Food Price and Inflation Volatilities during Covid-19 Period: Empirical Study of a Region in Indonesia

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Abstract: - This study aims to analyse the effect of food price volatility on inflation in 34 provinces in Indonesia using monthly data from January 2018 to December 2021. The dynamic ordinary least squares (DOLS), fully modified ordinary least squares (FMOLS), and heterogeneous non-causality approaches were used. The results showed the presence of a long-term relationship between food prices and inflation volatilities. Furthermore, it was noted that chili, rice, shallot, and garlic prices had a positive impact on inflation volatility, but chicken prices had a negative effect. The empirical results also suggested that central and local governments need to stabilize food prices to minimize inflation fluctuation. When the data were split before and during the Covid-19 pandemic, the results showed there was a significant difference in the effect of chili, rice, shallot, and chicken prices volatility on inflation volatility.

Key-Words: Inflation volatility, food Price volatility, Panel Cointegration tests, FMOLS, DOLS

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1 Introduction

The Covid-19 pandemic has changed the production and consumption of foods, as well as affected prices. Recent contributions to food prices have emphasized the role of certain macroeconomic factors, such as monetary, fiscal, trade, and exchange rate policies in the formulation of agricultural prices. [1], as well as, [2], examined the role of exchange rates in determining prices. [3], and, [4], found a substantial effect of monetary factors on agricultural prices. Meanwhile, [5], stated that monetary policy indirectly affects the agricultural sector by contributing to low and stable inflation expectations, as well as low-interest rates. Other empirical studies, such as, [6], as well as, [7], identified a relationship between expected inflation and changes in the relative prices of some products.

Food price volatility and the underlying factors have important macroeconomic implications for inflation. In addition, food inflation has a significant impact on welfare, specifically for low-income earners. When the transmission of food price shocks is strong, as is the case in several low-income countries, the impact will be crucial on inflation and welfare levels. [8], found that food inflation is generally higher and more persistent than non-food inflation in several countries. This result is important to developing countries such as Indonesia and has serious implications for food security, as food occupies a large portion of the consumption basket in the country.

In Indonesia, the government has always been concerned about price stability. Currently, food price policies have been implemented in the short term, but not in the long run. Domestic commodity prices have continued to rise, which can consequently trigger inflation. Several factors cause food price fluctuations in developing countries, including Indonesia, namely variations in agricultural output between harvests as a result of diseases and changing weather conditions, inelastic demand for agricultural products, the longer it takes for items to respond to price fluctuations, as well as the increasing incomes and populations in the world. Volatility in agricultural commodity prices has worldwide implications, although the impact is disproportionately significant in developing countries. It has a direct impact on programs aimed at eliminating hunger and malnutrition, increasing food production, stabilizing consumer prices, and expanding small-scale agricultural output. Although it affects the whole society, the effect is

much stronger on the poor because a higher share of their income is devoted to food.

Indonesia is the world's fourth most populous country, behind the United States, China, and India. The population increases every year with about 270.20 million people recorded in September 2020, an increase from the previous year which was 270.6 million. Therefore, it is necessary to have food security in various existing commodities to fulfill the community's needs. During certain periods, such as the fasting month (Ramadan), Eid holidays, Christmas celebrations, and other commemorative days, there is a scarcity of food commodities that creates volatile price fluctuations.

[9], stated that the increasing demand for food commodities is due to an increase in population and people's income. Consequently, when there is an increase in population, there will be a concomitant rise in the demand for food and vice versa. The scarcity of supply and high public demand also makes prices fluctuate and has an impact on the economic condition of a region. This can be seen from its contribution to inflation. However, food commodities are of concern because they are included in the ingredients group, which is a fairly large contributor to inflation.

From 2018 to 2021, it can be seen that the highest inflation in the food and beverage expenditure group occurred in 2020, which was 47%. Each year, the ingredients group always increases its contribution to general inflation. The commodities analyzed are stapled foods, such as rice, chili, onions, and chicken, which are the benchmarks for availability in Indonesia because they are strategic, [10]. The prices of these commodities fluctuate and it is important to ensure stability. Despite the country's economic downturn due to COVID-19, agricultural production has been less affected. This is evident by the increase in supply and favourable prospects for production, hence, the stock of staple foods is expected to reach the highest level. In general, disruptions occurred in production, processing, and marketing due to outbreaks, containment efforts, as well as shifts in consumer demand. This has led to rising prices and out-of-stock of food products.

