

COVID-19 PANDEMIC AND VOLATILITY OF SUGAR PRICE AT REGIONAL LEVEL IN INDONESIA FOR THE PERIOD AUGUST 2018-AUGUST 2021

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Article history:

Received
10 May 2022

Revised
5 July 2022

Accepted
24 July 2022

Available online
29 July 2022

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Abstract: It is expected that the COVID-19 pandemic provides a significant impact on food price volatility in many products including sugar. The paper aims to analyze the price dynamic of sugar before covid (1st August – 2nd March 2020) and during the covid outbreak (3rd March – 31th August 2021) in all provinces in Indonesia by using the t-test and ARCH GARCH model. Based on Augmented Dickey-Fuller analysis before and during covid, the prices of sugar in Indonesia were stationary at the “first difference”. The results reveal that the prices of sugar in all provinces in Indonesia before covid was lower compared to during the COVID-19 pandemic. According to ARCH GARCH results, sugar prices were much more volatile in Riau, Jambi, West Java, East Nusa Tenggara, West Kalimantan, South Sulawesi, Central Sulawesi, and West Papua. As such, the government should focus to reduce the price volatility of sugar in these provinces.

Keywords: ARCH GARCH, COVID-19, sugar prices, stationarity, volatility

Abstrak: Pandemi COVID-19 diperkirakan akan memberikan dampak yang signifikan terhadap gejolak harga pangan di berbagai produk termasuk gula. Penelitian ini bertujuan untuk menganalisis dinamika harga gula sebelum covid (1 Agustus – 2 Maret 2020) dan selama wabah covid (3 Maret – 31 Agustus 2021) di seluruh provinsi di Indonesia dengan menggunakan uji-t dan Model ARCH GARCH. Berdasarkan analisis Augmented Dickey-Fuller sebelum dan selama covid, harga gula di Indonesia stasioner pada “first difference”. Hasil penelitian mengungkapkan bahwa harga gula di seluruh provinsi di Indonesia sebelum covid lebih murah dibandingkan saat pandemi COVID-19. Berdasarkan hasil ARCH GARCH, harga gula jauh lebih berfluktuatif di Riau, Jambi, Jawa Barat, Nusa Tenggara Timur, Kalimantan Barat, Sulawesi Selatan, Sulawesi Tengah, dan Papua Barat. Oleh karena itu, pemerintah harus fokus untuk mengurangi volatilitas harga gula di provinsi-provinsi tersebut.

Kata kunci: ARCH GARCH, COVID-19, harga gula, stasioneritas, volatilitas

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INTRODUCTION

The COVID-19 pandemic has had a significant negative impact on public sentiment. This results in panic, irrational buying behavior (Shadiqi et al. 2021; Liu et al. 2021), and influenced on prices in the agricultural products (Ilesanmi et al. 2021). The agricultural sector is closely related to food security because it naturally plays an important role in the provision and protection of food availability (Shidiq 2020; Rozaki 2021). In Indonesia, food price stability is a major problem faced by producers and consumers with large price fluctuations occurring in almost all staple foods (Sahara et al. 2018). The sugar production in Indonesia, especially in centrifugal sugar relatively lower than the consumption (Figure 1). Furthermore, sugar is one of the strategic foods in Indonesia due to higher demand based on import (UN Comtrade, 2022). The lower production and higher demand from consumption implicates the lower export and higher import related with sugar products with Harmonized System (HS) code 17 (Figure 2). It is more challenging after the Coronavirus Disease 2019 (COVID-19) was faced in Indonesia at March 2020. The food industry

in Indonesia was affected by COVID-19, especially in supply chain (Anugrah et al. 2020; Nugroho et al. 2020).

