



Price Fluctuations and Market Dynamics of Chicken Meat in South Kalimantan: A Vector Autoregression Approach

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ABSTRAK

Daging ayam merupakan sumber protein terjangkau bagi masyarakat Kalimantan Selatan, tetapi harganya sering bergejolak menjelang Ramadan dan Idulfitri. Penelitian ini mengukur dinamika pasar jangka pendek antara daging ayam, telur, dan beras serta mengkuantifikasi volatilitas harga menggunakan data harga eceran bulanan Januari 2020 hingga Desember 2024. Harga dalam log diuji kointegrasi dan tidak ditemukan hubungan jangka panjang, kemudian dianalisis dengan *vector autoregression* pada beda pertama untuk menelusuri respon impuls dan dekomposisi varians, serta model volatilitas sederhana untuk menggambarkan pengelompokan dan persistensi. Hasil menunjukkan perubahan harga daging ayam bersifat kembali ke kecenderungan semula, terdapat alih-terusan dari harga telur yang mendorong harga daging ayam dalam satu hingga dua bulan, dan keterkaitan harga beras kecil. Pada dua belas bulan, guncangan telur menjelaskan sekitar seperlima variasi perubahan harga daging ayam. Hasil juga menunjukkan volatilitas berkelompok namun cenderung menurun, sejalan dengan proses yang kembali ke rata-rata. Temuan ini mendukung pengelolaan berjangka pendek dengan menjadikan harga telur sebagai sinyal dini sebelum hari besar keagamaan dan melakukan tindakan dini pemasaran di waktu yang terbatas untuk menjaga keterjangkauan harga daging ayam beserta telur.

ABSTRACT

Chicken meat is a key source of affordable protein in South Kalimantan, yet prices often swing around Ramadan and Eid. This study measures short-run market dynamics among chicken, eggs, and rice and quantifies price volatility using monthly retail data from January 2020 to December 2024. Log prices are analyzed with a cointegration test that shows no long-run relationship, followed by a vector autoregression in first differences to trace impulse responses and variance decomposition, and a simple volatility model to characterize clustering and persistence. Results show mean reversion in chicken price changes, a clear pass-through from egg prices that lifts chicken within one to two months, and a small link from rice. By twelve months, egg shocks explain about one fifth of the variation in chicken price changes. Volatility clusters but tends to decline, consistent with a mean-reverting process. These findings support short-horizon management that uses eggs as an early-warning signal before festive periods and applies time-bounded market actions to keep poultry affordable.

1. Introduction

Chicken meat is the most accessible source of animal protein for Indonesian households, so the stability of retail prices is central to food affordability in South Kalimantan. Recent SUSENAS 2024 data for the three main urban districts of South Kalimantan show that chicken overwhelmingly dominates household meat consumption: average per capita weekly intake of broiler meat is 0.169 kg in Kota Banjar, 0.221 kg in Kota Banjarmasin, and 0.239 kg in Banjarbaru City, whereas beef consumption is only 0.006–0.012 kg per capita per week and other meats are almost negligible (BPS-Statistics Indonesia, 2024). In household menus, eggs act as a close substitute for chicken, while rice, which is the dominant staple, anchors the food budget and can crowd out spending on animal protein when its price rises (Khoiriyah et al., 2023). South Kalimantan is also one of Indonesia's more religious provinces, with a dense calendar of Islamic events including Ramadan, Eid, and large gatherings such as *Haul* event. Using 2020–2024 PIHPS data, our calculations show that, in the month preceding Ramadan and Eid, average retail prices in South Kalimantan increase by about 8% for chicken, 6.5% for eggs, and 2.5% for rice relative to their respective annual monthly means, before partially correcting afterwards. These events can temporarily raise demand and tighten distribution, so province specific evidence on price volatility and cross commodity transmission is important for market surveillance and stabilization (Mangeswuri, 2023; Anonim, 2025).

