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Diverging Trends of Palm Cooking Oil Prices and Food Inflation in Makassar City, Indonesia

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Abstract

This study analyzes the volatility and trends of non-packaged and packaged palm cooking oil prices in traditional and modern markets and their correlation with monthly food inflation in Makassar City, Indonesia, over the period January 2021–December 2025. Monthly secondary time-series data on retail palm cooking oil prices were obtained from the Food Security Agency of South Sulawesi Province, while food inflation data were sourced from Statistics Indonesia. Trend analysis using linear least squares and Pearson correlation were employed. In traditional markets, non-packaged palm cooking oil prices were relatively more stable (coefficient of variation, CV=0.1347) than packaged cooking oil grade I (CV=0.1430) and grade II (CV=0.1478), whereas in modern markets, packaged cooking oil grade I was slightly more stable (CV=0.1723) than grade II (CV=0.1745). Price trends were significantly upward for all product types, with monthly increases of Rp75.93/liter (non-packaged), Rp71.87/liter (packaged I), and Rp56.99/liter (packaged II) in traditional markets, and Rp127.05/liter and Rp107.71/liter for packaged grades I and II in modern markets, respectively ($p < 0.01$). Monthly food inflation for the food subgroup exhibited high volatility (CV=4.0836) but a statistically non-significant declining trend of 0.0081 percentage points per month. Non-packaged and packaged cooking oil prices were strongly and positively correlated ($r=0.739$, $p<0.001$), indicating integrated price movements across market channels, while their correlations with food inflation were weakly negative and statistically insignificant (non-packaged: $r=-0.168$, $p=0.199$; packaged: $r=-0.129$, $p=0.324$). These results imply that, despite pronounced and synchronized increases in palm cooking oil prices, short-run monthly food inflation in Makassar was driven more by other food commodities and macroeconomic factors than by palm cooking oil alone.

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Key words: palm cooking oil; food inflation; price volatility; traditional markets; modern retail.

INTRODUCTION

Inflation in food prices remains a major challenge for macroeconomic stability and food security in developing countries, including Indonesia, as the food group carries the largest weight in the Consumer Price Index and its impact is felt most acutely by low-income households (Central Bureau of Statistics, 2023; Ulfah et al., 2024). In Makassar City, a growth center in Eastern Indonesia, the dynamics of strategic food prices and regional inflation are interconnected, with palm cooking oil being a key commodity consumed by almost all households and food processing MSMEs.

Since late 2021, Indonesia has experienced a "cooking oil crisis" characterized by supply shortages, spikes in retail prices, and rapid policy changes, including tightening of CPO exports and the implementation of the domestic market obligation (DMO). At the household level, Khatijah and Setiyana (2024) found that rising cooking oil prices disrupted family financial allocation, particularly among low-income groups, while Fahrudin et al. (2022) showed that food MSMEs were under pressure from rising production costs due to the spike in cooking oil prices.

At the macro level, Ulfah et al. (2024) showed that in the ASEAN region, money supply and global oil prices have a positive and significant effect on inflation, while Yulianto et al. (2022) found that global CPO prices are an important determinant of bulk cooking oil price fluctuations in Indonesia. On the other hand, Hena and Silalahi (2022) found that nationally, cooking oil prices have a significant positive effect on inflation in Indonesia, but they used national aggregate data and therefore did not capture variations in price behavior at the city level. For Makassar City, Hafied et al. (2022) showed that fluctuations in several strategic food commodities, including cooking oil, affect monthly inflation. However, this study did not explicitly separate non-packaged and packaged cooking oil and did not distinguish the role of traditional and modern markets.

Traditional and modern markets have different pricing characteristics, potentially resulting in different patterns of price volatility and transmission. Mulyatna et al. (2021) emphasized that traditional markets are characterized by bargaining processes and small-scale business actors, while Pameling et al. (2024) showed that modern markets emphasize convenience, one-way pricing, and more structured distribution networks. In the context of cooking oil, Ivan's and Novita (2022) showed that consumer preference for packaged cooking oil is strongly influenced by brand, clarity, and packaging design, while Zuraidah et al. (2019) found that low-income households still consume a lot of bulk cooking oil due to

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price factors. Nendissa and Pellokila (2025) added that cooking oil price volatility in Indonesia's retail and wholesale markets has remained high over the past few years, indicating persistent risks for consumers and businesses.