Based on National Strategic Food Price Information Center (PIHPS) data in 2021, the estimation of domestic sugar prices in traditional markets is accurate and can be used with a coefficient of variation value of less than 25%. Figure 3 shows the average domestic sugar price at the consumer level in three periods, namely overall, before covid, and during covid. The average sugar price for the period 1st August 2018 to 31th August 2021 is Rp14,312, while the standard deviation is Rp1,240.77. Hence, the price of sugar in the archipelago has a low variation because the standard deviation value is smaller than the average value. However, if you look at the average before and during covid, there is a significant price difference. The average price of sugar before Covid 1 August 2018 to 2 March 2020 was Rp13,686, while during the Covid period March 3rd, 2020 until August 31th, 2021 it was Rp15,016. The importance of observing changes before and during the onset of covid to see the impact of the pandemic on sugar price volatility in all provinces in Indonesia.

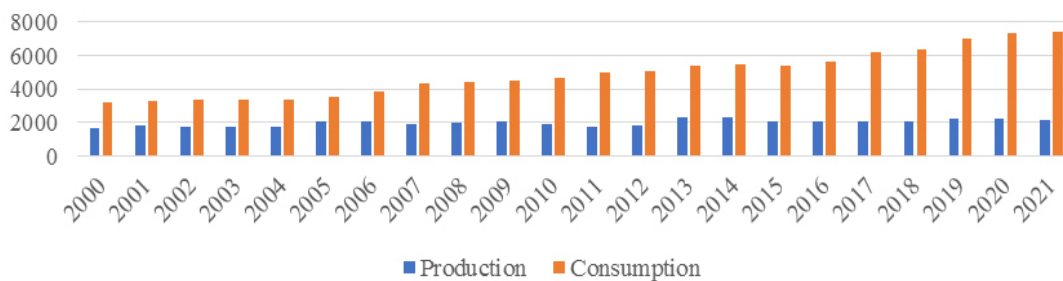


Figure 1. The Production and consumption of centrifugal sugar (1000 MT) (Indexmundi, 2022)

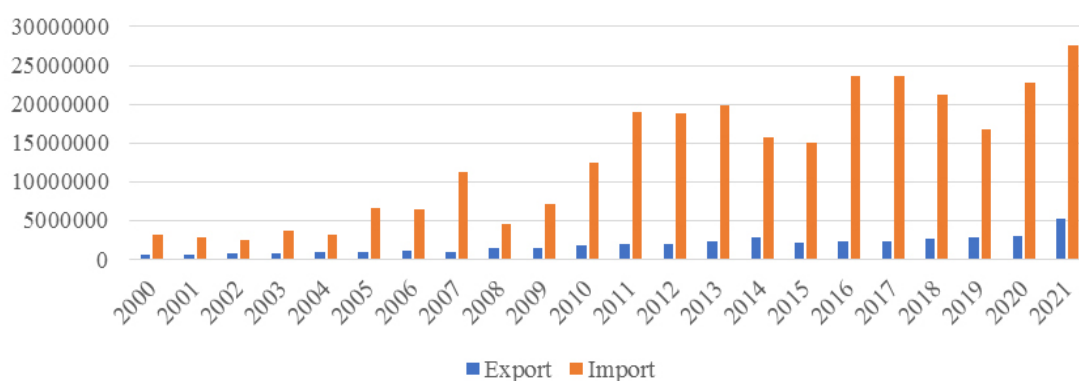


Figure 2. The export and import of sugar and confectionery sugar (1000 USD) (UN Comtrade, 2022)

