosoh (epidermal removal) are signs of rice of medium quality (broken grains).

The research findings can be used to establish whether or not there is vertical integration of the rice market amongst market participants, particularly wholesalers and traditional markets in NTT. The research also describes the behavior of medium rice prices both before and during the Covid-19 epidemic in general. The authors recommended the responses that the government and market players should make in the face of the ongoing price scenario.

2. Methodology

Kupang City, East Nusa Tenggara Province, the region with the greatest city population in NTT Province and the core of the NTT rice trade, was chosen for this study. For customers in conventional markets, wholesalers play a significant role in the wholesale distribution of premiums. Figure 1 depicts the research region, which is representative of the archipelago and is located in East Nusa Tenggara Province.

Figure 1. Map of the study area

The National Strategic Food Price Information Center, an organization that always provides the evolution of national strategic food prices in real-time, is the data source. Price information for premium medium quality rice for the monthly period from January 2018 to December 2021 is adopted to analyze vertical market integration. The price behavior is fully assessed by examining price trends from January 2018 to February 2020 prior to Covid-19. In the meantime, the price trends are also evaluated from March 2020 to March 2022 during Covid-19.

2.1 Analysis Model

Market integration offers an important approach to study the marketing of agricultural products. The accurate data of market integration can be utilized to make decisions, implement strategies, and raise welfare [17]. There are various methods to test market integration, including correlation, simple regression, cointegration, and vector autoregression (VAR). The VAR analysis is superior than others in many ways. It can distinguish between the reference market and the follower market, which may define the direction of price transmission. Besides, it does not differentiate between endogenous and exogenous factors, making it easier to implement. All dependent variables in the VAR model must be stationary, for non-stationary independent variables will result in erroneous regression [18]. The characteristics of ECM, however, are to allow short-term dynamic changes while limiting the existence of a long-term interaction between variables, aiming to converge into a cointegration relationship.

The stages of market integration analysis are as follows:

Data stationarity test

Data stationarity test intends to detect false regression [18]. To obtain stationary data, it is important to perform a stationarity test using Augmented Dickey-Fuller (ADF) at the same degree. In the ADF test, the data trend can be tested by:

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

where, P_t is the rice price in each market in period t (Rp/kg); P_{t-1} is the rice price in each market in the previous

period t-1; ΔP_t and ΔP_{t-1} are $P_t - P_{t-1}$ and $P_{t-1} - \Delta P_{(t-1)-1}$, respectively; m is the number of lags; α_0 is the intercept; $\alpha, \beta, \text{and } \gamma$ are parameter coefficients; ε_t is the error term.

The null hypotheses are as follows:

$H_0 : \gamma = 0$; the time series data is not stationary.

$H_1 : \gamma < 0l$; the time series data is stationary.

The testing adopts the following rules:

If the ADF statistic > ADF is critical, then reject H0, i.e., the data is stationary.

If the ADF statistic ADF is critical, then accept H1, i.e., the data is not stationary.

Optimal lag determination

The optimal lag time is needed in the VAR model to observe the effect of one variable on other variables. The magnitude of a variable's lag can have an effect on other variables because it takes time for a variable to respond to the movement of other variables. Here, the Akaike information criterion (AIC) is adopted to determine lag length.

Cointegration test

Conduct a cointegration test if the studied price variables are not level-integrated. Here, Johansen's cointegration test is adopted to establish whether there is integration or not by combining various variables. If the computed value of LR is less than the critical threshold, there is no cointegration.

