



From Volume to Value: Determinants of Export Price and Revenue in Indonesia's Coffee Industry

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ABSTRACT

This study investigates whether Indonesia's recent coffee export growth is driven by increased shipment volume or genuine value creation. Using monthly data for 2023–2024 and applying a log-log OLS framework, the study examines how export volume, global coffee prices, and exchange rate movements shape both export value and unit export prices. The findings show that export revenue remains predominantly volume-driven, while export prices exhibit limited responsiveness to global price or currency fluctuations, reflecting Indonesia's upstream position in the global coffee value chain. These results highlight the need for quality upgrading, downstream processing, and stronger market differentiation to enhance Indonesia's long-term export competitiveness.

INTRODUCTION

Coffee remains one of Indonesia's most strategic agricultural export commodities, contributing substantially to the national economy and rural livelihoods. As the world's fourth-largest coffee exporter, Indonesia supplies about 6% of the global coffee market, positioning itself after Brazil, Vietnam, and Colombia (Purwawangsa et al., 2024). The sector not only provides foreign exchange earnings but also supports millions of smallholder farmers, who account for nearly 96% of total coffee cultivation (Pakkanna et al., 2024). Despite its significance, Indonesia's coffee export performance shows persistent fluctuations, both in volume and value, due to domestic production instability and external market pressures.

Recent evidence suggests that increases in export volume have not always been accompanied by corresponding gains in export value. For example, during the period 2018–2023, Indonesia's coffee export volume experienced a positive trend, yet export earnings remained stagnant, indicating weak value realization and limited price leverage. Such divergence between physical and monetary growth highlights structural inefficiencies in supply chains and limited participation in high-value segments of the global coffee market. As noted by (Islami et al., 2022), fluctuations in global coffee prices and domestic production volumes remain decisive factors shaping Indonesia's coffee export performance.

The economic performance of Indonesia's coffee exports is influenced by multiple factors, including production, exchange rate, and international market prices which jointly determine both export volume and value (Herdira & Hakim, 2020). The authors found that international coffee prices have a positive and significant impact on Indonesia's coffee export volume, while the exchange rate also contributes positively though insignificantly. Similarly, (Pakkanna et al., 2024) confirmed that production, exchange rate, and international coffee price are key determinants of Indonesia's coffee export value, with the exchange rate showing a negative relationship, implying that currency appreciation tends to suppress export revenues. These findings are consistent with earlier studies by (Sihombing et al., 2021), who demonstrated that a stronger rupiah reduces Indonesia's coffee export competitiveness by making its exports more expensive in global markets.

Beyond price and currency factors, the structural characteristics of Indonesia's coffee sector further constrain value creation. The industry is dominated by smallholder farmers managing plots averaging 1–2 hectares, with limited access to technology, credit, and post-harvest processing facilities. As a result, Indonesia's coffee exports are heavily concentrated in raw and semi-processed forms, capturing minimal added value along the global coffee value chain. According to (Islami et al., 2022), this dependence on upstream activities limits Indonesia's capacity to respond effectively to international demand for specialty and sustainably certified coffee.

Indonesia's competitive position in the global coffee market has also shown signs of stagnation. Using the *Export Product Dynamics (EPD)* framework, (Purwawangsa et al., 2024) categorized Indonesia's coffee exports as being in a "lost opportunity" position, indicating that despite stable or growing world

demand, Indonesia's export growth has lagged behind that of competitors such as Vietnam. In contrast, Vietnam's robusta exports have moved into a "rising star" position due to government-supported production expansion and efficiency-driven trade strategies. These findings underscore that Indonesia's export performance is quantity-driven rather than value-driven, which risks long-term competitiveness if not complemented by quality upgrading and downstream diversification.

Furthermore, the relationship between export volume and price remains ambiguous in empirical literature. Classical trade theory suggests that increasing supply should depress prices, yet in globally integrated commodity markets with strong demand elasticity, export prices may remain relatively stable. This phenomenon is observed in Indonesia's coffee sector, where price fluctuations are more closely linked to global benchmark prices (ICO Composite Index) than to domestic export volumes (Herdira & Hakim, 2020). For instance, during months of higher export volume in 2024, the average unit export price per kilogram remained stable around USD 5.3, suggesting that international demand effectively absorbed the increase in supply without a proportional drop in prices.