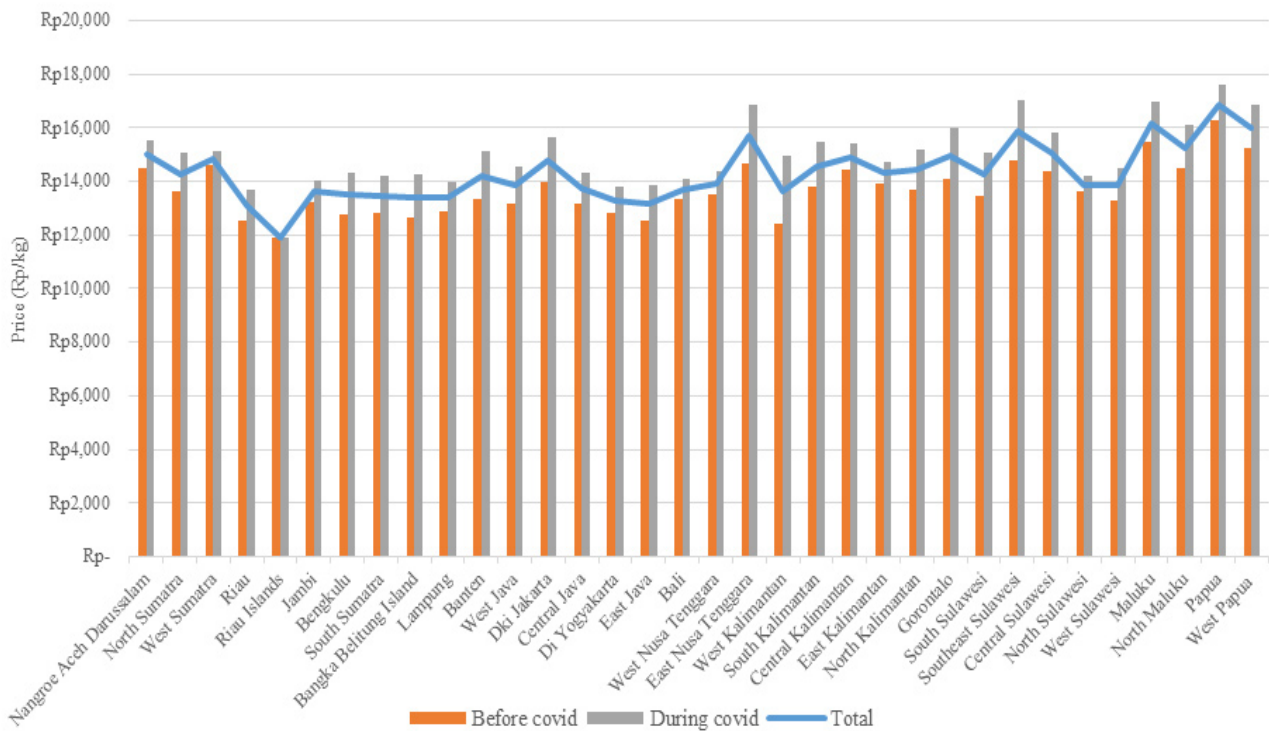


Figure 3. Average sugar price for all provinces in Indonesia before covid, during covid, and the whole period August 2018 – August 2021 (Rp/kg) (PIHPS, 2021)

Factors that significantly influence the retail price of sugar are sugar consumption, imports of sugar for industrial needs, world sugar prices, the retail of rice price and sugar retail prices in the previous period (Rachmadhan et al. 2020). The retail of rice price in consumer is the most influential variable in the creation of sugar prices. When the volume of sugar imports continues to increase, sugarcane production fluctuates and tends to decline. This condition was caused by the entry of imported sugar at low prices which resulted in the national sugar losing part of its market, resulting in instability in local sugar prices (Safrida et al. 2020). Price fluctuations could be seen by using volatility (Nainggolan et al. 2018). A knowledge of price volatility will assist in creating informed policy decisions and help market participants to better respond to this phenomenon (Gaetano et al. 2018).

There are several previous studies in sugar volatility analysis. Godana et al. (2014) investigated the factors were affected on volatility sugar price in Ethiopia from December 2001 until December 2011. This study found that import price for sugar, fuel oil price, exchange rate (dollar-birr), general inflation, inflation in non-food items, inflation in food items, past shock, and volatility on monthly domestic price had statistically

significant effect on the current month domestic price volatility. Laili et al. (2014) with the study about the volatility of world sugar price and domestic sugar price in Indonesia. The result is the volatility of the world sugar price and the domestic sugar price, each worth less than 1 (one) at a nominal price series. Volatility of raw sugar is 0.00254. The volatility of refined sugar is 0.957513. Domestic sugar price volatility is 0.980068, with downward trend. Jati (2014) examined the volatility of return sugar price in Brazil, India, France and Indonesia. Specific in Indonesia result, this study found that the risk potential of volatility return of Indonesia sugar price is higher than India.

