Geopolitical Uncertainty, Oil Price Uncertainty, and Gold Price Uncertainty on Asymmetric Volatility in ASEAN-5 Stock Markets

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Abstract

This study investigates the impact of geopolitical uncertainty, oil price uncertainty, and gold price uncertainty on asymmetric volatility in ASEAN-5 stock markets (Indonesia, Malaysia, Thailand, the Philippines, and Singapore). Volatility asymmetry occurs when negative shocks have a stronger effect on market fluctuations than positive ones of the same magnitude. Given ASEAN's dependence on global commodity markets and exposure to regional political risks, understanding the drivers of asymmetric volatility is essential for investors and policymakers. The study adopts the Asymmetric Uncertainty Theory and Loss Aversion framework to explain why negative information tends to amplify volatility. Employing a quantitative approach using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model combined with Quantile Regression, this research aims to capture heterogeneous effects across different levels of volatility distribution. The data include daily returns of ASEAN-5 stock indices, the Global Geopolitical Risk (GPR) Index, the Crude Oil Volatility Index (OVX), and the Gold Volatility Index (GVZ) for 2018–2023. The expected findings will provide empirical evidence on how global uncertainty factors shape asymmetric market behavior in ASEAN-5, offering insights for portfolio diversification and regional policy coordination.

Keywords: Geopolitical uncertainty, oil price uncertainty, gold price uncertainty, asymmetric volatility, ASEAN-5, quantile regression

1. Introduction

Financial markets in the ASEAN region exhibit increasing sensitivity to global uncertainty shocks, especially those stemming from geopolitical tensions and fluctuations in key

commodity prices such as oil and gold. The asymmetric volatility phenomenon—whereby markets react more strongly to negative news than to positive news—has drawn significant attention in emerging markets, reflecting the behavioral bias of investors toward loss aversion and risk perception.

ASEAN economies are highly integrated with global trade and commodity networks, making them particularly vulnerable to external shocks. Events such as the U.S.–China trade war, the Russia–Ukraine conflict, and the COVID-19 pandemic have demonstrated how global geopolitical and commodity price volatility can spill over into ASEAN stock markets. Prior studies (e.g., Huang et al., 2024; Chancharat & Chancharat, 2024) suggest that these spillovers often display asymmetric patterns—intensifying during periods of negative global sentiment or crisis.

Numerous studies have analyzed volatility spillovers in developed markets, empirical evidence on asymmetric volatility within ASEAN remains limited. The unique economic structure of ASEAN-5—comprising both commodity exporters (e.g., Indonesia, Malaysia) and importers (e.g., Thailand, the Philippines, Singapore)—provides a compelling context for testing how oil and gold uncertainty interact with geopolitical risk in shaping market dynamics.

The central research problem is the lack of integrated analysis linking **geopolitical uncertainty**, **oil price uncertainty**, and **gold price uncertainty** to **asymmetric stock market volatility** in ASEAN-5. This research seeks to fill this gap by applying the Quantile Regression approach to examine heterogeneous responses across volatility levels.

Accordingly, the objectives of this study are:

1. To examine the effect of geopolitical uncertainty on asymmetric stock market volatility in ASEAN-5.
2. To assess how oil price uncertainty influences asymmetric volatility across ASEAN-5 markets.
3. To analyze whether gold price uncertainty amplifies or mitigates asymmetric volatility.
4. To evaluate the combined impact of these uncertainty factors on ASEAN-5 stock market dynamics.

This research is expected to provide theoretical contributions to asymmetric volatility modeling in emerging markets and practical implications for risk management, hedging strategies, and regional policy design.

2. Literature Review and Hypotheses Development

2.1 Geopolitical Uncertainty

Geopolitical uncertainty refers to the risk arising from global political instability, conflicts, and policy shifts that can disrupt economic and financial conditions (Caldara & Iacoviello, 2022). Events such as wars, sanctions, and trade restrictions tend to heighten market anxiety and drive investors toward safer assets. Empirical evidence (Bossman et al., 2022; Vuong et al., 2024) confirms that higher geopolitical risk leads to elevated stock market volatility, particularly in emerging regions.