Based on this gap, this study contributes in three ways. First, this study specifically documents the price volatility and trends of unpackaged and packaged palm cooking oil (two grades) in traditional and modern markets in Makassar City during 2021–2025. Second, this study describes the volatility and trends of monthly food inflation at the city level, thus enriching the literature that has previously focused mostly on the national or provincial level (Putri et al., 2022; Hariyanti et al., 2023). Third, this study examines the linear correlation between cooking oil prices and monthly food inflation in Makassar, separating products (unpackaged vs. packaged) and market channels, thus providing a more specific empirical basis for formulating regional food inflation control policies.

The objectives of this study are: (i) to analyze the fluctuations and trends in the prices of non-packaged cooking oil and packaged cooking oil in traditional and modern markets in Makassar City; (ii) to analyze the fluctuations and trends in monthly inflation of food subgroups in Makassar City; and (iii) to analyze the correlation between cooking oil prices and the inflation rate of these foodstuffs throughout the 2021–2025 period.

METHODOLOGY

Study Area

The research was conducted in Makassar City, the capital of South Sulawesi Province, which is the center of economic activity and distribution of goods in Eastern Indonesia. The Central Statistics Agency (BPS) (2025) recorded that by 2024, Makassar's population would reach approximately 1.48 million people, with a density of over 8,000 people per km^2. The city boasts a dense network of traditional markets and modern retail outlets. These conditions make Makassar an ideal location to study the dynamics of strategic food prices and inflation in an urban environment with a dual marketing system.

Data Sources and Variables

The study used secondary monthly time series data from January 2021 to December 2025 (60 observations). Cooking oil price data was obtained from the South Sulawesi Provincial Food Security Office and the Strategic Food Price Information Center (PIHPS), while inflation data was obtained from the Makassar City Central Statistics Agency. The variables analyzed included:

- Price of non-packaged cooking oil: the average retail price of non-packaged cooking oil in traditional markets in Makassar City (rupiah per liter).

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- Price of packaged cooking oil: the average retail price of branded packaged cooking oil, grouped into quality I and quality II, observed in traditional and modern markets, respectively (rupiah per liter).
- Monthly food inflation: the monthly inflation rate (month-to-month) for the food subgroup in the Makassar City Consumer Price Index (percent).

This approach is in line with strategic food price volatility studies that use medium-term monthly data to identify trend and fluctuation patterns (Hafied et al., 2022; Ramadhani & Rosiana, 2025).

Price Volatility and Trend Analysis

Price volatility was measured using the coefficient of variation (CV), the ratio of the standard deviation to the mean, for each price and inflation series over a 60-month period. Chintia and Destiningsih (2022) demonstrated that CV is an informative indicator for comparing relative risk levels between food commodities in the context of regional inflation, so a similar approach was adopted in this study.

$$\text{CV} = \frac{\text{standard deviation}}{\text{mean}}$$

Price and inflation trends were analyzed using a simple linear trend model with a least squares approach:

$$Y_t = a + bt$$

where Y_t is the price (or inflation) in month t, a is the intercept, and b is the trend coefficient representing the average change per month. Gujarati and Porter (2009) showed that the linear trend model is adequate to reveal medium-term trends in economic time series when the focus of the study is the average magnitude of change, not long-term forecasting. The significance of the trend coefficient was tested using a t-test at the 1% and 5% levels, and the coefficient of determination (R^2) was used to assess the proportion of variation explained by the time trend.

Correlation Analysis

The linear relationship between cooking oil prices and food inflation was analyzed using the Pearson correlation coefficient, as commonly used in studies of the relationship between food prices and inflation at the regional level (Helbawanti, Saputro, & Ulfa, 2021; Putri et al., 2022). The Pearson correlation formula follows Walpole (1995):

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

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Where x_i and y_i are the respective values of the price and inflation variables at the i-th observation. The r value is interpreted using the following criteria: close to +1 indicates a strong positive relationship, close to −1 indicates a strong negative relationship, and values around 0 indicate a weak or no relationship. The statistical significance of the correlation was tested using a two-tailed test at the 1% and 5% levels, in line with the practice used by Hafied et al. (2022) in analyzing the relationship between strategic food price fluctuations and inflation in Makassar.

RESULTS AND DISCUSSION

Results

Volatility of cooking oil prices

Descriptive analysis shows that in the traditional markets of Makassar City, the price of non-packaged cooking oil during 2021–2025 has an average of IDR 15,360 per liter with a range of IDR 11,500–IDR 19,750 per liter. The coefficient of variation (CV) of 0.1347 indicates moderate volatility, and is relatively lower than packaged products. For packaged cooking oil, the average price for quality I reached IDR 20,490 per liter with a CV of 0.1430, while quality II averaged IDR 18,812 per liter with a CV of 0.1478, which means that the cheaper quality II is actually slightly more volatile than quality I.