Based on this description, the purpose of this study is to analyze the dynamics of sugar prices before covid (1st August 2018 – 2nd March 2020) and during the covid outbreak (3rd March 2020 – 31th August 2021) in all provinces in Indonesia. The novelty in this study, when compared to previous research, is that the analysis is carried out by comparing prices before and during the COVID-19 pandemic and focusing on one object, namely sugar in all provinces in Indonesia. The problem-solving approach in this study begins with identifying sugar prices using the T-test. The second step is to avoid false regressions with the stationary test

(unit root test). Finally, a price volatility analysis was carried out using the ARCH and GARCH models. The different of this study is investigation of sugar price by comparing the period before and after COVID-19 pandemic due to limitation of physical activities, classified in Indonesia major islands.

METHODS

The data used in this study were sourced from PHIPS. The data taken is the price of sugar at the traditional market level based on the region. In the secondary data collection process, tabulated data were processed using Microsoft Excel and Eviews 10 software. To empirically study the impact of covid on sugar prices in Indonesia. The authors collected daily prices in all provinces in Indonesia for the period before covid, from August 1st 2018 to March 2nd 2020 and during covid, from March 3rd 2020 to August 31th 2021. The analysis stage in this study serves to follow the research objectives. Each analysis tool is designed to be interrelated and complementary to one another. This study used the t-test to identify sugar prices in all provinces before and during covid. If the t-stat value is less than the significance value (5%), the price of sugar in the province before covid was cheaper than during covid. This applies the other way around during Covid.

The hypotheses in this paper were:

$H_0: \mu_1 \leq \mu_2$, sugar prices before covid are cheaper than sugar prices during covid

$H_1: \mu_1 > \mu_2$, sugar prices before covid are more expensive than sugar prices during covid)

Significance level: $\alpha = 5\%$ or 0.005

Hypothesis test criteria:

Do not reject H_0 if t-test \leq table or p-value $> \alpha$

Reject H_0 if t-test $>$ table or p-value $\leq \alpha$.

The data stationarity test is needed to avoid spurious regression. This test was performed using the Augmented Dickey-Fuller (ADF) test to detect the presence of unit roots. If the value of the t-statistic in the ADF as the stationary test is less than the critical value at the levels of 1%, 5%, and 10%, then the test rejects H_0 which means that sugar prices in the province are stationary at the level 95%. If it is not stationary, the time series regression became spurious.

The hypotheses in this paper were:

$H_0: |\alpha| = 1$, there is a unit root problem in the autoregressive model)

$H_1: |\alpha| < 1$, there is no unit root problem in the autoregressive model)

Significance level: $\alpha = 5\%$ or 0.005

Hypothesis test acceptance criteria:

Do not reject H_0 , if t stat $>$ critical point or p-value $> \alpha$ (not stationary)

Reject H_0 , if t stat $<$ critical point or p-value $\leq \alpha$ (stationary).

Lepetit (2011) explains that volatility can be known by looking at the value of positive signs. In this case is the ARCH value (data diversity), while is the GARCH value (previous residual variance).

If $\alpha + \beta = 1$ or $\alpha + \beta > 1$; the volatility is high, while if $\alpha + \beta < 1$; the volatility is low. We assume that the price of sugar follows GARCH (1,1), which is widely known as a powerful tool in the literature (Yu et al. 2020).

$$y_t = u_0 + u_1 y_{t-1} + \varepsilon_t + \rho_1 \varepsilon_{t-1}$$

Where, y_t is the sugar price at that time, and $\varepsilon_t | \varphi_t = N(0, \sigma_t^2)$ In this study, the volatility analysis used is the price of sugar before and during covid for each province in Indonesia. The value used does not directly use the value of $\alpha + \beta$ because it is also determined by the probability that determines whether the value is real or not. The probability that ARCH (ε_{t-1}^2) and GARCH (σ_{t-1}^2) is smaller than the 1% significance level meets the requirements of the ARCH GARCH model, which has a coefficient value that is not more than 1 and is not negative.