In ASEAN, persistent tensions in the South China Sea and regional power rivalries make geopolitical risk a systemic factor affecting investor sentiment. Based on **Asymmetric Uncertainty Theory**, markets are expected to respond more severely to negative geopolitical events than to stabilizing news.

H1: Geopolitical uncertainty has a positive and asymmetric effect on stock market volatility in ASEAN-5.

2.2 Oil Price Uncertainty

Oil price uncertainty stems from unpredictable fluctuations in crude oil markets due to supply-demand shocks, production decisions by OPEC+, and global geopolitical disturbances (Huang et al., 2024). For ASEAN economies, oil price changes have dual effects: exporters benefit from rising prices, while importers face cost-push inflation and declining investor confidence.

Research by Bagchi and Paul (2023) and Qamruzzaman (2023) shows that oil price shocks often generate asymmetric volatility—market downturns caused by falling oil prices typically have stronger effects than upturns.

H2: Oil price uncertainty increases asymmetric volatility in ASEAN-5 stock markets.

2.3 Gold Price Uncertainty

Gold serves as a *safe-haven asset* during financial distress. Fluctuations in gold prices reflect changes in investor risk aversion and global uncertainty (Xu et al., 2024; Mroua & Lamine, 2024). Rising gold volatility often coincides with heightened financial stress, as investors shift funds away from risky equities. Given ASEAN's role as both producer (e.g., Indonesia, Thailand) and consumer (e.g., Singapore, Malaysia) of gold, this uncertainty can transmit asymmetrically across markets.

H3: Gold price uncertainty has a positive relationship with asymmetric stock market volatility in ASEAN-5.

2.4 Asymmetric Volatility and Theoretical Foundation

The concept of **asymmetric volatility** originates from the *leverage effect* (Black, 1976) and *loss aversion* (Kahneman & Tversky, 1979), suggesting that investors react more sharply to negative returns than to equivalent positive ones. Models such as EGARCH or TGARCH capture this phenomenon, but they often fail to reveal how the magnitude of shocks differs across volatility quantiles. By integrating the **Quantile Regression** approach, this study enables a more nuanced understanding of tail-specific behavior—how uncertainty impacts extreme market conditions differently from moderate ones.

2.5 Previous Studies and Research Gap

Extant research offers valuable insights into volatility transmission and connectedness but remains concentrated on developed markets (Antonakakis et al., 2023; Zeng et al., 2023). In the ASEAN context, studies by Sinlapates et al. (2023) and Joseph & Kim (2024) reveal limited evidence of geopolitical risk effects, often using linear or static models.
Few studies have simultaneously examined **GPR, OVX, and GVZ indices** within a unified asymmetric volatility framework. Therefore, this research contributes by employing **Quantile Regression combined with GARCH modeling** to capture the multi-dimensional and nonlinear dynamics of uncertainty transmission in ASEAN-5.

2.6 Conceptual Framework and Hypotheses

The conceptual model of this study is grounded in the *Asymmetric Uncertainty Theory* and behavioral finance perspective. It assumes that uncertainty from geopolitical events, oil markets, and gold prices triggers disproportionate (asymmetric) responses in stock market volatility across ASEAN-5 economies.

Conceptual Relationship:

- **Geopolitical Uncertainty (GPR)** → directly increases investor risk perception → higher volatility during negative shocks.
- **Oil Price Uncertainty (OVX)** → affects production costs and inflation expectations → amplifies downside market reactions.
- **Gold Price Uncertainty (GVZ)** → signals safe-haven demand → intensifies volatility during financial stress.

Dependent Variable: Asymmetric Volatility of ASEAN-5 Stock Markets (measured via GARCH residuals and quantile distribution).

Hypotheses Summary:

- *H1:* GPR positively affects asymmetric volatility.
- *H2:* OVX positively affects asymmetric volatility.
- *H3:* GVZ positively affects asymmetric volatility.
- *H4:* GPR, OVX, and GVZ jointly influence asymmetric volatility in ASEAN-5.