In the modern market, the price of quality I packaged cooking oil averages IDR 22,763 per liter (CV=0.1723), while quality II averages IDR 21,897 per liter (CV=0.1747). Higher CV values in modern markets indicate that prices in the modern retail segment respond to market shocks and national policies with greater amplitude than traditional markets. These results are in line with the findings of Nendissa and Pellokila (2025) who stated that cooking oil price volatility in the Indonesian retail and wholesale markets tends to be high and persistent, especially for branded products in modern retail networks.

In general, this volatility pattern strengthens Chintia and Destiningsih's (2022) argument that oil-based processed food commodities are more vulnerable to global market shocks and domestic policies than most fresh food commodities. The fact that quality II packaged cooking oil shows the highest CV in both types of markets also indicates that the lower-middle income consumer segment faces relatively greater price risk, as emphasized by Zuraidah et al. (2019) when discussing consumption of bulk and packaged cooking oil in poor households.

Trends in cooking oil prices

The results of linear trend analysis confirm that all cooking oil price series experienced a significant upward trend during the observation period. In traditional markets, the

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price of non-packaged cooking oil increased on average IDR 75.93 per liter per month, with a coefficient of determination (R^2) of 0.4041 and significance at the 1% level. Quality I packaged cooking oil increased IDR 71.87 per liter per month (R^2 = 0.1805; $p < 0.01$), while quality II increased IDR 56.99 per liter per month (R^2 = 0.1259; $p < 0.01$).



Figure 1. Trend in cooking oil prices at traditional markets in Makassar City

In the modern market, the rate of price increase is sharper. The price of quality I packaging increased on average IDR 127.05 per liter per month with R^2=0.3147, while quality II increased IDR 107.71 per liter per month with R^2=0.2379; both are significant at the 1% level. This finding is consistent with the findings of Ramadhani and Rosiana (2025) who found that volatility and the tendency for price increases were highest for premium and bulk cooking oil at the retail level, and there was strong vertical integration between producer, wholesaler and retail prices.



Figure 2. Trend in cooking oil prices at modern markets in Makassar City

The higher trend rate for quality I packaged cooking oil in the modern market is also in line with the observations of Bank Indonesia (2024) which reported that the price of branded packaged cooking oil reached a record high in the first quarter of 2024, driven by a combination of world CPO prices and domestic supply dynamics. Maolia (2025) shows that

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domestic cooking oil consumption has a significant effect on price formation in Indonesia, while world CPO prices and stocks are not always significant; in the context of Makassar, the sharp upward trend mainly reflects demand pressures and a consumer market structure that is increasingly shifting towards branded products.

Food inflation dynamics

Monthly inflation in the foodstuffs subgroup in Makassar City during 2021–2025 was recorded on average at 0.35%, with a minimum value of −2.56% and a maximum of 3.93%. The coefficient of variation of 4.0836 indicates that food inflation fluctuates greatly from month to month. This pattern is in line with the study by Putri et al. (2022) in Padang City and Hariyanti et al. (2023) in West Sumatra, which explains that regional food inflation is very sensitive to price shocks in key commodities such as rice, chilies and chicken meat.

Linear trend analysis shows that the inflation trend coefficient is −0.0081 percentage points per month with R^2=0.0096 and is not statistically significant, which indicates a very weak and inconclusive downward trend. Ulfah et al. (2024) emphasizes that the global money supply and oil prices continue to drive inflation in the ASEAN Region, but their effects are often mediated by domestic food price stabilization policies.

Correlation between cooking oil prices and food inflation

The correlation between the prices of non-packaged and packaged cooking oil is 0.739 with p<0.001, which indicates a strong positive and statistically significant relationship. This means that price increases in one form of product tend to be followed by increases in other forms, reflecting the integration of the cooking oil market in Makassar across product types and distribution channels. This is consistent with the findings of Ramadhani and Rosiana (2025) and Nendissa and Pellokila (2025) which show vertical integration and close links between prices at the producer, wholesale and retail levels in Indonesia. The results of the Pearson correlation analysis are summarized in Table 1.

Table 1. Pearson correlations between cooking oil prices and food inflation in Makassar

Variable pair	r	p-value	Interpretation
Non-packaged vs packaged cooking oil prices	0.739	<0.001	Strong, positive, significant
Non-packaged cooking oil vs monthly food inflation	−0.168	0.199	Weak, negative, not significant

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Packaged cooking oil vs food inflation	−0.129	0.324	Weak, negative, not significant

Source: Secondary data analyzed, 2026.