There have been fluctuations in sugar prices in all provinces in Indonesia due to COVID-19. Furthermore, descriptive statistics were carried out and data were separated before and during COVID-19. To identify the price of sugar, t-test and stationarity test was carried out. Volatility analysis in this study uses the ARCH (data diversity) and GARCH (residual diversity) models. The results of the study are expected to show the impact of COVID-19 on the dynamics of sugar prices in all provinces in Indonesia, so that policy recommendations can be obtained for implementing sugar price regulation in each province.

RESULTS

Sumatera Island

There are the five provinces in Sumatera with lowest price of sugar price per kg before covid, namely Riau Islands (Rp11,200), Riau (Rp11,350), South Sumatera (Rp12,050), Bangka Belitung Islands (Rp12,150), Lampung (Rp12,200). While the highest of price of sugar per kg o during covid occurred in the provinces of Aceh, which was Rp20,450, North Sumatera (Rp18,450), West Sumatera (Rp18,250), Riau (Rp17,800), Bengkulu and South Sumatera (Rp17,500).

When the t-test was carried out in the provinces on the island of Sumatra, it was revealed that the t-stat value was smaller than the 5% significance value. Therefore, it can be concluded that the price of sugar on the island of Sumatra before covid was lower than the price during covid. It is means that the COVID-19 pandemic affected the sugar supply relatively lower than the consumption in Sumatera. In this island, the central production of sugarcane as the feedstock of sugar only found in North Sumatera, South Sumatera, and Lampung (Ditjenbun 2019) implicating the supply from three province to other provinces restricted. Therefore, the COVID-19 pandemic influence on the price of sugar through the limitation of supply chain

based on logistic transportation as stated from several studies (Laborde et al. 2021).

The unit root test shows that the sugar prices for each province in the island of Sumatra before and during covid was stationary at the “first difference”. The sugar prices for each province on the island of Sumatra before and during covid had no difference based on ARCH-GARCH test, The sum of ARCH GARCH before and during covid, with probabilities is shown in Table 1.

Kalimantan Island

The price of sugar on Kalimantan Island for the period August 2018 to August 2021, the lowest price occurred before COVID-19 in West Kalimantan (Rp11,550), South Kalimantan (Rp12,750), North Kalimantan (Rp13,200), East Kalimantan (Rp13,500), and Central Kalimantan (Rp13,550). While the highest price occurred during Covid in West Kalimantan (Rp22,500), Central Kalimantan (Rp21,150), North Kalimantan (Rp20,250), South Kalimantan (Rp19,550), and East Kalimantan (Rp18,450). When the T-test was carried out in the provinces on the island of Kalimantan, it was seen that the T-stat value was smaller than the 5% significance value, it can be concluded that the price of sugar on the island of Kalimantan before covid was lower than the price during covid.

Table 1. Sugar price Sumatera Island on ARCH GARCH model

Province	Before covid			During covid		
	Total	prob ARCH	prob GARCH	Total	prob ARCH	prob GARCH
Aceh	0.526633	0.0000***	0.0001	0.673462	0.006	0.0000
North Sumatera	0.361354	0.0001***		0.587466	0.0035	0.0001
West Sumatera	0.745752	0.0015***	0.0000	0.750000	0.0164	0.0001
Riau	0.696968	0.0022***	0.0001	0.707704		0.0037
Riau Island	0.750000	0.0473**	0.0000	0.683894	0.0000	0.0001
Jambi	0.635734		0.0000	0.498998	0.0000	
Bengkulu	0.676614		0.0005	0.75	0.0003	0.0000
South Sumatera	0.546546	0.0003***	0.0191	0.502804	0.0108	0.0063
Bangka Belitung Island	0.713662	0.0011***	0.0000	0.716392	0.0006	0.0000
Lampung	0.526344	0.0021***	0.0339	0.527922	0.0034	0.0000

Notes: *, **, *** = significant at 1%, 5% and 10%

Kalimantan is one of the major islands in Indonesia that does not have sugar production (Ditjenbun, 2022). Therefore, this island depends on the other islands as a main supplier for sugar, meanings that there was impact of COVID-19 on the other islands could affected on Kalimantan. In the unit root test, it can be seen that the sugar price data for each province on the island of Kalimantan before and during covid was stationary at the “first difference” After the ARCH GARCH test was carried out, the price of sugar in each province on the island of Kalimantan before and during covid had low volatility and did not cause changes, except for the province of West Kalimantan, but the changes were not significant. The sum of ARCH GARCH before and during covid, with probabilities is shown in Table 2.