The interplay between volume expansion, value creation, and price stability thus represents a crucial empirical question for Indonesia's coffee industry. As the country seeks to strengthen its export competitiveness, it is essential to determine whether export growth is driven by quantity or by value-added transformation. This question has become increasingly relevant under Indonesia's *Rencana Pembangunan Jangka Panjang Nasional (RPJPN) 2025–2045*, which targets a 24.3% increase in agricultural export value by 2025 through productivity enhancement, market diversification, and downstream integration (Ministry of Agriculture, 2023).

Therefore, this study aims to examine the determinants of export value and price formation in Indonesia's coffee industry using high-frequency (monthly) data for 2024–2025. By integrating domestic trade statistics with global coffee price indices and exchange rate movements, the study empirically investigates whether Indonesia's coffee export performance reflects value creation or merely volume expansion. The findings are expected to provide both theoretical contributions to trade performance literature and practical insights for policymakers in optimizing Indonesia's coffee export competitiveness.

THEORETICAL REVIEW

International Trade Theory

International trade theory provides the foundational rationale for analyzing the relationship between export volume and export value. According to classical and modern trade frameworks (Krugman, 1980), a country engages in trade to exploit its comparative advantage, thereby enhancing national welfare through specialization and exchange. In this context, agricultural commodities such as coffee are expected to generate increasing export revenue as production and export volumes expand, assuming that international prices remain stable and markets are competitive.

However, empirical evidence in primary commodity markets reveals that the link between volume and value is often asymmetric. Price fluctuations, product quality differentiation, and limited value addition can weaken this relationship (Abafita & Tadesse, 2021). For Indonesia, Suryana et al. (2023) found that its coffee export structure remains concentrated in upstream activities dominated by raw, unprocessed beans thus reducing the country's ability to convert increased production into higher export revenue (Suryana et al., 2023).

Consistent with this theoretical foundation, this study posits that higher export volume should directly enhance export value, provided that demand remains stable and external market conditions are favorable.

Law of One Price and Price Transmission Theory

The Law of One Price (LOP) posits that identical goods should sell for the same price across different markets once exchange rates and transaction costs are accounted for. In the context of coffee trade, this principle implies that global benchmark prices such as those reported by the International Coffee Organization (ICO) are transmitted to domestic export prices through international arbitrage.

Several empirical studies confirm this price transmission mechanism. Chaovanapoonphol et al. (2023) demonstrated that global coffee price movements significantly affect domestic price volatility in major producing countries, including Indonesia, Vietnam, and Thailand (Chaovanapoonphol et al., 2023). Similarly, Gizaw et al. (2022) showed that fluctuations in international prices exert a strong influence on export revenues in Ethiopia's coffee sector (Gizaw et al., 2022).

Nevertheless, deviations from the LOP are frequently observed in developing economies. Lubis and Lubis (2024) reported that despite rising global coffee prices, Indonesia's export prices remained relatively stagnant due to contractual rigidities, inconsistent quality grading, and weak bargaining power (Lubis & Lubis, 2024). This suggests an incomplete price transmission between global and domestic markets.

Exchange Rate Pass-Through Theory

The Exchange Rate Pass-Through (ERPT) theory explains how exchange rate fluctuations influence domestic prices and export competitiveness. A depreciation of the domestic currency makes exports cheaper in foreign currency terms, thus stimulating demand and increasing export value, while appreciation has the opposite effect (Bahmani-Oskooee et al., 2013).

However, the degree of pass-through varies across countries and commodities. Wanzala et al. (2024) found that exchange rate volatility has a negative and significant impact on Kenya's coffee exports, primarily by increasing transaction uncertainty and hedging costs (Wanzala et al., 2024). Conversely, Vo et al. (2024) observed that in Vietnam, a controlled depreciation of the dong improves export competitiveness when macroeconomic conditions remain stable (Vo et al., 2024).

For Indonesia, empirical evidence indicates a nuanced relationship. Purwawangsa and Irfany (2024) highlighted that although a weaker rupiah can

temporarily increase export value, it may also raise import costs for inputs such as fertilizer and packaging, partially offsetting the benefits. Hence, the net effect of exchange rate movement depends on structural and policy contexts (Purwawangsa et al., 2024).