A key question is whether food price volatility has a significant effect on inflation volatility in 34 provinces. Therefore, efforts to mitigate significant price fluctuations must be directed at the regional and national levels. As an alternative, when inflationary fluctuations in developing countries are mostly caused by other macroeconomic factors, the most effective policy solution is likely to be at the national level concerning fiscal and monetary policies. The reasons for the topic's popularity are obvious. Also, in developing countries, the fluctuation of basic food prices is a significant source of risk. This is especially true for the nation's low-income residents. The significant correlation between food cost volatility and inflation in the country is due to three variables. Firstly, variations in the prices tend to be higher during the Covid-19 period, [11]. Secondly, low-income communities spend a huge portion of their expenditures on food, frequently more than 60%., therefore, price volatility has a major influence on purchasing power. Thirdly, most of the population in several provinces use agriculture as their main livelihood.

2 Literature Review

Inflation is a condition of continuous price increases, [12]. Three components state that inflation has occurred, namely rising prices, which are general and occur continuously. Commodity prices are believed to have increased when they are higher than in the previous period. The general nature means that rising prices also affect other goods. Keynes's theory states that inflation occurs due to people's desire to live beyond the limits of their economic capacity. Therefore, the demand for goods is greater than the available quantity. The reason for this is that individuals learn to know what they want and develop an effective demand for commodities. Inflation occurs when the quantity of demand for an item surpasses the maximum number of items that may be produced at a specific price level.

The long-term inflation theory is referred to as the structuralist type because it observes the driver of the rising price that originates from the structure of the economy, specifically the distribution of food ingredients. The production of goods that is not proportional to demand also leads to an increase in prices. Consequently, the price of goods increases evenly, which means inflation has occurred. This inflation cannot be halted alone by shrinking the money supply; it must also be combated by raising growth and innovation in the food category.

According to, [13], commodity price is a leading indicator of inflation. This is because the prices quickly respond to shocks that occur in the economy in general. For example, the increase in demand (aggregate demand shock) and prices respond to non-economic shocks. This includes natural disasters, such as landslides, floods, and others that become distribution channels for

commodities. In general, it is the monetary worth of an item or service as determined by the amount of money paid by a customer to achieve the desired products or services. Food commodities are strategic because they function to meet the primary needs of the community which are also part of activities to fulfill human rights, [14].

Fluctuations occur in commodity prices because of a mismatch between supply and demand for consumer needs. The prices will decrease when there is excess supply and increase with less supply. Also, the behavior of farmers and traders has an important role in shaping prices because they regulate the number of sales in accordance with consumer needs. Therefore, fluctuations are the result of farmers' failure to regulate the amount of supply needed by consumers, [15]. According to, [16], the demand for commodities can continuously increase in tandem with the increase in population, the standard of living, and people's welfare. On the supply side, food and agricultural commodities are vulnerable to being disturbed by climatic and natural conditions, limitations, and changes in the function of agricultural land, as well as international geopolitical conditions. This results in the supply of agricultural commodities experiencing disruption. Demand develops quite high and continues to increase without being accompanied by balanced supply developments which will cause prices to rise and seek a new balance. Hence, Cobweb's theory explains how the price of agricultural products fluctuates every season. This occurs as a result of the slow reaction of producers to prices, [17].

[18], showed that in the long-term rice and chicken prices had a substantial impact on inflation. Using the same model, [19], showed that in the long run, the price of red chili had a major influence on inflation, while in the short term, the price of red chili, rice, shallots, and garlic had a significant effect. [20], still with the same model, stated that in the long run, the price of red chili and chicken had a significant effect on inflation, while in the short term, the price of rice had a significant effect. Furthermore, [21], stated that the rice price margin had an important impact on inflation. Using the same model, [22], showed that chili, rice, and onion prices had a significant effect. [23], also stated that the price of rice, shallots, and red chilies affected inflation.

3 Data and Econometric Methodology

3.1 Data

Panel data estimation was used in this work, which is a mix of time-series data and cross-section data with monthly data from 2018M1 to 2021M12 for 34 provinces. The prices of chili, rice, shallots, garlic, and chicken volatilities are the independent variables, while the dependent is inflation volatility. Furthermore, data on food prices were obtained from the National Strategic Food Price Information. The consumer price index for calculation inflation was also acquired from the Central Statistics.