Two gaps limit the usefulness of existing studies for provincial operations. First, the magnitude and persistence of volatility in retail chicken prices are seldom quantified with models that show how long disturbance episodes last and whether volatility reverts toward a mean. Second, short run transmission from eggs and rice to chicken is often described with correlations rather than dynamic pass-through estimates at policy relevant horizons. For decisions that depend on timing, such as scheduling market operations or advising traders, it is necessary to know whether a one month shock in eggs or rice passes through within one to three months, whether the effect fades by the sixth month, and how large the contribution of those shocks is relative to fluctuations that originate in the chicken market itself (Dissanayake, 2016; Gökteş, 2016; Hayat et al., 2016; Aulia, 2022). South Kalimantan specific evidence at that temporal resolution is limited.

This study addresses those gaps by jointly analyzing price fluctuations and market dynamics for chicken, eggs, and rice using monthly retail prices from January 2020 to December 2024. The empirical strategy has two complementary tracks. A univariate GARCH model measures the magnitude and persistence of volatility in the retail chicken price and applied to the stationary series, it shows how quickly volatility decays after a shock and whether it returns toward a long run mean or remains elevated for several months. A Vector Autoregression in first differences is estimated for chicken, eggs, and rice; impulse response functions trace the time path of chicken's response to one standard deviation shocks in eggs and rice, and forecast error variance decomposition quantifies the share of chicken's forecast variance attributable to shocks in each price at policy relevant horizons.

The combined approach strengthens policy relevance by focusing on a single province, which avoids masking that can arise when national aggregates blend areas with different supply chains and consumption patterns; by modeling volatility explicitly, which clarifies whether observed price swings are isolated or clustered and informs realistic intervention windows; and by providing horizon specific guidance on when shocks from substitutes and budget anchors are most likely to influence chicken prices (Pamungkas et al., 2024).

By quantifying volatility and mapping short-run pass-through in a single, province-focused study, the analysis delivers evidence that is directly usable for market surveillance and stabilization design in South Kalimantan. The results are intended to inform the timing and the likely duration of price pressures following shocks in related staples, around Ramadan, Eid, and Haul event, and to clarify how much of chicken's short run variability is externally driven compared with the share that is intrinsic to the chicken market itself.

2. Methodology

2.1. Data

This study uses monthly retail prices for chicken meat, eggs, and rice in South Kalimantan from January 2020 to December 2024, sourced from Indonesia's National Strategic Food Price Information Center (PIHPS Nasional). After lag adjustments, the effective sample for VAR-based analyses spans 2020M04–2024M12 (57 observations). Prices are converted to natural logarithms for elasticity-based interpretation and to work

with proportional changes, which is standard in applied econometrics and time-series analysis (Wooldridge, 2015; Stock & Watson, 2019)

$$LN_CHICKEN_t = \ln(P_{ln_chicken,t})$$

$$LN_EGG_t = \ln(P_{ln_egg,t})$$

$$LN_RICE_t = \ln(P_{ln_rice,t})$$

Dynamic changes are modeled using monthly log differences, which approximate percentage changes.

$$\Delta LN_t = LN_t - LN_{t-1}$$

Table 1. Research variables

Variables	Unit	Symbols	Sources
Chicken meat price	Rp/kg	CHICKEN	PIHPS
Chicken egg price	Rp/kg	EGG	PIHPS
Rice price	Rp/kg	RICE	PIHPS

Notes: Monthly retail prices for South Kalimantan (2020–2024). Prices are log-transformed (LN) and modeled in first differences (ΔLN).

2.2. Econometric Strategy

The empirical strategy proceeds in four steps. First, stationarity is assessed using Augmented Dickey–Fuller (ADF) tests with an intercept and automatic lag selection via the Schwarz Information Criterion (SIC). Second, long-run comovement among LN_CHICKEN, LN_EGG, and LN_RICE is examined using Johansen’s trace and maximum-eigenvalue tests. Given no cointegration at the 5% level, this study estimate a Vector Autoregression (VAR) in first differences to capture short-run market dynamics. Third, impulse response functions (IRF) and forecast error variance decomposition (FEVD) are computed from the estimated VAR to quantify dynamic pass-through and the relative contribution of shocks. Finally, to characterize price fluctuations (volatility), this study estimate a univariate GARCH(1,1) model on the stationary chicken price series.