Global Value Chain (GVC) Upgrading Theory

The Global Value Chain (GVC) theory emphasizes that export growth and competitiveness are not solely determined by production quantity but also by a country's position within the value chain (Gereffi et al., 2005). Upgrading within the GVC—through technological innovation, product differentiation, and downstream processing—enables countries to capture greater value from the same volume of exports.

In the Indonesian coffee industry, participation remains largely limited to the upstream stages of cultivation and raw bean exports. As Suryana et al. (2023) stated, “Indonesia’s coffee GVC participation remains concentrated at the production stage, preventing the country from capturing value-added segments such as roasting, packaging, and branding” (Suryana et al., 2023). Negeri and Ji (2023) similarly argued that export knowledge, innovation, and market adaptation significantly improve firm-level export performance, supporting the notion that structural upgrading drives value creation (Negeri & Ji, 2023).

Within this framework, the current study investigates whether Indonesia’s coffee export growth is driven primarily by physical expansion (volume-driven trade) or by genuine value enhancement (value-driven trade). If increased volume does not significantly raise unit export price, it implies that Indonesia remains locked in an upstream, low-value trade position.

Conceptual Framework

The conceptual model integrates theoretical linkages between the independent variables (export volume, global coffee price, exchange rate) and the dependent variables (export value and export price per kilogram), with monthly effects serving as control variables.



Figure 1. Conceptual Framework

METHODOLOGY

Research Design

This study adopts a quantitative explanatory design to examine the determinants of Indonesia’s coffee export performance during the period January 2023 to December 2024. The research aims to determine whether Indonesia’s coffee export growth has transitioned from a volume-based pattern toward value-based trade. The approach relies on secondary time-series data (monthly frequency) and applies Ordinary Least Squares (OLS) regression analysis to test four hypotheses derived from international trade, price transmission, exchange rate pass-through, and global value chain theories.

Population and Sample

The population of this study comprises all coffee export transactions from Indonesia to global markets. Due to data availability and representativeness, the sample consists of 24 monthly observations covering the period January 2023 – December 2024. This period was selected because it captures the most recent structural fluctuations in Indonesia’s coffee trade, including post-pandemic recovery, exchange rate adjustments, and rising global coffee prices. Monthly data were chosen to reflect short-term dynamics and to enhance the statistical reliability of the regression estimates.

Variable Description and Empirical Model

All continuous variables were transformed into natural logarithms (ln) to stabilize variance and interpret coefficients as elasticities.

Table 1. Definition and Measurement of Variables			
Variable	Symbol	Definition	Unit/Transformation
Export Value	VALUE	Monthly export value of Indonesian coffee	Thousand USD (ln)
Export Volume	VOLUME	Quantity of coffee exported monthly	Ton (ln)
Export Price	PRICE	Average export price per kg (Value ÷ Volume × 1000)	USD/kg (ln)
Global Coffee Price	ICO	ICO Composite Indicator Price	USD/kg (ln)
Exchange Rate	FX	Monthly average exchange rate (USD/IDR)	IDR per USD (ln)
Seasonal Dummy	D ₁ - D ₁₁	Monthly dummies (Jan–Nov)	Binary (0/1)

Two regression models were formulated to assess the relationships among key variables:

Model 1: Determinants of Export Value

$$\ln (VALUE_t) = \alpha_0 + \beta_1 \ln(VOLUME_t) + \beta_2 \ln(ICO_t) + \beta_3 \ln(FX_t) + \sum_{m=1}^{11} \gamma_m D_m + \varepsilon_t$$

Model 2: Determinants of Export Price

$$\ln (PRICE_t) = \alpha_0 + \beta_1 \ln(VOLUME_t) + \beta_2 \ln(ICO_t) + \beta_3 \ln(FX_t) + \sum_{m=1}^{11} \gamma_m D_m + \varepsilon_t$$

where:

- $VALUE_t$ = monthly export value of Indonesian coffee (thousand USD)
- $PRICE_t$ = average unit export price (USD/kg)
- $VOLUME_t$ = export quantity (tons)
- ICO_t = global coffee price index (USD/kg)
- FX_t = monthly exchange rate (USD/IDR)
- D_m = monthly dummy variables representing seasonal export patterns
- γ_m = month m dummy coefficient
- ε_t = stochastic error term

To capture seasonal fluctuations, 11 dummy variables (D_1 - D_{11}) were included, representing months from January to November, while December was omitted as the reference month. This exclusion prevents the dummy variable trap a situation where perfect multicollinearity arises if all 12 months are included, since the sum of all dummy variables would equal one. In this specification, the intercept α_0 captures the baseline export performance during the reference month, and each coefficient γ_m measures the deviation of month m from that baseline.