ECM test

The error correction model (ECM) solves the short-term imbalances, eyeing long-run equilibrium. The R2 coefficient or residual from the first regression, i.e., the error correction term, can be used to determine the model details. The observed model is valid if the test results are significant. In the long run, an equilibrium condition can be obtained if the variable connections are cointegrated. Here, the Engle-Granger ECM model is adopted:

$$Yt = 0 + 1\Delta Xt + 2\ ECt + et$$
$$ECt = (Yt\text{-}1 - 0 - 1\ Xt\text{-}1)$$

3. Results and Discussion

3.1 Wholesalers and Traditional Markets

Gathering and distributing, buying and selling, choosing products, providing financing, warehousing commodities, and transportation are just a few of the duties of wholesalers. Many advantages can be offered by wholesalers, including the ability to transfer several items in a single transaction, the opportunity to purchase product contracts before the crop is harvested, and the flexibility to change up marketing strategies. Rules for sorting and packaging, delivering huge quantities of output, and the buyer's need for constant quantity and quality all apply in relation to the buyer's control over price and the vulnerabilities of wholesalers.

The survey results indicate that a number of rice wholesalers, notably PT Multi Niaga Jaya Abadi and Bulog NTT, are based in Kupang City. Bulog is a state-owned business that handles food logistics. The company's business operations include logistics, warehousing, surveys, pest treatment, the provision of plastic bags, transportation, trading in food commodities, and retail. Bulog is a company that still carries out government-mandated public duties, such as purchasing grain, upholding fundamental prices, distributing rice for social assistance, and managing food inventories. Meanwhile, PT Multi Niaga Jaya Abadi is a distributor who has gained the trust of many producer centers to deliver a variety of goods, including rice, a staple food for the people of Kupang City, Labuan Bajo, Flores, and the neighborhood. With a 20-truck delivery fleet, a 4 hectare stock warehouse, and 1,000 distribution points of sale, PT Multi Niaga Jaya Abadi presently sources its rice from West Nusa Tenggara, Java, and Sulawesi.

Traditional markets are recognized for being supplied with a wide variety of food items that are traded in one market location. In conventional markets, negotiations about prices are used to complete transactions for products and services. Market power is determined by the bargaining power of market participants.

3.2 Market Integration Analysis

The time series analysis is performed using EViews 11. The software, according to Nendissa et al. [19], makes computer-based data analysis, regression, and forecasting simple. It is a computer program that analyzes economic and statistical data. EViews can be applied to financial analysis, cost analysis, simulation, macroeconomic forecasting, and the interpretation of scientific data. In the software, data are stored as an object variable. The type of object that is presently being utilized in the work file is indicated by the icon that displays next to the object

name. For every item, there is a specific set of data analysis methods referred to as EViews. With the aid of the software, one can run a quick hypothesis test or present a graphical summary of the results. Therefore, it is reasonable to use this tool to resolve problems that take the form of time series, cross sections, or panels. This study examines the monthly price data for a commodity of medium-quality rice from wholesalers and traditional markets in the city of Kupang for the years 2018 through 2021.

Stationarity test

The ADF unit root test is employed to test data stationarity, with a 5% significance level. Because there is no unit root in the data, an observed variable is said to be stationary if its ADF statistic value exceeds the critical ADF. If the statistical ADF is lower than the critical ADF, it can be said that the data are not stationary. In addition to examining the statistical ADF value and the critical ADF value, it is possible to utilize the probability value to assess whether the data are stationary. The data are stationary if the probability value is less than 5% or with a confidence level of 0.05. If the data series is stationary without differencing, it is thought to be a level condition, for the data is not stationary when the probability value is more than 5% with a confidence level of 0.05. If the data series is stationary in the first derivative, the first differencing or integration criterion of order 1 is satisfied (1). If the time series data must be derived from "d" times in order to be stationary, they can often be expressed in form (d) or integrated of order "d."

According to the results of the ADF unit root test, the data on the price of medium rice in conventional markets and wholesalers are in the following ranges (Table 1).

Table 1. Stationarity test results

Variable	Unit Root Test				Information
	Level		1stDifference		
	ADF	Prob	ADF	Prob	
Traditional_Kupang	-3,137054	0.0331	-	-	Stationary
Wholesalers	-2.267957	0.1875	-5.523439	0.0001	Stationary

Source: Secondary Data Processed, 2022; Description: Significant at the 1% confidence level

The null hypothesis is supported by Table 1 above, which shows that the price data for medium rice I in the traditional market are stationary at the level. The result clearly shows that the probability value of 0.0331 is already below the threshold of 0.05 and that the ADF statistic value (-3.137054) above the threshold of the ADFcritical value (-2.951125).