Java Island

The price of sugar in Java for the period August 2018 to August 2021, the five java provinces with lowest price occurred before COVID-19 in East Java (Rp11,750), DI Yogyakarta (Rp. 12,200), Central Java (Rp12,475), West Java (Rp12,550), Banten Province (Rp12,600). While the highest price occurred during COVID-19 in Central Java, which was (Rp19,800), followed by Banten (Rp19.500), DKI Jakarta (Rp19,200), East Java (Rp18,700), and West Java (Rp17,600). When the T-test was carried out in the provinces on the island of Java, it was seen that the T-stat value was smaller than

the 5% significance value, it can be concluded that the price of sugar in Java before covid was lower than the price during COVID-19.

Java is the island in Indonesia with larger production for sugar commodities, seen from production trend in several provinces in Java (Ditjenbun, 2022). COVID-19 in Java also have a higher case, implicating the physical limitation policy include Bali Island. On the other hand, East Java and Central Java is the two province includes into top three of sugar central production in last six years from 2019 (Ditjenbun, 2019). It is caused the sugar supply relatively lower due to policies affected on physical logistic availability. The result also similar with empirical evidence in Sumatera Islands, implying the two islands as a main central production are hampered to distributes.

In the unit root test, it can be seen that the sugar price data for each province in Java before and during covid was stationary at the “first difference” except for the price of sugar during covid in West Java Province which was stationary at the “level”. After the ARCH GARCH test was carried out, the price of sugar in each province on the island of Java before and during covid had low volatility and did not cause changes, except in West Java, but the changes were not significant. The sum of ARCH GARCH before and during covid, with probabilities is shown in Table 3.

Table 2. Sugar price Kalimantan Island on ARCH GARCH model

Province	Before covid			During covid		
	Total	prob ARCH	prob GARCH	Total	prob ARCH	prob GARCH
West Kalimantan	0.560972	0.0000***	0.0000***	0.516904	0.0000***	
South Kalimantan	0.526582	0.0000***		0.52829	0.0258**	0.0000***
Central Kalimantan	0.736738	0.0017***	0.0000***	0.726808	0.0168**	0.0001***
East Kalimantan	0.545732	0.0000***	0.0174**	0.65073	0.0166**	0.0000***
North Kalimantan	0.551484	0.0000***		0.71245	0.0000***	0.0001***

Notes: *, **, *** = significant at 1%, 5% and 10%

Table 3. Sugar price Java Island on ARCH GARCH model

Province	Before covid			During covid		
	Total	prob ARCH	prob GARCH	Total	prob ARCH	prob GARCH
Banten	0.528474	0.0039***	0.0056***	0.543506	0.0057***	0.0000***
West Java	0.501458	0.0408**		0.469204		0.0000***
DKI Jakarta	0.503754	0.0069***		0.589302	0.0325**	0.0001***
Central Java	0.750000	0.0153**	0.0000***	0.714432	0.0034***	0.0000***
DI Yogyakarta	0.746488	0.0326**	0.0001***	0.546952	0.0000***	0.0437**
East Java	0.494236	0.0000***		0.750000	0.0126**	0.0000***

Notes: *, **, *** = significant at 1%, 5% and 10%

Nusa Tenggara and Bali Island

The price of sugar on the islands of Nusa Tenggara and Bali for the period August 2018 to August 2021, the lowest price occurred before covid in the Provinces of Bali and West Nusa Tenggara, which was equal to Rp12,650, following by East Nusa Tenggara (Rp13,900). Meanwhile, the highest price occurred during Covid in East Nusa Tenggara Province, which was Rp20,400, Bali Rp17,750, and West Nusa Tenggara Rp16,750. When the T-test was carried out in the provinces on the islands of Nusa Tenggara and Bali, it was seen that the T-stat value was smaller than the 5% significance value, it can be concluded that the price of sugar on the islands of Nusa Tenggara and Bali before covid was lower than the price during covid.