3.2 Econometric Methodology

This study examined the linkage between food prices and inflation volatilities. The general model is as follows:

$$Inf\_vol_{it} = \beta_0 + \beta_1 P\_vol_{it} + \varepsilon_{it} \quad (1)$$

where Inf_Vol is inflation volatility. P_Vol is food price volatility.

3.2.1 Estimating Volatility

The volatility of food prices and inflation were forecasted using GARCH (1, 1). The prices are denoted as follows: Price of chili, Price of rice, Price of shallot, Price of garlic, and Price of chicken. It is defined as the standard deviation of the log (Pt /Pt - 1), where Pt is the price in time t and Pt - 1 is the price in time t - 1. Also, inflation is the growth rate of a consumer price index. The current growth rate of price is estimated on the assumption that the past rate influences the current. The regression equation was run for the lagged growth rate of prices for selected foodstuffs from one to the fourth period.

To measure the food price and inflation volatilities, the GARCH (1,1) model was applied because it performs best in modelling both variables. It is relatively simple to set up and calibrate because it relies on past observations. The compact representation of the model is specified as follows:

$$P_t = \alpha_0 + \beta_0 P_{t-1} + \varepsilon_t h_t^{1/2}$$
$$h_t = \alpha_1 + \sum_{i=1}^{a} \delta_i h_{t-1} + \sum_{i=1}^{b} \theta_i \varepsilon_{t-1}^2$$

3.2.2 Cross-sectional Dependence Test and Unit Root Tests

The existence of cross-sectional dependence was first examined as it can exist due to regional inflation and food price volatility. Furthermore,

[24], cross-sectional dependence test will be used to check the dependence among cross-sections in the model. Moreover, the cross-sectional augmented IPS (CIPS) test developed by, [25], was used to check the unit root test in the model.

3.2.3 Panel Cointegration Test

The long-term cointegration relationship between the variables was estimated using the Pedroni panel cointegration test. This method was established by [26], [27].

3.2.4 Fully Modified OLS and Dynamic OLS Tests

Calculations of the long-run elasticity of output were made using the FMOLS and DOLS methods of [28], [29]. The following is a representation of the equation:

$$Y_{it} = \delta_i + \beta_i \boldsymbol{X}_{it} + \varepsilon_{it} \quad (4)$$

where Y and X denote inflation volatility and the related independent variable vector, respectively, and i, t, and ε denote individuals, time, and disturbance.

$$Y_{it} = \delta_i + \beta_i \boldsymbol{x'}_{it} + \sum_{j=-p}^{p} \sigma_{ik} \Delta x_{it+p} + e_{it} \quad (5)$$

where Y, X, i, t, and e correspondingly, the volatility of inflation, the associated vector of independent variables, specific cross-section, period, and the disturbance.

3.2.5 Panel Causality Test

The Granger causality panel consists of details about timing, heterogeneity, and independence, [30]. Temporality refers to a variable's $x_{i,t}$ prior values being able to have an impact on $y_{i,t}$. According to, [31], when $x_{i,t}$ fails to granger-cause $y_{i,t}$, $x_{i,t}$ is exogenous of $y_{i,t}$, while independence means there is no causality between the variables. The standard method to examine causality is the Granger non-causality test for heterogeneous panel data models. [32], approach, which is based on individual country Wald statistics of Granger non-causality averaged across cross-section units, was closely followed.

4 Empirical Results

4.1 Descriptive Statistics

Table 1. Descriptive Statistic

Variable	Inflation Volatility	Chili Price Volatility	Rice Price Volatility	Shallot Price Volatility	Garlic Price Volatility	Chicken Price Volatility
Mean	0.2779	0.0381	0.0361	0.0243	0.0379	0.0278
Median	0.2383	0.0323	0.0323	0.0209	0.0347	0.0251
Std Dev	0.0397	0.0264	0.0140	0.0170	0.0238	0.0070
Min.	4.17E.08	5.62E.09	2.70E-8	1.93E-9	3.29E-09	2.87E-09
Max.	0.67328	0.2287	0.2619	0.2252	0.6578	0.2622
Skewness	2.9653	1.8294	2.6017	3.0630	2.4461	1.8135
Kurtois	27.1116	9.1140	15.5955	24.8831	19.8543	8.7561
Jarque-Bera	34197.5	2445.3	12214.7	24873.2	27423.5	2229.6
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: This table provides a descriptive statistic of all variables considered in this paper.