As can be seen in Table 1, the pricing data for medium-quality rice at wholesalers is stationary at the first degree of difference. This verifies the null hypothesis . The level test results with a statistical ADF value of (-2.267957) are less than the critical ADF (-2.948404) with a probability value of (0.1875) greater than 0.05, according to the output produced. T First, differencing is carried out to ensure that there are no stationary areas on the level. With a probability value of 0.0001, which is less than 0.05, it can be demonstrated that the ADF statistic value of (-5.523439) is smaller than the critical ADF (-2.951125). The null hypothesis can be rejected since the pricing data for medium-quality rice at wholesalers is stationary at the first level of differentiation.

The results of the unit root test (ADF Test) demonstrate that the ADF statistic value is higher than the critical threhsold of the ADF statistic. The monthly pricing data for medium-quality rice in the traditional market of Kupang City and Kupang City wholesalers is known to be stationary and may be carried over to the next test based on the test results above.

Optimal lag test

The data must be stationary to produce a VAR estimate. The variable data is stable at the first difference level. Hence, it is expected that the estimation would result in a reliable model output, and our conclusion would be highly valid. The research findings will be very valid as a result. Finding the precise lag's length is the first step in developing the VAR model. For VAR modeling, the best lag time must be identified. It is anticipated that the overall dynamics of the model cannot be accurately portrayed if the ideal lag entered is too short. But a long optimal latency will provide a poor estimate, owing to the limited degree of freedom (especially in models with small samples). Therefore, the proper lag time must be determined before estimating the VAR (Table 2).

Table 2. Results of optimal lag test

lag	LogL	LR	FPE	AIC	SC	HQ
0	-446.5389	NA	2.19e+09	27.18418	27.27488	27.21469
1	-419.5311	49.10513*	5.44e+08	25,78976	26.06186*	25.88132*
2	-415.0669	7.575556	5.31e+08*	25.76163	26.21512	25.91422
3	-410.9469	6.492270	5.32e+08	25.75435*	26,38924	25.96797

* Rejection of the hypothesis at the 0.05 level; Source: Secondary Data Processed, 2021

Under the Akaike information criterion (AIC), the results of the optimal lag test suggest that the best lag length is 1 with an AIC value of 25,75435.

Cointegration test

The cointegration test provides a tool to determine whether there is a long-term relationship between two variables. If the test variable exhibits cointegration, a long-term relationship can be assumed. This technique can be used with time series data that are not stable at the level, as long as the data have a long-term equilibrium relationship (cointegrated). As a result, the cointegration testing in this study employs the Johansen test. When the trace statistic and maximal eigenvalue are compared to the t-statistic value, the null hypothesis is rejected and the two variables are cointegrated. The test results show that the level of significance is 5%.

Here, the cointegration test is performed to ascertain if there is a long-term relationship between the cost of medium-quality rice in Kupang City's traditional market and its wholesalers. The test results are displayed in Tables 3-5.

Table 3. Cointegration test results: unrestricted cointegration rank test (trace)

Hypothesized No. of CE (s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None*	0.70743	46.01286	25.87211	0.0000
At most 1	0.18848	6.68317	12,51798	0.3787

Trace test indicates 1 cointegrating eigenvalue at the 0.05 level; * Rejection of the hypothesis at the 0.05 level

Table 4. Cointegration test results: unrestricted cointegration rank test (maximum eigenvalue)

Hypothesized No. of CE (s)	Eigenvalue	Max-Eigen Statistics	0.05 Critical Value	Prob.**
None*	0.70743	39.32969	19.38704	0.0000
At most 1	0.18848	6.68317	12,51798	0.3787

Maximum eigenvalue test indicates 1 cointegrating eigenvalue at the 0.05 level; * Rejection of the hypothesis at the 0.05 level

Table 5. Cointegration test results: normalized cointegrating coefficients (standard error in parentheses)

GDP	PTRAD
1000000	-1,611,403 0.17238

Source: Secondary Data Processed, 2021

By contrast, the value of the trace statistic is based on the results of the cointegration research and has a critical value of 1%. T he trace statistic value is greater than the critical value with a 5% confidence level, which is 46.01286; greater than the critical value with a 0.05 confidence level, which is 25.87211; and greater than the eigenvalue, which is smaller than the trace statistic value. Therefore, the two variables can be considered as cointegrated.