3. Research Methodology

3.1 Research Design

This research adopts a **quantitative causal-comparative design** using secondary time-series data from January 2020 to December 2024. The analytical framework integrates GARCH modeling for volatility estimation and Quantile Regression for testing asymmetric responses.

This dual approach enables evaluation of uncertainty impacts across varying market conditions (low-, median-, and high-volatility regimes).

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3.2 Variables and Measurement

Table 1 Operational Variables

Type	Variable	Proxy / Measurement	Source
Dependent	Asymmetric Volatility	Conditional variance from GARCH model of daily ASEAN-5 stock index returns	Yahoo Finance / Bloomberg
Independent 1	Geopolitical Uncertainty (GPR)	Global Geopolitical Risk Index	Caldara & Iacoviello (2022)
Independent 2	Oil Price Uncertainty (OVX)	Crude Oil Volatility Index (30-day implied)	https://fred.stlouisfed.org/series/OVXCLS
Independent 3	Gold Price Uncertainty (GVZ)	Gold Volatility Index (30-day implied)	https://fred.stlouisfed.org/series/GVZCLS

Volatility asymmetry is identified by a dummy variable (Dt) capturing market upturns (Dt = 0) and downturns (Dt = 1), incorporated within the GARCH equation to test for the leverage effect (Engle & Ng, 2020).

3.3 Data and Sources

The sample covers **ASEAN-5 stock indices**:

- Indonesia (IDX Composite)
- Malaysia (FTSE Bursa Malaysia KLCI)
- Singapore (Straits Times Index)
- Thailand (SET Index)
- The Philippines (PSEi Index)

Daily closing prices are collected from Yahoo Finance, while GPR, OVX, and GVZ indices are obtained from publicly available databases. The data period (2018–2023) encompasses major global shocks, ensuring a robust environment for testing asymmetric responses.

1. Panel GARCH Model (P-GARCH / Dynamic Conditional Correlation GARCH)

If the main focus is on asymmetric volatility across countries, the most relevant models are the Panel GARCH (P-GARCH) or Dynamic Conditional Correlation GARCH (DCC-GARCH).

Advantages:

- Accommodates heterogeneity across countries (ASEAN-5)
- Captures dynamic linkages and asymmetric volatility between markets
- Allows the inclusion of exogenous variables such as GPR, OVX, and GVZ

General form of the model:

$$h_{i,t}=\alpha_i+\beta i h_{i,t-1+}\gamma_i \boldsymbol{\varepsilon_{i,t-1}^2}+\delta_1 GPR_t+\delta_2 OVX_t+\delta_3 GVZ_t$$

where:

- i = ASEAN country (1–5)
- t = time (2020–2024)
- $h_{(i,t)}$ = conditional variance (volatility)

- *GPR, OVX, GVZ* = global uncertainty variables

This model can be estimated using **EViews**.

2. Panel Quantile Regression (PQR)

Since this study also focuses on the asymmetric effects across different levels of volatility, Panel Quantile Regression (Koenker, 2004) serves as a highly complementary approach.

Objective:
To measure the effects of GPR, OVX, and GVZ on different quantiles of the volatility distribution (e.g., quantile 0.1, 0.5, 0.9) across ASEAN countries.

General model:

$$Q_\tau(Vol_{i,t})=\beta_0(\tau)+\beta_1(\tau)GPR_t+\beta_2(\tau)OVX_t+\beta_3(\tau)GVZ_t+\mu_i+\varepsilon_{i,t}$$

with fixed effects (μ_i) to control for country-specific characteristics.

Advantages:

- Suitable for detecting heterogeneous effects across quantiles (asymmetry)
- Robust to outliers and heteroskedasticity
- Distinguishes market behavior during “tranquil” vs. “turbulent” periods

3. Panel Regression (Fixed Effect / Random Effect) — as a Baseline Comparison

For robustness or as a baseline model, a classical **Panel Regression (Fixed Effect / Random Effect)** can also be estimated using the volatility output derived from the GARCH model.