The descriptive statistic of this article is presented in Table 1. Specifically, the skewness and kurtosis of each variable's data suggested that the distribution was about normal. All variables had modest coefficients of skewness and were positively skewed. As the kurtosis value for each variable was less than the normal distribution's median value of 3, this indicated that the data were close to being normally distributed. Furthermore, each variable had a mean-to-median ratio close to 1. Between the highest and the minimum, the range of variance was reasonable. In comparison to the mean, the standard deviation was quite low, indicating a tiny coefficient of variation. The Jarque-Bera test revealed that the variables were not normal, even though the preceding descriptive statistics showed that each variable is normal. However, this does not appear to be a major issue.

4.2 Cross-Sectional Dependence and Panel Unit Root Analysis

Previous studies on the relationship between the volatility of food prices and inflation overlooked the critical issues of heterogeneity and cross-sectional reliance. Following the assumptions provided by, [33], as well as, [34], the data used for the empirical analysis were assumed to have cross-sectional dependencies. When the data set involves cross-sectional dependency issues, the traditional panel unit root tests are inapplicable.

Table 2. Cross-section Dependence and Panel Unit Root

Variables	Inflation Volatility	Chili Price Volatility	Rice Price Volatility	Shallot Price Volatility	Garlic Price Volatility	Chicken Price Volatility
Pesaran CD	2.5486**	10.4488***	10.2492***	13.0346***	27.4152***	7.1698
P-value	0.0108	0.0000	0.0000	0.0000	0.0000	0.0000
Unit root test with cross-sectional dependence						
CIPS tests (level)	-1.1845	-0.2668	-1.6359	-1.3886	-1.1753	-0.3882
CIPS tests (1st difference)	-14.0875***	-3.3831***	10.7391***	-6.0022***	-6.5611***	-3.2887***

To address this issue, [24], dependency panel unit root test, i.e., a cross-sectional (CD) dependency test, was used. Table 2 presents the empirical results and it can be seen that the null hypothesis of cross-sectional independence at the 1% significance level was strongly rejected. Additionally, [25], cross-sectional augmented panel root test was used for cross-sectional dependency data. The empirical findings in Table 2 indicate that the panel unit root null hypothesis was not rejected for all sample variables at that level. We then convert all variables to their first difference, it was determined that all variables were stationary. This result provides evidence of the equation's integration of all variables in eq. (1).

4.3 Result of Panel Cointegration

After the integration of the variables, a study was conducted to see if there is a long-term association between food price volatility and inflation. Therefore, this study utilized [26], [27] long-term cointegration test. The Pedroni residual cointegration test is presented in Table 3. The proposed cointegration test contains seven test statistics, namely "Panel v Statistics, rho Panel, PP Panel, ADF Panel, rho Group, PP Group, and ADF Group Statistics working under parametric and non-parametric frameworks". Table 4 summarizes the empirical findings and Table 5 presents the Kao residual cointegration test.

Table 3. Pedroni Residual Cointegration Test

Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-3.5356	0.9998	-4.4206	1.0000
Panel rho-Statistic	-1.8101	0.0351	-4.3886	0.0000
Panel PP-Statistic	-8.6043	0.0000	-11.7633	0.0000
Panel ADF-Statistic	-7.5153	0.0000	-4.1413	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	-3.0141	0.0013		
Group PP-Statistic	-20.6841	0.0000		
Group ADF-Statistic	-5.3433	0.0000		

Table 4. Kao Residual Cointegration Test

	t-Statistic	Prob.
ADF	-9.1275	0.0000

Table 5. Johansen Cointegration Test

Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-3.5356	0.9998	-4.4206	1.0000
Panel rho-Statistic	-1.8101	0.0351	-4.3886	0.0000
Panel PP-Statistic	-8.6043	0.0000	-11.7633	0.0000
Panel ADF-Statistic	-7.5153	0.0000	-4.1413	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	-3.0141	0.0013		
Group PP-Statistic	-20.6841	0.0000		
Group ADF-Statistic	-5.3433	0.0000		

Out of the seven test statistics, the following six, namely rho Panel, PP Panel, ADF Panel, rho Group, PP Group, and ADF Group statistics, demonstrated the existence of long-term cointegration between variables. It can be concluded that the volatilities of price and inflation had a long-term equilibrium relationship. In addition, two other panel cointegration approaches were applied, namely, the Kao panel and the Johansen Fisher-Type panel cointegration test developed by, [35], [36]. The findings presented by this test confirmed the existence of a long-term equilibrium relationship between food prices and inflation volatilities.