As shown in Table 5, a 1% rise in traditional markets results in a 1.611% increase in wholesalers. The Engle-Granger error model must be corrected after learning the results of the cointegration test.

ECM test

The ECM was carried out to find long- and short-term correlations that develop as a result of cointegration between research variables. The first difference form of the dependent and independent variables was selected to create a short-term equation for short-term estimation.

Table 6. ECM test results

Variable	Coefficient	Std.Error	t-Statistic	Prob
C	-0.01048	0.03006	-0.348685	0.7296
D (GDP)	0.66511	0.18911	3.516926	0.0013
RESID01 (-1)	-0.41211	0.12915	-3.190977	0.0032
R-squared0.38598		Mean dependent var		0.00714
Adjusted R-squared 0.34767		SD dependent var		0.21698
SE of regression 0.17526		Akaike info criterion		-0.56332
Sum squared residual 0.98287		Schwarz criterion		-0.43001
Log-likelihood 12.85817		Hannan-Quinn Criter.		-0.51730
F-statistic 10.05789		Durbin-Watson stat		1.29507
Prob (F-statistic) 0.00041				

Source: Secondary Data Processed, 2021

The results above show a trace statistic value of -3.190977 (high enough) and a probability value 0.05. Thus, the ECM used is valid and that the probability value of the coefficient is less than 0.05, namely 0.0032. It can therefore be concluded that in this ECM identifies a short-term relationship (Table 6). Based on the data in the table above, the ECM can be established as:

Y = Price of Rice in Traditional Markets; X = Rice Price at Wholesalers; ECt = Error due to unbalance, or ***Ptrad =- 0.01048 + 0.665 GDP - 0.4121 ECt.***

The aforementioned model leads to the conclusion that an imbalance is the source of the incorrect value of ECt -0.4121. It still takes 4.92 months for the system to get balanced, as indicated by the ECt value of -0.4121, which denotes the error brought on by the imbalance. The price of rice does not necessarily come from traditional markets or wholesalers, for the price can be directly controlled by the government. Further, it takes another 4 months for the impacts of this imbalance to cointegrate or interact.

3.3 Rice Price Behavior

A pattern of price changes over a certain time period is what defines price behavior. The period from January 2018 to February 2020 was used to monitor pricing behavior prior to COVID-19. The pandemic started in March 2020 and lasted until March 2022. The Indonesian government declared that Covid-19 had been under control and that there was now room to execute health measures for the movement of people and products from April to August 2022. Since then, the economic situation started to improve. The wars in Russia and Ukraine, however, struck the world once more. According to FAO and WFP reports, several developing nations would experience severe food insecurity from October 2022 to January 2023 [20]. A second wave of economic catastrophe, centered on the world food crisis, is expected to occur in 2023. The food crisis will affect those with lower middle-class incomes. To reduce the damage, the government must act strategically and implement policies that directly help the vulnerable.

Figure 2 shows that the pricing behavior of medium-quality rice was more dynamic prior to the Covid-19 pandemic (in the area to the left of the red line). In traditional markets, consumer prices are less dynamic than wholesaler pricing. The price movement pattern does not show a symmetrical movement where each movement mirrors the other.