2.3. VAR Specification and Lag Selection

$$y_t = [\Delta LN_CHICKEN_t, \Delta LN_EGG_t, \Delta LN_RICE_t]'$$

$$y_t = c + A_{-1} y_{t-1} + \dots + A_{-p} y_{t-p} + \varepsilon_t$$

Where c is a vector of constants and ε_t is a vector of innovations. The lag length p is chosen using the Akaike (AIC), Schwarz (SIC), Hannan–Quinn (HQ), and Final Prediction Error (FPE) criteria, complemented by residual LM tests for serial correlation.

The benchmark specification uses $p = 2$, consistent with the information criteria and clean residual diagnostics.

2.4. Identification and Dynamic Effects

IRFs and FEVDs are computed from the VAR's Wold moving-average representation using Cholesky orthogonalization. This study adopts the economically motivated ordering $[\Delta\text{LN_EGG}, \Delta\text{LN_RICE}, \Delta\text{LN_CHICKEN}]$, allowing contemporaneous shocks in egg and rice prices to affect chicken within the month but not vice versa. Horizons up to 12 months are reported. Robustness to alternative orderings was checked and does not alter the qualitative conclusions

2.5. GARCH Model for Price Fluctuations

To quantify the magnitude and persistence of price fluctuations, this study estimates a univariate GARCH(1,1) model for the stationary chicken price series y_t (either $\Delta\text{LN_CHICKEN}_t$ or the stationary level, depending on the ADF outcome). The mean equation includes a constant and, where supported by AIC/SIC, an AR(1) term.

$$y_t = \mu + \varphi y_{t-1} + u_t$$

The conditional variance follows:

$$h_t = \omega + \alpha u_{t-1}^2 + \beta h_{t-1}$$

Parameters are estimated by (quasi) maximum likelihood under a Gaussian assumption with Bollerslev–Wooldridge robust standard errors. Volatility persistence is assessed via $\alpha + \beta$; mean reversion is indicated when $\alpha + \beta < 1$. Conditional variance plots and the parameter estimates (ω, α, β) are reported.

$$\alpha + \beta < 1 \text{ (mean reversion)}$$

2.6. Diagnostics and Stability

For the VAR, this study reports: (i) residual serial correlation LM tests to verify no remaining autocorrelation at the chosen lag; (ii) normality and heteroskedasticity checks for transparency; and (iii) stability based on the inverse roots of the characteristic polynomial (all roots inside the unit circle).

2.7. Software

All analyses are implemented in EViews 13, using built-in routines for ADF tests, Johansen cointegration, VAR estimation, IRF/FEVD computation, and ARCH–GARCH modeling.

3. Results and Discussion

3.1. Overview of Chicken Retail Price Developments in South Kalimantan

Figure 1 shows monthly retail chicken prices in South Kalimantan from 2020 to 2024. The series climbs into a higher range over time, with frequent short-run swings. The most visible surges appear before Ramadan and Eid, followed by partial corrections afterward; this pattern is consistent with well-documented festive-season demand spikes in Indonesia's food markets (Azalia et al., 2023; Permatasari et al., 2023). A trough occurs around early 2021, while from mid-2023 onward the market settles into a higher, more stable plateau.

The Augmented Dickey–Fuller (ADF) unit root tests indicate that all variables used in this study, namely the chicken price (LN_CHICKEN), egg price (LN_EGG), and rice price (LN_RICE), are non-stationary in levels: their means and variances change over time and shocks to prices have persistent effects instead of dying out. To avoid spurious regression results and to satisfy the stationarity assumption of the VAR model, we difference each series once. After first differencing, the ADF tests reject the unit root for all three variables, indicating that the monthly changes in prices are stationary. Thus, each series is integrated of order one, $I(1)$, and is suitable for further analysis using a VAR framework.