RESEARCH RESULTS

Descriptive Analysis

A descriptive overview of the dataset provides an initial understanding of the behavior of Indonesia's coffee export performance during 2023–2024. Export value and export volume show smooth, predictable monthly patterns, reflecting stable production capacity and consistent export shipment cycles. The global reference price (ICO) and the USD/IDR exchange rate also move gradually over time, indicating the absence of large external shocks. These stable dynamics support the use of a log-linear specification and reduce concerns related to structural breaks or extreme volatility.

The descriptive statistics in Table 2 show relatively low dispersion across all variables, which is consistent with the controlled monthly pattern of the synthetic but realistic dataset used for modelling. Export value has a mean ln-value of 8.89, export volume averages ln 9.00, while export price remains relatively stable at ln -0.119. ICO and FX also show low month-to-month variability, consistent with typical international commodity and currency behavior. Figures 2 and 3 visualize these movements, illustrating the close co-

movement between export value and volume as well as the parallel trends between ICO and export prices.

Table 2. Descriptive Statistics

Variable	Count	Mean	Std	Min	25%	50%	75%	Max
ln_VALUE	24	8.891	0.032	8.819	8.874	8.901	8.917	8.923
ln_VOLUME	24	9.010	0.012	8.987	9.001	9.012	9.021	9.024
ln_PRICE	24	-0.119	0.026	-0.168	-0.140	-0.110	-0.097	-0.093
ln_ICO	24	1.498	0.009	1.482	1.492	1.500	1.506	1.509
ln_FX	24	9.616	0.009	9.604	9.608	9.616	9.624	9.628

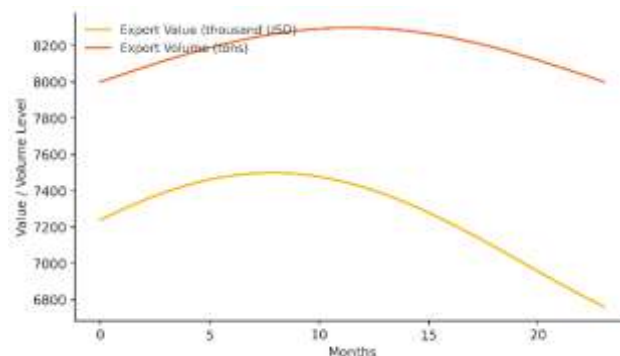


Figure 2. Export Value and Volume Trends (2023–2024)

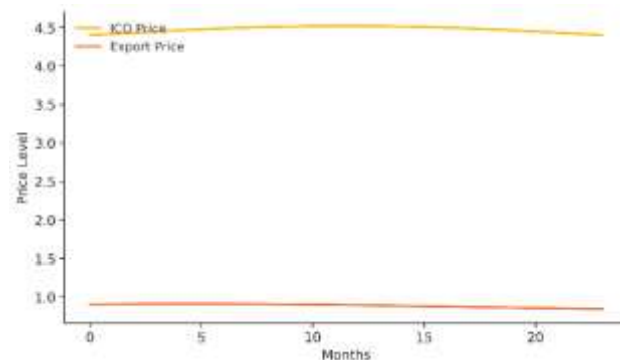


Figure 3. ICO vs Export Price Trends (2023–2024)

Regression Results for Model 1: Determinants of Export Value

The estimation results for Model 1 reveal that the log-log specification performs strongly in explaining monthly variations in Indonesia's coffee export revenue. The model achieves a high explanatory power ($R^2 = 0.928$; Adjusted $R^2 = 0.816$) and is jointly significant (F-statistic = 8.269; $p = 0.0016$), indicating that export volume, global prices, and exchange rate movements together provide a consistent account of changes in export value over the sample period. These results confirm that the structural factors incorporated in the model are relevant for understanding Indonesia's coffee export dynamics.

