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AN ANALYSIS OF MARKET REFLEXIVITY AND VOLATILITY IN THE FORMATION OF ASSET BUBBLES IN THE JAKARTA ISLAMIC INDEX: A PERSPECTIVE ON THE PROHIBITION OF GHARAR

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ABSTRACT

Volatility in Indonesia's Islamic stock market is a significant concern because the Jakarta Islamic Index (JII) has substantial market capitalization yet remains exposed to global market uncertainty, as reflected by the Volatility Index (VIX). This study analyzes the effect of the VIX on JII volatility (VOL_JII), the effect of VOL_JII on price deviation from equilibrium (PDE_JII), the direct effect of the VIX on PDE_JII, and the mediating role of VOL_JII in the relationship between the VIX and PDE_JII over the 2016–2025 period. This study employs a quantitative explanatory approach using monthly secondary data (120 observations) analyzed via dynamic regression with HAC/Newey-West standard errors and a Sobel test to assess the mediating effect. The results indicate that the VIX has no significant effect on either VOL_JII or PDE_JII, while VOL_JII has a significant negative effect on PDE_JII. The mediation test further indicates that VOL_JII was not found to significantly mediate the effect of the VIX on PDE_JII in this sample. These findings suggest that the internal dynamics of the JII market—particularly volatility persistence and price deviation—are more relevant in explaining signs of an asset bubble than the direct transmission of global market uncertainty.

Keywords: VIX, Jakarta Islamic Index volatility, price deviation from equilibrium, mediation effect, reflexivity.

ABSTRAK

Volatilitas pasar saham syariah Indonesia menjadi perhatian penting karena Jakarta Islamic Index (JII) memiliki kapitalisasi yang besar namun tetap rentan terhadap ketidakpastian pasar global yang tercermin melalui Volatility Index (VIX). Penelitian ini bertujuan menganalisis pengaruh VIX terhadap volatilitas JII (VOL_JII), pengaruh VOL_JII terhadap Price Deviation from Equilibrium (PDE_JII), pengaruh langsung VIX terhadap PDE_JII, serta peran mediasi VOL_JII dalam hubungan VIX dan PDE_JII selama periode 2016–2025. Penelitian menggunakan pendekatan kuantitatif eksplanatori dengan data sekunder bulanan (120 observasi) yang dianalisis melalui regresi dinamis dengan standard error HAC/Newey-West serta uji Sobel untuk efek mediasi. Hasil penelitian menunjukkan bahwa VIX tidak berpengaruh signifikan terhadap VOL_JII maupun PDE_JII, sedangkan VOL_JII berpengaruh negatif dan signifikan terhadap PDE_JII. Pengujian mediasi juga menunjukkan bahwa VOL_JII tidak terbukti memediasi pengaruh VIX terhadap PDE_JII. Temuan ini menyimpulkan bahwa dinamika internal pasar JII, khususnya persistensi volatilitas dan penyimpangan harga, lebih relevan dalam menjelaskan pembentukan indikasi gelembung aset dibandingkan transmisi langsung ketidakpastian pasar global.

Kata kunci: VIX, Jakarta Islamic Index volatility, price deviation from equilibrium, mediation effect, reflexivity.



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INTRODUCTION

The capital market is a vital component of the financial system, serving as a vehicle for capital mobilization and the formation of asset prices based on market participants' information and expectations. Historically, stock price dynamics have not always moved in proportion to fundamental conditions but can experience significant fluctuations due to changes in expectations, sentiment, and uncertainty. These conditions are particularly relevant in the Islamic stock market, as the development of Indonesia's Islamic stock index indicates that this market has significant size and activity within the national capital market system. Data from the Financial Services Authority (Otoritas Jasa Keuangan (OJK), 2025) shows that the market capitalization of the Jakarta Islamic Index (JII) reached Rp3,340.60 trillion in 2024, although the JII index value in the same year fell to 484.37 from 535.68 in 2023. These changes indicate that the dynamics of the JII still need to be examined, particularly regarding the risks, volatility, and price anomalies occurring within it.