3.2. Price Fluctuations (GARCH)

Figure 2 shows that the estimated conditional variance declines over the sample. Volatility is elevated early on, eases with a clear drop in the middle of the period and remains relatively low and stable thereafter. This pattern is consistent with a persistent yet mean-reverting volatility process. These findings align with food price patterns that are often shaped by seasonal factors, particularly ahead of major religious holidays when demand rises sharply. This interpretation aligns with evidence that GARCH models capture volatility clustering with less-than-unity persistence and that incorporating

seasonality improves forecasts for poultry prices (Ahmed et al., 2018; Jatau et al., 2018). Even so, the GARCH (1,1) results indicate that although chicken prices still face short term disturbances, volatility tends to decline over the longer run. This pattern may reflect improvements in market mechanisms, such as better coordination along the poultry supply chain, improved transport and cold chain infrastructure, and wider access to price information for traders and consumers, as well as the effectiveness of government interventions, including market operations and subsidized “cheap markets”, price ceilings for key staples, and policies that facilitate interregional trade to smooth temporary supply shocks.

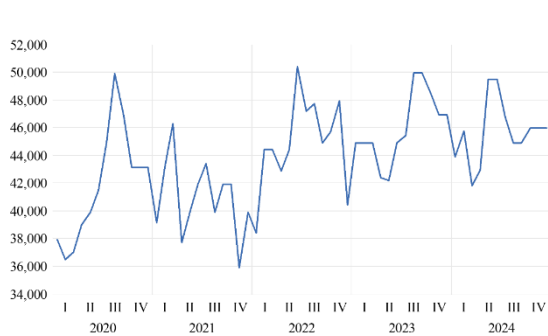


Figure 1. Monthly retail price of chicken in South Kalimantan, 2020 to 2024 (author’s calculations using PIHPS data).

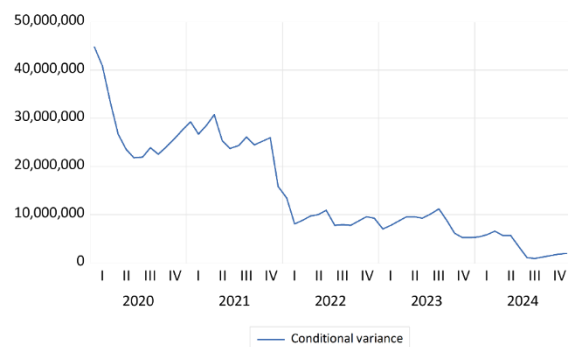


Figure 2. Estimated conditional variance from the GARCH(1,1) model for monthly log differences of chicken retail prices in South Kalimantan, 2020 to 2024.

3.3. Cointegration Test

The Johansen cointegration tests show that both the Trace and Max Eigen statistics are not significant at the 5 percent level. This indicates that there is no long-run cointegrating relationship among chicken, egg, and rice prices. Accordingly, the subsequent analysis uses a Vector Autoregression (VAR) models in first differences are widely used to characterize short-run interactions once Johansen tests indicate no cointegration (Fernandez and Raine, 2021).

Table 2. Johansen cointegration test results for LN_CHICKEN, LN_EGG, and LN_RICE

Trace Test			
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.
None	25.8155	29.797	0.134
At most 1	9.2785	15.4947	0.34
At most 2	3.4799	3.8415	0.062
Maximum Eigenvalue Test			
Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.
None	16.5368	21.1316	0.195
At most 1	5.7988	14.2646	0.639
At most 2	3.4799	3.8415	0.062