Figure 2. Pattern of price movement of medium quality rice before and during Covid-19

Prices for consumers, specifically the traditional market, stagnated at the start of the pandemic period. Then, the price dropped to nearly the price at wholesalers Rp. 11,000 from the previous Rp. 12,450. It was observed that price behavior at the beginning of the pandemic, price movements at wholesalers began to rise with weak fluctuations. Panics that lead to panic buying are the root cause of price behavior that is irrational and difficult to manage. The level of economic activity plummeted sharply, and social, political, and cultural conditions all shifted at once. In a catch-22 situation, the government implemented a variety of measures, giving health priority over the economy or vice versa.

Governments around the world have taken drastic measures against Covid-19, which affect local food prices [21]. The wise decision from the Indonesian government is a combined policy that restricts socioeconomic activity in the impacted areas based on a priority scale depending on the number of persons exposed to Covid-19 while speeding up the distribution of vaccinations to the populace. This approach is regarded as a means for the economy

to keep expanding while also succeeding in saving lives. The government's approach to supplying food is to diversify consumption and to avoid any burden on the rice stock supply for the population. Because the government is constantly concerned with maintaining stable rice prices, it is expected that the trend of medium quality rice price movements from April to August 2022 would be a stable vertical movement between the two prices. In contrast to other food commodities, the Indonesian government's primary policies are the establishment of celling and floor prices.

Based on the pattern of price movements between traditional markets, it is possible to decipher the effects of Covid-19 [14] and several other factors [15, 16], both in the short and long term long-term. Prices can fluctuate in response to variations in supply and demand in the near term, but these changes have less of an impact on prices over the long term. Extreme weather events may be the reason why supply changes in the short term and moves up or down the curve. Prices are impacted in the short term by these developments. Covid-19 is disrupting the US meat market by triggering shocks to the supply and demand side [22]. The integration of the rice market is influenced by the transaction process, which starts with demand, supply, and price or transaction costs. This is because the pandemic-related distribution obstacles prevented what should have happened between the vertical markets in the two markets. Asymmetric knowledge between market players causes each market to move structurally separately, which leads price behavior to fluctuate due to inadequate infrastructure.

The price of rice has increased for various staple commodities in both the traditional market and the wholesalers market as a result of Covid-19. Along with rice, market sugar, cooking oil, and eggs also became more expensive as a result of Covid-19, which was spurred by government initiatives to restrict the mobility of people [23]. This government policy was followed by panic buying by some people, whose overspending causes prices to soar. The distribution of commodities and the supply chain are thus hindered.

From a geographic perspective, Indonesia has two seasons: The hot Muslim season, which lasts from April to October, and the rainy season, which lasts from November to March. The summer season in eastern Indonesia can continue for 7-8 months. As a result, Indonesia's climate varies quite a bit. Sea transportation is crucial, for Indonesia is made up of numerous small and large islands. The distribution of goods across islands is dependent on that mode of transportation. The distribution of goods is hampered by the restricted transportation options, resulting in a significant price gap between regions. The distribution of commodities may be disrupted by the wind and weather, including high sea waves, as the rainy season. The Indonesian Logistics Affairs Agency carries out market operations (selling staple foods at prices below market prices) to help the government combat any slight fluctuations in the price of rice. Other government measures include establishing floor and ceiling prices on essential foods like rice and cooking oil.

4. Conclusions

The Covid-19 pandemic is not the only cause of unintegrated markets. Other causes include climate factors, infrastructure, marketing information systems, and the behavior of market participants. However, the pandemic has made it difficult for all market participants to maintain rice prices. According to the results of the market integration test, there is cointegration between wholesale market prices and consumer market prices in the traditional market. Thus, there is a short-term, rapid vertical price adjustment between the traditional market and the wholesalers market. That is why both market participants respond quickly to price changes. However, it takes a long time for prices to affect one another—4 months—to reach long-term market equilibrium. Rice is one of the key commodities that the government constantly monitors and intervenes with various policy measures to stabilize prices in comparison to other food commodities.

By regularly tracking price changes over time, the government, wholesalers, and conventional market actors (market players) who are active in selling rice take part in maintaining the rice price. Consistent application of government regulations is required to prevent unfair market practices.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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