Similar with Sumatera and Java empirical evidence, the Nusa Tenggara and Bali Island being the provinces with sugar production, lower than Sumatera and Java. The impact of COVID-19 on sugar price through the limitation of supply chain also found in Nusa Tenggara and Bali, means that the higher price is arise when the sugar supply is hampered.

In the unit root test, it can be seen that the sugar price data for each province on the islands of Nusa Tenggara and Bali before and during covid was stationary at the “first difference”, except for the price of sugar during covid in West Nusa Tenggara Province which was stationary at the “level”. After the ARCH GARCH test was carried out, sugar prices in the Provinces of Bali and West Nusa Tenggara before and during Covid had low volatility and did not cause changes, while in East Nusa Tenggara Province the changes were not significant. The sum of ARCH GARCH before and during covid, with probabilities is shown in Table 4.

Sulawesi Island

The price of sugar on Sulawesi Island for the period August 2018 to August 2021, the lowest price occurred before covid in North Sulawesi Province, which was Rp12,000, West Sulawesi (Rp12,150), Gorontalo (Rp12,750), South Sulawesi (Rp12,800), and Central Sulawesi (Rp13,650). While the highest price occurred during covid in Southeast Sulawesi Province, which was Rp21,200, Gorontalo Province Rp19,900, North Sulawesi Rp19,650, West Sulawesi Rp18,300, South Sulawesi Rp17,950, and Central Sulawesi Rp17,500. When the T-test was carried out in the provinces on Sulawesi Island, it was seen that the T-stat value was smaller than the 5% significance value, it can be concluded that the price of sugar on Sulawesi Island before Covid was lower than the price during COVID-19.

Sulawesi Island also gain the sugar from several provinces. The COVID-19 implicates the limitation of supply due to restriction of transport and logistic. Therefore, it is caused the supply of sugar in COVID-19 relatively smaller than before pandemic.

In the unit root test, it can be seen that the sugar price data for each province on Sulawesi Island before and during covid was stationary at the “first difference” After the ARCH GARCH test was carried out, sugar prices for each province on Sulawesi Island before and during Covid had low volatility and did not cause changes, except for the Provinces of South Sulawesi and Central Sulawesi, but the changes were not significant. The sum of ARCH GARCH before and during covid, with probabilities is shown in Table 5.

Table 4. Sugar price Nusa Tenggara and Bali Island on ARCH GARCH model

Province	Before covid			During covid		
	Total	prob ARCH	prob GARCH	Total	prob ARCH	prob GARCH
Bali	0.533776	0.0001***	0.0120**	0.65031	0.0005***	0.0000***
West Nusa Tenggara	0.750000	0.0048***	0.0000***	0.518198	0.0196**	0.0000***
East Nusa Tenggara	0.492828			0.685218		0.0000***

Notes: *, **, *** = significant at 1%, 5% and 10%

Maluku and Papua Island

The sugar prices in Maluku and Papua islands for the period August 2018 to August 2021, the lowest price occurred before covid in North Maluku Province, which was Rp13,450, West Papua Province Rp14,000, Maluku Province Rp14,800, and Papua Province Rp15,850. While the highest price occurred during covid in West Papua Province, which was Rp41,650, North Maluku Province Rp20.500, Maluku Province Rp20,150, and Papua Province Rp20,100.

When the T-test was carried out in the provinces on the islands of Maluku and Papua, it was seen that the T-stat value was smaller than the 5% significance value. it can be concluded that the price of sugar on the islands of Maluku and Papua before covid was lower than the price during covid. Similar with Kalimantan evidence, the sugar price in this island also affected on COVID-19 due to limitation of supply from central production in several provinces in Java, Sumatera dan Bali. It is caused the lower supply than a demand of sugar, implicating the price is relatively higher in COVID-19.