3.4. Estimation of the VAR Model

This study estimates a VAR (2) using monthly percent changes in chicken, egg, and rice prices over 2020M04 to 2024M12. Chicken price changes tend to settle within one to two months, so spikes do not persist. Own shocks tend to cool down within one to two months, implying short term mean reversion. This pattern is consistent with evidence from meat markets showing that price disturbances can dissipate quickly at short horizons when analyzed through impulse response type dynamics (Kuiper & Lansink, 2013). Beyond own dynamics, the IRFs suggest meaningful cross commodity spillovers. Positive shocks to egg prices lead to a small but statistically significant increase in chicken prices in the short term, indicating that these commodities tend to move in the same direction rather than offset each other. More generally, the presence of cross market spillovers and non-uniform adjustment across food prices aligns with the broader literature on price transmission and asymmetric adjustments in agricultural markets (Lajdová & Bielik, 2015). For rice, we find that positive rice price shocks also raise chicken prices in the short run, although the linkage is relatively smaller than the egg to chicken effect at these horizons.

Table 3. VAR(2) estimates for $\Delta\ln(\text{chicken})$, $\Delta\ln(\text{egg})$, and $\Delta\ln(\text{rice})$.

Variable	Coefficient	Std. Error	t statistic	p value
$\Delta\ln(\text{chicken})(-1)$	-0.4349	0.126	-3.465	0.001 **
$\Delta\ln(\text{chicken})(-2)$	-0.2477	0.1251	-1.9782	0.054 ·
$\Delta\ln(\text{egg})(-1)$	0.2556	0.1258	2.0336	0.048 *
$\Delta\ln(\text{egg})(-2)$	0.4519	0.1296	3.4895	0.001 **
$\Delta\ln(\text{rice})(-1)$	0.6154	0.1606	3.8387	<0.001 ***
$\Delta\ln(\text{rice})(-2)$	0.2984	0.1428	2.0918	0.042 *
Constant (C)	0.0044	0.0084	0.5217	0.605

Note: *, **, *** denote significance at the 5%, 1%, and 0.1% levels; · indicates marginal significance at 10%. R-squared: 0.347; Adj. R-squared: 0.268.

Taken together, the results are consistent with the interpretation that common upstream cost pressures and distribution frictions, such as feed, fuel, and logistics, can generate synchronized movements across staples. This strengthens the case for joint monitoring of key commodities for market surveillance and stabilization (Sendhil et al., 2023). From a policy perspective, the short adjustment window implied by the VAR dynamics suggests that responses, such as temporary stock releases, faster distribution, or targeted market operations, should be implemented promptly within one to two months to limit spillovers into chicken prices.

3.5. Impulse Response Function (IRF)

The impulse responses show that chicken responds positively to egg and rice shocks within one to two months and the effect fades toward zero by about six to ten months.

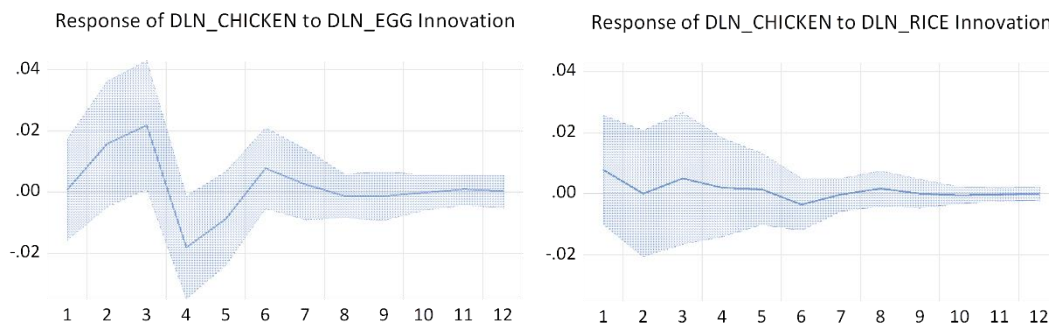


Figure 3. Impulse response of $\Delta\ln$ chicken to $\Delta\ln$ egg and $\Delta\ln$ rice shocks using Cholesky identification with 95 percent Monte Carlo bands and a twelve month horizon.