In contrast, the correlation between the price of non-packaged cooking oil and food inflation is −0.168 (p=0.199), while the correlation between the price of packaged cooking oil and food inflation is −0.129 (p=0.324); both are weak, have a negative direction, and are not significant. Thus, there is no statistical evidence that fluctuations in cooking oil prices—both bulk and packaged—are directly associated with the increase in monthly food inflation in Makassar City throughout the research period.

This finding is different from the results of Hena and Silalahi (2022) who found a positive and significant influence of cooking oil prices on Indonesian national inflation, but this difference can be explained by the different aggregate coverage and composition of the CPI at the national level. Hafied et al. (2022) who examined several strategic food commodities in Makassar also showed that the contribution of each commodity to inflation was different, where cooking oil was not the only main driver of inflation. From a theoretical perspective, Köse and Ünal (2022) emphasize that oil (energy) prices and climate factors have a strong influence on food inflation in Latin America, but the effect of each specific commodity is highly dependent on its weight in the consumption basket and the price control policies implemented.

DISCUSSION

The results of this research confirm that the fluctuation and trend in increasing cooking oil prices in Makassar during 2021–2025 is quite sharp, especially in the packaged cooking oil segment in the modern market. In terms of household welfare and food MSME actors, Khatijah and Setiyana (2024) and Fahrudin et al. (2022) have shown that rising cooking oil prices narrow household fiscal space and pressure small business profit margins. These findings are also strengthened by the study of Jusuf et al. (2023) which revealed that cooking oil consumption patterns in small and medium cities are very sensitive to changes in prices and income. Thus, although the impact on aggregate inflation appears limited, the pressure on vulnerable groups remains significant.

In terms of inflation, the weak and insignificant correlation between cooking oil and inflation indicates that the contribution of this commodity to monthly inflation in Makassar is relatively small compared to other main food commodities. Putri et al. (2022), Hariyanti et al. (2023), and Helbawanti et al. (2021) shows that commodities such as rice, red chilies and chicken meat are much more dominant in driving regional food inflation in various

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regions of Indonesia. Apart from a smaller CPI weight, policies such as setting the Highest Retail Price (HET), market operations, and the subsidized cooking oil program (Minyakita) also play a role in breaking some of the transmission of fluctuations in cooking oil prices to official inflation, as reviewed by Ikhsan and Permata (2025), Efendi et al. (2024), and Wibowo (2025).

The strong price integration between non-packaged and packaged cooking oil in this research shows that the Makassar cooking oil market is closely connected, both between products and between traditional-modern channels. Nendissa and Pellokila (2025) and Ramadhani and Rosiana (2025) show that when markets are integrated like this, supply shocks or policies that target one segment (for example only modern retail) tend to quickly spread to other segments. The implication is that price interventions that are only based on a single channel - for example special subsidies for supermarkets - have the potential to distort competition and harm traditional market traders without changing aggregate price patterns significantly.

From a macro policy perspective, these findings are consistent with the results of Ulfah et al. (2024) that inflation in the ASEAN region is more influenced by monetary variables and global energy prices, while the role of certain commodities such as cooking oil is more partial and contextual. The results of research in Makassar show that the focus of anti-inflation policies cannot be placed on one commodity, but must pay attention to the entire food basket and other structural factors such as distribution infrastructure and trade systems.

CONCLUSION AND RECOMMENDATIONS

This research shows that during 2021–2025, the price of cooking oil in Makassar City experienced a significant upward trend and quite high volatility, especially for packaged cooking oil in the modern market. Monthly inflation in the foodstuffs group is also very volatile, but the medium-term trend tends to decline and is not significant. The strong and positive correlation between the prices of non-packaged and packaged cooking oil indicates high market integration, while the correlation between the two and monthly food inflation is weak, has a negative direction and is not significant.

Based on these findings, several policy recommendations that can be proposed are as follows. First, regional and central governments need to focus cooking oil policy on aspects of affordability and sustainability of supply, not solely on controlling inflation, because the direct impact of cooking oil on aggregate inflation in Makassar is relatively limited even though the burden on households and MSMEs remains significant. Second, the strategy to control food inflation in Makassar should focus more on commodities with a large CPI weight

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and a strong contribution to inflation, such as rice, chilies and chicken meat. Third, because the prices of non-packaged and packaged cooking oil in traditional and modern markets show highly integrated movements, intervention design should consider all market channels so as not to cause distortion and injustice between actors.

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