4.4 Estimation Results of Dynamic Ordinary Least Square

The long-run elasticity of the output was estimated using FMOLS and DOLS. Endogeneity and serial correlation are also taken into account with these methods. The results are presented in Table 6. This study confirmed the positive impact of food price volatility on inflation, except for the chicken price which had a significant negative effect. Based on Table 6, the estimation model showed the prices of red chili, onion, garlic, and chicken had a positive effect on inflation, while the price of rice had a negative effect in 34 provinces from January 2018 to December 2021. Based on the coefficient of the determination test result, an R-squared (R^2) value of 0.9179 and 0.9018 was obtained. This showed the independent variables, namely red chili, rice, shallot, garlic, and chicken prices, was able to explain inflation changes in the provinces.

Table 6. Result of Estimation Panel Cointegration

Variable	FMOLS		DOLS	
	Coefficient	Std.error	Coefficient	Std.error
Chili Price Volatility	1.4551***	0.0164	2.9876***	0.4350
Rice Price Volatility	0.1079***	0.0136	0.1715***	0.0591
Shallot Price Volatility	0.0785***	0.0151	1.3452*	0.7498
Garlic Price Volatility	0.0342***	0.0174	0.0003***	0.0001
Chicken Price Volatility	-3.8270***	0.0168	-6.7644***	1.5751
R Square (R^2)	0.9178		0.9018	

Note: The dependent variable is Inflation volatility.

The results showed there was a positive effect of chili price volatility on inflation. It should be noted that a 1 percentage point increase in chili price volatility caused an increase in inflation by 1.45-2.98 points. The results of this study are in accordance with, [18], [19], as well as, [20], which stated that chili prices had a significant positive effect on inflation volatility. Also, there was a positive effect of rice price volatility in the provinces. This indicated that an increase of 1 percentage point in rice price volatility caused an increase in inflation of 0.1079-0.1715 points. This is in accordance with, [21], [22], who stated that rice price volatility had a significant positive effect on inflation. This study also showed that there was a positive effect of shallot price volatility on inflation in the provinces. An increase of 1 percentage point in shallot price caused a rise in inflation volatility of 0.0785-1.3452. These results are in accordance with [19] ,[20], [22], [23], which stated that shallot price had a significant positive effect on inflation volatility. Meanwhile, garlic price positively influenced inflation volatility, indicating that an increase of 1 percentage point in the price caused a rise in inflation volatility of 0.0003 - 0.0342 points. These results are in accordance with, [37], [38], who stated that garlic prices had a significant positive effect on inflation.

The magnitude of chili price on inflation indicated that it is a significant driver of volatility in all provinces. One of the reasons for the large effect is the high public demand for chili since there are no commodities or food ingredients that can substitute for its needs. Besides daily consumption, it is used as a raw material in the food industry. The value of its consumption in Indonesia is relatively large, indicating that an increase in the price of curly red chili will cause variations in inflation. Meanwhile, the magnitude of rice, shallot, and garlic prices volatility on inflation is not too large, implying that the small fluctuation of the four commodity prices does not have a huge effect on inflation fluctuations. These results are in line with previous studies, such as, [39], in Africa, [40], in Eastern Europe, [41], in Indonesia and Thailand, [42], in Turkey, as well as, [43], in India which stated that the price of food positively influenced inflation volatility.

In contrast, the results showed there was a negative effect of chicken price volatility on inflation in all provinces. There is also a discrepancy between the theory that has been explained and the results obtained which showed chicken price volatility had a significant negative effect. This can be seen from the development of chicken prices, indicating that the diversity tends to be stable in each region. This occurs because chicken is a staple food consumed by 96% of Indonesian. Therefore, the prices tend to be stable and do not follow economic developments, specifically inflation. These results are contrary to, [38], [44] who stated that chicken price volatility negatively influenced inflation.

The data are split into two groups, namely before and during Covid-19. The results of panel FMOLS and DOLS estimations are presented in Table 7. A significant difference was found between before and during the Covid-19 pandemic. First, the chili price volatility had a negative and significant effect on inflation volatility before the pandemic but was positive during the period. This implies that the price was more volatile during the pandemic. In contrast, rice price was less volatile during the pandemic compared to before. The magnitudes of the effects of shallot and garlic price volatility on inflation were higher during the period compared to before. Finally, the results showed chicken price volatility had a positive and significant effect on inflation before the pandemic but were negative during the period.