3.6. Forecast Error Variance Decomposition (FEVD)

Table 4 shows that own shocks dominate at very short horizons. By three months, egg explains a meaningful share of chicken’s forecast variance and rises to about one fifth by twelve months, while rice remains small at around two percent. This pattern aligns with the impulse response functions, which show a short run pass through from eggs and a limited role for rice. Interpreted through the lens of demand elasticity, these results suggest that the crossprice effect of eggs on chicken is positive but moderate: changes in egg prices can move chicken prices, so households and traders treat eggs and chicken as partly substitutable protein sources, although own price effects for chicken remain much stronger. In contrast, the very small variance share attributed to rice implies that the crossprice elasticity between rice and chicken is close to zero at these horizons, which is consistent with rice acting mainly as a staple that constrains overall food budgets rather than as a direct substitute for chicken meat.

Table 4. Forecast error variance decomposition of $\Delta \ln$ chicken at horizons 1 to 12 months. Identification and ordering follow the VAR in first differences.

Horizons (months)	S.E.	Chicken (%)	Egg (%)	Rice (%)
1	0.0626	98.4	0.0	1.5
3	0.0736	85.0	13.4	1.6
6	0.0772	78.2	20.0	1.8
12	0.0773	78.1	20.1	1.8

Note: Values are percent shares of the forecast variance of $\Delta \ln$ chicken. S.E. is the forecast error standard deviation. Identification is Cholesky with degrees of freedom adjustment and the order $\Delta \ln$ egg, $\Delta \ln$ rice, $\Delta \ln$ chicken. Horizons are in months. Rounding may cause totals to differ from 100.

3.7. Policy interpretation

This study finds Ramadan and Eid seasonality and a short run pass through from eggs to chicken that peaks within about one to two months, while rice plays a small role and there is no long run cointegration. Policy should focus on short horizon management. Use egg prices as an early warning four to six weeks before the holiday period, then prepare time bounded actions such as limited stock releases, faster logistics to wet markets, and targeted market operations in eggs when signals appear (Permatasari et al., 2023). Evidence on Indonesian poultry markets supports tight chicken and egg linkages and short run substitution, so egg shocks can pressure chicken retail prices quickly in the province (Setiadi et al., 2022; Wibowo et al., 2025). Because volatility is episodic and

tends to revert, interventions should be sharp and temporary rather than prolonged (Baladina et al., 2021; Girsang et al., 2023). Pair field actions with a simple weekly dashboard and short-term forecasts to anticipate spikes before holidays, since time series models have performed well for chicken and egg prices in Indonesia (Wisodewo et al., 2022; Hakim. et al., 2024;). Success is measured by shorter and lower holiday season spikes and a faster return to normal compared with the previous three years.

4. Conclusion

This study supports a short horizon stabilization strategy for staple food prices in South Kalimantan. Using monthly data for 2020M04 to 2024M12, the VAR results indicate that chicken price shocks dissipate within about one to two months and that positive egg price shocks transmit to chicken prices within the same window, while the rice linkage is smaller at these horizons. These findings imply that provincial and district market authorities and the inflation control team, particularly Provincial Department of Trade, Department of Food Security and Regional Inflation Control Team, should treat egg prices as a leading indicator four to six weeks before Ramadan and Eid and prepare time bounded responses when signals rise. Operationally, this includes targeted market operations in eggs, temporary and limited stock releases where feasible, and faster logistics to wet markets to reduce short term distribution frictions, supported by active poultry health surveillance to prevent outbreak driven supply shocks. Implementation should be accompanied by a weekly public dashboard that tracks retail chicken and egg prices, retail to farmgate spreads, and supply and animal health indicators, with success measured by shorter and lower holiday price spikes and a faster return to normal compared with recent years.

Future work should add richer drivers such as feed costs, fuel and transport, rainfall, and disease incidents, and use models that allow transmission to change during holidays, for example SVAR, TVP VAR, or regime switching. These steps would sharpen forecasts, improve targeting, and strengthen the province's capacity to keep poultry affordable during seasonal demand surges.

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