In the unit root test, it can be seen that the sugar price data for each province on the islands of Maluku and Papua before and during covid was stationary at “first

difference” except for the price of sugar before covid in Papua Province which was stationary at the “level”. After the ARCH GARCH test was carried out, the price of sugar in each province on the islands of Maluku and Papua before and during COVID-19 had low volatility and did not cause any change, except for the Province of West Papua, but the changes were not significant. The sum of ARCH GARCH before and during covid, with their probabilities is shown in Table 6.

Managerial Implications

This research have implications for the main national sugar stakeholders, namely the government and producers (farmers). The government must immediately evaluate the performance of Indonesian sugar prices during the period August 2018 to August 2021 to regulate the sugar trading system in the domestic market. There were several policies for controlling the sugar price such as: 1) monitoring and managing the logistic and transport for food supply in COVID-19 to maintain the balanced supply and demand, 2) build a warning system that connects price information in all regions in Indonesia to provide information in case of price fluctuations and 3) support the sugar domestic supply in COVID-19 due to limitation of several sugar exporter countries.

Table 5. Sugar price Sulawesi Island on ARCH GARCH model

Province	Before covid			During covid		
	Total	prob ARCH	prob GARCH	Total	prob ARCH	prob GARCH
Gorontalo	0.714466		0.0040***	0.72082	0.0074***	0.0002***
South Sulawesi	0.741988	0.0000***	0.0000***	0.526378		0.0000***
Southeast Sulawesi	0.530766	0.0001***	0.0001***	0.50792	0.0390**	0.0183**
Central Sulawesi	0.747412	0.0328**	0.0001***	0.526378		0.0000***
North Sulawesi	0.661154		0.0039***	0.75	0.0000***	0.0000***
West Sulawesi	0.750000	0.0183**	0.0000***	0.579834	0.0000***	0.0000***

Notes: *, **, *** = significant at 1%, 5% and 10%

Table 6. Sugar price Maluku dan Papua Island on ARCH GARCH model

Province	Before covid			During covid		
	Total	prob ARCH	prob GARCH	Total	prob ARCH	prob GARCH
Maluku	0.743688		0.0000***	0.743688	0.0076***	0.0000***
North Maluku	0.750000		0.0002***	0.535102	0.0000***	0.0000***
Papua	0.518608	0.0131**	0.0336**	0.543316	0.0005***	0.0164**
West Papua	0.533702	0.0000***		0.750000		0.0000***

Notes: *, **, *** = significant at 1%, 5% and 10%

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The prices of sugar in all provinces in Indonesia during the COVID-19 pandemic are higher compared to the condition before the outbreak. Based on the analysis of the ARCH GARCH model, sugar prices in all provinces in Indonesia before and during covid tend to fluctuate in the province of Riau, Jambi, West Java, East Nusa Tenggara, West Kalimantan, South Sulawesi, Central Sulawesi, and West Papua. Based on the Minister of Trade (Permendag No. 96 2018) the reference price for selling sugar at the consumer level is Rp12,500/kg. Before the COVID-19 outbreak, several provinces sold sugar below the reference price, such as Riau (Rp11,350/kg), Riau Islands (Rp11,200/kg), East Java (Rp11,750), and West Kalimantan (Rp11,550). However, in several provinces of Indonesia, the price of sugar is sold higher price than the reference price particularly in West Papua, implying that it more expensive than the reference price. In ARCH and GARCH results, we found that the sugar price in all provinces were higher in after COVID-19 than before COVID-19.

Recommendations

The government needs to ensure a sufficient supply of sugar in the provinces in which the sugar prices are higher than the reference price set by the Ministry of Trade. In addition, it is important to pay attention to logistics and transportation systems to ensure the distribution of sugar to all provinces in Indonesia, especially areas far from sugar-producing areas. This is also implied that the pandemic COVID-19 is still occurring until now, thus concerns over sugar stocks are a matter of consideration among market participants to prioritize adequate distribution transportation.

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