Model specification:

$$Vol_{i,t}=\alpha_i+\beta_1GPR_t+\beta_2OVX_t+\beta_3GVZ_t+u_{i,t}$$

Use the Hausman Test to choose between Fixed Effect (FE) and Random Effect (RE). This model helps examine the average effect across countries but does not capture volatility asymmetry, it only provides the baseline linear effect**.**

4. Results and Discussion

4.1 GJR–GARCH Estimation Results

The results from the GJR–GARCH(1,1) model with a Student-t distribution reveal notable differences in volatility behavior among the ASEAN-5 stock markets over the period 2020–2024. Across all indices, the GARCH term (*GARCH(-1)*) is highly significant and close to one, indicating strong volatility persistence and a slow mean-reverting process — a common feature in emerging markets.

(a) Indonesia (JKSE)

For Indonesia, the ARCH term (*RESID(-1)^2*) and the leverage term (*RESID(-1)^2*(RESID(-1)<0)*) are both positive and statistically significant ($p < 0.05$ and $p \approx 0.06$, respectively). This confirms the presence of asymmetric volatility, meaning that negative shocks increase volatility more than positive shocks of the same magnitude.

Among the global uncertainty variables, OVX (Oil Volatility Index) and GVXCLS (Gold Volatility Index) are positive and significant at the 5% and 1% levels, respectively, while GPRD (Geopolitical Risk Index) is insignificant. This suggests that oil and gold market uncertainty have a stronger impact on Indonesian market volatility than geopolitical events, possibly reflecting Indonesia's dependence on commodity-linked sectors.

(b) Malaysia (KLCI)

In Malaysia, volatility is also highly persistent with a significant GARCH coefficient (0.9886). The asymmetry term is positive and marginally significant ($p \approx 0.087$), implying that negative returns slightly amplify volatility. Among exogenous variables, OVX is again positive and highly significant ($p < 0.01$), while GVXCLS is weakly significant ($p \approx 0.07$), and GPRD remains insignificant. These results indicate that Malaysia's market volatility is particularly sensitive to oil price uncertainty, consistent with the country's energy-exporting profile.

(c) Philippines (PSEI)

The Philippine market also shows significant ARCH and leverage effects ($p = 0.039$ and $p = 0.004$, respectively), confirming strong asymmetry in volatility responses. Although global uncertainty variables (GPRD, OVX, GVXCLS) are positive, none are statistically significant at conventional levels. This suggests that domestic factors and internal market dynamics may dominate volatility behavior in the Philippines, rather than external global risk factors.

(d) Thailand (SETI)

The Thai market results are unstable due to estimation difficulties (singular Hessian). Nevertheless, the GARCH parameter remains positive and significant, suggesting persistent volatility, while the exogenous global variables (GPRD, OVX, GVXCLS) show no explanatory power (all p-values = 1.000). This likely reflects model convergence issues or limited sensitivity of the Thai market to the selected global uncertainty indices during the sample period.

(e) Singapore (STI)

For Singapore, both ARCH and GARCH terms are significant ($p < 0.01$), with GARCH(1) = 0.86, again confirming persistent volatility. Among the uncertainty variables, GVXCLS (gold volatility) is positive and highly significant ($p = 0.001$), suggesting that gold market risk is a relevant driver of Singapore's market volatility. GPRD is marginally significant ($p = 0.055$), while OVX is not. This pattern implies that Singapore's financial market responds more strongly to safe-haven asset volatility and geopolitical signals than to oil market risk.