Table 7. Result of Estimation Panel Cointegration Before and the time of Covid-19

Variable	FMOLS			
	2018-2019		2020-2021	
	Coefficient	Std.error	Coefficient	Std.error
Chili Price Volatility	-1.3147***	0.1729	2.5766***	0.0029
Rice Price Volatility	0.4671***	0.0849	-0.8276***	0.1432
Shallot Price Volatility	0.1683	0.3090	0.7919***	0.0055
Garlic Price Volatility	0.6035**	0.2222	0.4925***	0.0023
Chicken Price Volatility	0.3685***	0.0308	-0.9684***	0.2567
R Square (R^2)	0.8804		0.9408	
Variable	DOLS			
	2018-2019		2020-2021	
	Coefficient	Std.error	Coefficient	Std.error
Chili Price Volatility	-0.7375***	0.2136	0.5226	0.7347
Rice Price Volatility	1.7490**	0.6896	-1.6022***	0.4233
Shallot Price Volatility	0.9657	1.9205	1.6708	1.0789
Garlic Price Volatility	2.4623***	0.7847	0.5425**	0.2359
Chicken Price Volatility	0.3085***	0.1045	-0.3025***	0.0064
R Square (R^2)	0.7811		0.7667	

Note: The dependent variable is Inflation volatility.

4.5 Non-Causality Test Result

The, [32], approach was applied to conduct a panel Granger non-causality test for heterogeneous panel data models. The causation association between

food prices and inflation volatility was also established using the group mean Wald test statistic. The non-causality test has the advantage of being able to be used in integrated or cointegrated models without the need for pre-testing for unit roots or cointegration.

The results from the estimation for the two null hypotheses are presented in Table 8. The first hypothesis is that chili, rice, shallot, garlic, and chicken price volatility does not homogeneously cause inflation. Meanwhile, the other hypothesis is that inflation does not homogeneously cause price volatility. The estimation results showed there were bidirectional causalities between chili price and inflation, as well as rice price and inflation. This suggests that the causality runs from chili and rice price volatilities to inflation. However, there were unidirectional causalities between the price volatilities of shallot, garlic, as well as chicken prices, and inflation.

Table 8. Dumitrescu Hurlin Panel Causality Tests

Null Hypothesis	Wald Statistics	$\overline{Z}$ Statistics	Probability Values
Chili Price Volatility does not cause Inflation Volatility	1.8397	2.7356	0.0059***
Inflation Volatility does not cause Chili Price Volatility	1.7029	2.2596	0.0238**
Rice Price Volatility does not cause Inflation Volatility	13.6819	3.8887	0.0001***
Inflation Volatility does not cause Rice Price Volatility	14.5873	4.6026	0.0000***
Shallot Price Volatility does not cause Inflation Volatility	2.5960	5.5552	0.0000***
Inflation Volatility does not cause Shallot Price Volatility	1.2427	0.6243	0.5324
Garlic Price Volatility does not cause Inflation Volatility	3.4597	3.2382	0.0012***
Inflation Volatility does not cause Garlic Price Volatility	2.2605	0.2506	0.8021
Chicken Price Volatility does not cause Inflation Volatility	19.3513	5.9343	0.0000***
Inflation Volatility does not cause Chicken Price Volatility	9.1182	-7.7642	0.4447

*Note: *** denotes rejection at a 1% significance level*

5 Conclusion and Recommendation

In Indonesia, the government's primary concern has always been price stability. Currently, Food price policies have been implemented in the short term, but in the long run, domestic commodity prices have continued to rise, which can trigger inflation. Therefore, this study evaluated the impact of food price volatility on inflation by using monthly provincial-level data from 2018 to 2021. A heterogeneous panel approach was applied and the long-term operating elasticity between the two variables was determined. The results found that chili, rice, shallot, and garlic prices volatility had a positive effect on inflation in 34 provinces, hence, when the prices are volatile, inflation will be increased. This is contrary to the chicken price which had a negative effect on inflation.

These results provided several recommendations. Firstly, the development of food price volatility in chili, shallot, and chicken from 2018 to 2021 in the provinces shows a more volatile trend. Therefore, efforts are needed to maintain price stability by ensuring the smooth distribution and stock management of food. Secondly, as indicated that the prices of food commodities are subject to inflation volatility, the local government needs to make efforts to maintain price stability. Thirdly, more studies are needed on the factors that influence food prices, and it is necessary to consider policies and other related variables.

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