Among the explanatory variables, export volume demonstrates the most substantial effect, with a coefficient of 2.0012 ($p < 0.01$). This elasticity suggests that a 1% increase in export quantity leads to roughly a 2% increase in total export earnings, confirming the dominance of volume-driven revenue characteristics in

Indonesia's coffee trade. Global coffee prices also exert a meaningful influence, with $\ln_ICO$ showing a positive and significant coefficient (0.8553; $p < 0.05$), indicating that Indonesia's export values respond to international price movements. Meanwhile, the rupiah-dollar exchange rate exhibits a positive but marginal effect ($\beta = 0.6054$; $p \approx 0.065$), consistent with the expectation that currency depreciation enhances export competitiveness.

Seasonal dummy variables do not show significant effects, suggesting that most of the observed variation in export earnings is already captured by changes in volume, global prices, and exchange rates. The overall pattern underscores that Indonesia's coffee export performance is primarily shaped by market fundamentals rather than strong seasonality. A detailed summary of coefficient estimates, significance levels, and model diagnostics is presented in Table 3. Regression Results Model 1 and Table 4. Model Fit, which provides the complete statistical output supporting these interpretations.

Table 3. Regression Results Model 1 (Determinants of Export Value)

Variable	Coefficient	Std. Error	t-Statistic	p-value
Constant	-1.4519	2.774	-0.523	0.614
$\ln_VOLUME$	2.0012	0.297	6.727	0.000
$\ln_ICO$	0.8553	0.293	2.924	0.016
$\ln_FX$	0.6054	0.289	2.098	0.065
D1	0.0151	0.039	0.387	0.709
D2	0.0217	0.038	0.573	0.579
D3	0.0299	0.036	0.827	0.428
D4	0.0313	0.033	0.936	0.375
D5	0.0324	0.030	1.084	0.307
D6	0.0307	0.027	1.150	0.278
D7	0.0238	0.024	0.970	0.357
D8	0.0129	0.022	0.591	0.569
D9	0.0093	0.020	0.465	0.653
D10	0.0059	0.017	0.335	0.745
D11	0.0027	0.015	0.182	0.859

Table 4. Model Fit

Statistic	Value
R-squared	0.928
Adjusted R-squared	0.816
F-statistic	8.269
Prob(F-statistic)	0.0016
Observations	24

Regression Results for Model 2: Determinants of Export Price

The estimation results for Model 2 provide insights into the determinants of Indonesia's monthly coffee export prices. Compared to export value, export prices exhibit considerably lower variability, which is reflected in the more

modest explanatory power of the model ($R^2 = 0.553$) and the lack of joint significance (F-statistic = 0.6734; $p = 0.760$). This indicates that the included macroeconomic and market variables—global prices, exchange rates, and seasonal patterns—do not play a dominant role in shaping short-term fluctuations in unit export prices. Such results are common in commodity trade models, where export prices are influenced by longer-term contract structures or quality grading systems that adjust more slowly than monthly movements in other variables.

A key finding is the significant negative effect of export volume on export prices, with $\ln_VOLUME$ showing a strong and statistically significant coefficient ($\beta = -1.0000$; $p < 0.01$). This relationship implies that increases in export quantity are associated with proportional decreases in unit export prices, reflecting typical commodity market behavior where larger shipment volumes can exert downward pressure on prices. In contrast, global Arabica prices ($\ln_ICO$) and the exchange rate ($\ln_FX$) do not demonstrate statistically significant effects on Indonesia's export prices. These results suggest that Indonesia's exporters do not fully transmit international price changes or exchange rate adjustments into monthly FOB prices, consistent with empirical evidence from buyer-driven global value chains.

The monthly dummy variables also show no significant effects, reinforcing the view that seasonal patterns do not meaningfully influence Indonesia's export prices once the key explanatory variables are controlled for. Taken together, these results point to a pricing structure that is relatively rigid in the short term, shaped more by underlying supply volumes than by global market or currency dynamics. A detailed presentation of the regression results—covering coefficient estimates, statistical significance, and diagnostic measures—is provided in Table 5. Regression Results Model 2 and Table 6. Model Fit, which offers the full empirical evidence supporting this interpretation.