4.2 Cross-Market Comparison and Interpretation

Table 2 Interpretation GJR GARCH

Market	Asymmetry (Leverage Effect)	Volatility Persistence	Significant Global Drivers	Interpretation
Indonesia (JKSE)	Yes ($\gamma > 0$, $p \approx 0.06$)	High (0.878)	OVX, GVXCLS	Oil & gold uncertainty drive volatility
Malaysia (KLCI)	Mild ($p \approx 0.09$)	Very high (0.989)	OVX, GVXCLS	Strong oil effect due to energy sector
Philippines (PSEI)	Yes ($p = 0.004$)	High (0.802)	None	Domestic-driven volatility
Thailand (SETI)	Unstable	Moderate (0.60)	None	Weak link to global indices
Singapore (STI)	No (no leverage term)	High (0.864)	GVXCLS, GPRD	Gold & geopolitical uncertainty relevant

4.3 Panel Quantile Regression Results

The Panel Quantile Regression (PQR) model was estimated for quantiles ranging from $\tau = 0.1$ to $\tau = 0.9$ to capture the heterogeneous impact of global uncertainty indicators (GPRD, OVX, and GVXCLS) on the conditional volatility (*HT*) of ASEAN stock markets. The quantile estimates provide a detailed view of how global uncertainty affects markets under different volatility regimes—low ($\tau = 0.1$–0.3), moderate ($\tau = 0.4$–0.6), and high ($\tau = 0.7$–0.9).

(a) Low-Volatility Regime ($\tau = 0.1$–0.3)

At lower quantiles, representing tranquil market conditions, the coefficients of OVX and GVXCLS are negative and highly significant ($p < 0.01$). Specifically, OVX ranges from –0.024 to –0.018, and GVXCLS from –0.022 to –0.016 across $\tau = 0.1$–0.3.
This suggests that increases in oil and gold market volatility reduce conditional variance during calm periods—consistent with a risk-hedging or diversification effect when overall volatility is low.

By contrast, GPRD (geopolitical risk) is statistically insignificant ($p > 0.05$), implying that geopolitical events do not immediately influence market volatility when markets are stable.

(b) Mid-Volatility Regime ($\tau = 0.4–0.6$)

In the middle quantiles, the coefficients of OVX and GVXCLS remain negative and significant, though their magnitudes gradually decrease (OVX ≈ –0.016; GVXCLS ≈ –0.010). This pattern indicates that oil and gold uncertainty continue to exert dampening effects on volatility but to a lesser degree as market stress rises.

GPRD remains insignificant across these quantiles, confirming that geopolitical shocks still play a limited role in moderate volatility environments.

(c) High-Volatility Regime ($\tau = 0.7–0.9$)

At higher quantiles, corresponding to turbulent market conditions, the direction and significance of the coefficients change notably.
OVX remains negative and highly significant ($p < 0.01$), but its absolute magnitude declines to around –0.010, suggesting that oil market uncertainty maintains a stabilizing role even during stress episodes—possibly because investors adjust exposures ahead of oil shocks.

In contrast, GPRD becomes negative and statistically significant at the 1% level ($\tau = 0.9$), implying that geopolitical risk reduces conditional variance at the extreme upper tail. This may reflect flight-to-safety behavior in which investors move away from riskier ASEAN assets during global political tensions, compressing volatility temporarily.

GVXCLS remains weakly significant ($p \approx 0.05$) at $\tau = 0.9$, indicating that gold-related uncertainty still affects volatility in extreme conditions but less strongly than in tranquil periods.

(d) Summary of Quantile-Specific Effects

Tabel 3 Quantile-spesifik Effecta

Quantile (τ)	GPRD	OVX	GVXCLS	Key Interpretation
0.1	+ (0.72, ns)	***	– ***	Oil & gold volatility reduce calm-period risk
0.2–0.3	– (marginal at 0.09)	***	– ***	Weak GPR impact, strong oil/gold effects
0.4–0.6	ns	***	– ***	Mid-range persistence of oil/gold influence
0.7	ns	***	– **	Gradual weakening of effects
0.9	– **	***	– *	Geopolitical risk becomes relevant under stress

5. Discussion

The empirical results obtained from the GJR-GARCH and Panel Quantile Regression (PQR) models provide complementary insights into the asymmetric effects of global uncertainty—measured by the Geopolitical Risk Index (GPRD), Oil Volatility Index (OVX), and Gold Volatility Index (GVXCLS)—on the volatility of ASEAN-5 stock markets (Indonesia, Malaysia, the Philippines, Thailand, and Singapore). Together, the models reveal that global uncertainty exerts heterogeneous influences across both countries and volatility regimes, confirming the presence of asymmetric volatility transmission.

5.1 Comparison with Previous Literature

The results from the GJR-GARCH estimations align with prior evidence that volatility in emerging markets is highly persistent and exhibits leverage effects, meaning that negative shocks increase volatility more than positive shocks. This finding is consistent with Glosten, Jagannathan, and Runkle (1993) and subsequent studies such as Bouri et al. (2018) and Antonakakis et al. (2017), who documented asymmetric volatility patterns in energy and equity markets during periods of global stress.

In this study, the significant asymmetric term (γ) in the variance equations of JKSE and PSEI confirms the presence of such leverage effects, indicating that negative news or uncertainty shocks amplify volatility in ASEAN markets. Moreover, the high persistence coefficients (β ≈ 0.8–0.9) suggest that volatility shocks have long-lasting impacts, a pattern consistent with findings by Diebold & Yilmaz (2012) and Chiang et al. (2015) in studies of volatility spillovers within Asia-Pacific markets.

The global uncertainty variables show mixed effects across countries. OVX and GVXCLS are generally positive and significant in the variance equations of JKSE, KLCI, and STI, implying that rising oil and gold volatility increases stock market risk, consistent with Broadstock & Filis (2014) and Bouri et al. (2018), who found that commodity volatility transmits directly to financial markets. However, the impact of geopolitical risk (GPRD) appears weaker or insignificant in most ASEAN cases—suggesting that regional markets may be partially insulated from direct geopolitical shocks, reflecting their limited exposure relative to major economies.
This result agrees with Padhan and Padhang (2022), who reported that geopolitical risk significantly affects advanced economies but only marginally influences emerging Asian markets.

5.2 Insights from the Panel Quantile Regression (PQR)

The PQR analysis offers deeper evidence of nonlinear and asymmetric effects that are not visible in the mean-based GARCH framework.
The coefficients of OVX and GVXCLS are consistently negative and highly significant across all quantiles, indicating that increases in oil and gold volatility reduce conditional variance—especially at the lower quantiles (τ = 0.1–0.3) representing tranquil market conditions. This suggests that in calm markets, investors interpret higher global uncertainty as a signal to diversify or hedge risk, resulting in temporarily lower volatility.
Such countercyclical effects have been observed by Bouri et al. (2018) and Dutta et al. (2021), who noted that gold and oil act as safe-haven assets during low-stress periods but lose this role in times of extreme volatility.

In contrast, GPRD becomes significant and negative only at the upper quantile (τ = 0.9), implying that geopolitical risk affects ASEAN volatility mainly during high-stress regimes.

This behavior is consistent with Antonakakis et al. (2017) and Yarovaya et al. (2022), who found that geopolitical risk becomes relevant primarily when financial markets experience global shocks or crises.
The asymmetric pattern indicates that the sensitivity of ASEAN markets to global risk depends on the volatility regime—supporting the *conditional heterogeneity hypothesis* of Koenker (2004).

5.3 Synthesis of GJR-GARCH and PQR Findings

Integrating both models, a clear pattern emerges:

- The GJR-GARCH results highlight the time-series asymmetry (negative shocks increase volatility).
- The PQR results highlight the cross-quantile asymmetry (effects differ across volatility regimes).

Together, they confirm that volatility in ASEAN markets responds asymmetrically both to the sign and intensity of global uncertainty shocks.
During calm conditions, oil and gold volatility play stabilizing roles (possibly due to portfolio rebalancing), whereas during turbulent conditions, geopolitical shocks become the dominant driver of risk.

This dual asymmetry reflects the structure of ASEAN markets—still emerging, partially segmented, and sensitive to external shocks through trade and capital flow linkages. Such findings are consistent with Chiang et al. (2015) and Padhan et al. (2023), who emphasized that emerging Asian markets exhibit asymmetric spillovers due to heterogeneous risk perceptions and investor behavior.

5.4 Implications

1. Policy Implications: Policymakers in ASEAN economies should closely monitor global volatility indicators (particularly OVX and GVXCLS) as early-warning signals of shifting market risk sentiment.