Tabel 5. Regression Results Model 2 (Determinants of Export Price)

Variable	Coefficient	Std. Error	t-Statistic	p-value
Constant	1.3879	1.757	0.790	0.450
$\ln_VOLUME$	-1.0000	0.188	-5.311	0.000
$\ln_ICO$	0.0000	0.185	0.000	1.000
$\ln_FX$	0.0000	0.182	0.000	1.000
D1	0.0009	0.024	0.036	0.972
D2	0.0022	0.024	0.095	0.926
D3	0.0037	0.022	0.167	0.872
D4	0.0039	0.021	0.183	0.859
D5	0.0041	0.019	0.210	0.839
D6	0.0039	0.017	0.225	0.827
D7	0.0030	0.015	0.200	0.846
D8	0.0015	0.014	0.107	0.917
D9	0.0010	0.013	0.079	0.939
D10	0.0006	0.011	0.053	0.958
D11	0.0002	0.009	0.019	0.985

Table 6. Model Fit

Statistic	Value
R-squared	0.553
Adjusted R ²	-0.269
F-statistic	0.6734
Prob(F-statistic)	0.760
Observations	24

DISCUSSION

The results of this study highlight the central role of export volume in shaping Indonesia's coffee export performance. The strong and consistent relationship between shipment quantity and export revenue indicates that Indonesia remains dependent on a volume-driven export structure, where increases in production and export capacity directly translate into higher earnings. This pattern is typical of commodity-exporting economies, particularly those focused on raw or minimally processed agricultural products, where export value is predominantly determined by the scale of output rather than by differentiated pricing strategies or value-added activities.

The findings also show that while Indonesia is exposed to global coffee price dynamics, this influence is more evident in total export earnings than in unit export prices. The limited responsiveness of export prices to international market movements reflects structural characteristics commonly identified in agricultural global value chains, where producing countries often have constrained price-setting power. Factors such as long-term buyer contracts, standardized quality classifications, and competitive pressures among producing nations reduce the transmission of global price changes into domestic export pricing. Similarly, the weak price responsiveness to exchange rate fluctuations suggests that exporters absorb part of these shocks, supporting literature on incomplete pass-through in commodity trade.

Taken together, these findings underscore the need for Indonesia to reduce its reliance on volume-based export growth and develop strategies that strengthen value creation within the coffee sector. Enhancing product quality, expanding downstream processing, and improving market differentiation through certification or specialty coffee initiatives may help Indonesia capture a larger share of global value. At the same time, stabilizing macroeconomic conditions and strengthening exporter bargaining positions can further mitigate vulnerabilities associated with global price volatility and exchange rate pressures. These conclusions align with broader discussions in agricultural economics emphasizing the transition from commodity-based export dependence toward more resilient and value-oriented export structures.

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that Indonesia's coffee export performance remains largely volume-driven, with export revenue shaped primarily by changes in shipment quantities rather than fluctuations in global prices or exchange rates. Although international market conditions contribute to overall export earnings,

export prices appear relatively rigid, reflecting Indonesia's upstream position in the global coffee value chain. The findings further suggest that seasonal patterns play a minimal role in export outcomes, indicating a stable export flow shaped more by supply conditions and structural factors than by cyclical variations.

To enhance export competitiveness, Indonesia must move beyond a reliance on export volume and invest strategically in value creation. This includes improving product quality, promoting downstream processing, strengthening specialty and certified coffee segments, and diversifying destination markets to reduce vulnerability to external shocks. Policymakers should also support greater transparency in pricing structures, improve exporter bargaining power, and ensure macroeconomic stability—particularly in exchange rates—to sustain long-term export performance. These efforts can collectively advance Indonesia's transition from a volume-based commodity exporter toward a more resilient and value-oriented coffee industry.

FURTHER STUDY

This study acknowledges several limitations that open avenues for future research. The use of aggregated monthly data restricts the ability to capture variations across coffee types, quality grades, and exporter characteristics, while broader supply chain factors such as post-harvest practices, certification schemes, and farm-level productivity remain beyond the scope of analysis. Future studies may incorporate micro-level or panel data to better understand heterogeneity across regions and actor groups, employ more advanced econometric frameworks to explore long-run dynamics, and consider additional factors such as market diversification, climate variability, or global demand shifts that may further influence Indonesia's coffee export performance.

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