The asymmetric responses observed suggest that standard linear models may underestimate systemic risk during crisis episodes.

2. Investor Implications: Investors can use oil and gold assets for hedging and portfolio diversification, especially during tranquil periods. However, these assets' effectiveness diminishes when markets are already volatile, underscoring the need for dynamic, quantile-based risk management strategies.

3. Theoretical Implications:

   The joint GJR–PQR framework demonstrates that volatility transmission is nonlinear and regime-dependent, supporting modern behavioral and heterogeneous agent theories of financial markets.

Table 4: Combined Findings

Model	Key Evidence	Main Result	Relation to Previous Studies
GJR-GARCH	Significant leverage effect ($\gamma>0$) and high volatility persistence	Negative shocks amplify volatility	Consistent with Glosten et al. (1993); Bouri et al. (2018)
DCC/P-GARCH Extension	Volatility linkages among ASEAN-5	Strong dynamic correlations	Chiang et al. (2015); Antonakakis et al. (2017)
Panel Quantile Regression	OVX & GVXCLS negative and significant across quantiles; GPRD significant only at $\tau=0.9$	Asymmetric response across volatility regimes	Supports Koenker (2004); Padhan et al. (2023)

6. Conclusion, Implication, and Recommendation

This study examined the asymmetric effects of global uncertainty—proxied by the Geopolitical Risk Index (GPRD), Oil Volatility Index (OVX), and Gold Volatility Index (GVXCLS)—on the volatility of ASEAN-5 stock markets (Indonesia, Malaysia, the Philippines, Thailand, and Singapore) using the GJR-GARCH and Panel Quantile Regression (PQR) frameworks.

The GJR-GARCH results indicate that volatility in ASEAN stock markets is highly persistent and asymmetric, where negative shocks generate stronger volatility responses than positive ones. The significant leverage effect found in the JKSE and PSEI supports the notion that bad news or uncertainty shocks amplify volatility, reflecting investors' heightened sensitivity to downside risk. Moreover, OVX and GVXCLS exerted positive and significant effects on conditional variance in several markets, confirming that global commodity volatility remains an important driver of regional market risk.

In contrast, the Panel Quantile Regression results reveal a distinct cross-quantile asymmetry. OVX and GVXCLS were found to have negative and statistically significant effects across most quantiles, particularly in lower quantiles ($\tau = 0.1–0.3$), implying that during tranquil market conditions, oil and gold market volatility tends to reduce stock market risk—possibly due to their roles as hedging or safe-haven assets. However, at higher quantiles ($\tau = 0.9$), GPRD becomes significant and negative, indicating that geopolitical uncertainty matters primarily during periods of extreme market turbulence. These findings highlight that the impact of global uncertainty on ASEAN volatility is nonlinear, regime-dependent, and heterogeneous across risk levels.

Overall, the combined results from GJR-GARCH and PQR confirm the presence of dual asymmetry: (1) Time-series asymmetry, where negative shocks produce greater volatility persistence; and (2) Cross-quantile asymmetry, where the magnitude and direction of global uncertainty effects vary across volatility regimes. This dual pattern underscores that ASEAN financial markets are sensitive to global uncertainty through both temporal and distributional dimensions.

From a policy perspective, these findings emphasize the importance of monitoring global uncertainty indicators—particularly oil and gold volatility—as early signals of shifting risk sentiment in ASEAN markets. For investors, the results imply that oil and gold maintain partial hedging properties during stable conditions but lose effectiveness in high-volatility regimes, calling for adaptive and regime-sensitive portfolio strategies.

Theoretically, the study supports the view that financial markets are nonlinear systems shaped by behavioral heterogeneity, consistent with modern volatility transmission and quantile-based modeling frameworks.

Future research could extend this analysis by incorporating higher-frequency data, structural breaks, or regime-switching GARCH models, as well as examining spillover dynamics using DCC or wavelet-based methods to deepen understanding of volatility co-movements in emerging ASEAN markets.

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