One external factor that could potentially influence stock market dynamics is global uncertainty, as reflected by the Volatility Index (VIX). The VIX is widely used as an indicator of expected market volatility and provides insights into stock volatility dynamics. Magner et al. (2021) demonstrated that expectations volatility, as captured by indicators such as the VIX, carries predictive power for stock market dynamics through a financial synchronization effect, while Tran & Vo (2023) found that VIX-driven uncertainty has an asymmetric and economically significant effect on the volatility of Asia-Pacific stock markets. These findings suggest that changes in global uncertainty have the potential to serve as a source of external pressure on stock markets, but the strength of this transmission may vary across markets and index characteristics.

From a reflexivity perspective, changes in market conditions are not merely a consequence of external information but can also emerge through a feedback loop between investor perceptions and price movements, since market dynamics may contain endogenous feedback components that are not fully explained by external information (Filimonov & Sornette, 2012). However, volatility is not always synonymous with price deviations or asset bubbles: volatility merely indicates the magnitude of return fluctuations, whereas price deviation indicates the extent to which actual prices deviate from an equilibrium benchmark (Shiller, 2021), and persistent deviations may indicate price dynamics not fully explained by fundamentals. Linking volatility to Price Deviation from Equilibrium (PDE) therefore offers a different perspective from simply measuring volatility, consistent with the bubble literature's emphasis on feedback mechanisms and endogenous behavior in extreme price movements (Filimonov & Sornette, 2012; Sornette & Cauwels, 2014). Although the relationship between the VIX, volatility, and market dynamics has been extensively studied, there remains room for research on whether global uncertainty affects JII price deviations through volatility as an intermediary mechanism, since prior studies have mainly focused on the VIX's predictive power or on comparing volatility characteristics across indices rather than testing this chain within a single mediation framework. Thus, this study employs VOL_JII as a mediating variable

to test whether changes in global uncertainty, as represented by the VIX, can be transmitted to PDE_JII through changes in JII volatility.

This distinction matters for policy: high volatility does not necessarily signal price deviations that threaten market stability, whereas persistent deviations are more relevant as early warning signals of systemic risk. Most Indonesian sharia-market studies stop at volatility determinants, so this study treats VOL_JII and PDE_JII as distinct constructs. This study aims to analyze the effect of the VIX on JII volatility, analyze the effect of JII volatility on PDE_JII, examine the direct effect of the VIX on PDE_JII, and test the mediating role of VOL_JII in the relationship between the VIX and PDE_JII during the 2016–2025 period. This study is expected to provide an empirical contribution to the literature on the Islamic capital market by integrating global uncertainty, volatility, and price deviations into a single analytical framework. Furthermore, the reflexivity perspective is used to explain the potential formation of feedback mechanisms in market dynamics, while the prohibition of gharar—a foundational Islamic finance principle recently shown to intensify alongside market volatility and speculative trading (Muhammadi et al., 2024) is employed normatively to provide a Sharia context for interpreting uncertainty and price deviations in the Islamic capital market.

The novelty of this study lies in three aspects. First, it separates volatility (VOL_JII) from price deviation from equilibrium (PDE_JII) and tests both within a single mediation chain ($VIX \rightarrow VOL_JII \rightarrow PDE_JII$), whereas earlier studies of the Indonesian sharia market have mainly described or explained volatility itself (Hidayati & Sukmaningrum, 2021; Prasetyo et al., 2024; Pratama & Azzis, 2018). Second, it tests the direct (H3) and indirect (H4) effects of global uncertainty on the price deviation of a sharia-screened index, extending recent evidence on how global risk indicators such as the VIX affect Islamic equity markets (Kazak et al., 2025; Salisu & Shaik, 2022), from returns and volatility to bubble-type price deviations. Third, it operationalizes reflexivity as a testable feedback framework, consistent with recent evidence that investor emotions and feedback are integral to bubble dynamics (Agarwal et al., 2025; Taffler et al., 2024), and uses the prohibition of gharar as a normative lens for interpreting the findings.

The theory of reflexivity explains that the relationship between market participants' perceptions and market conditions is reciprocal. Investors form expectations based on observed information and conditions; subsequently, the decisions resulting from these expectations influence market prices and conditions. Changes in market conditions, in turn, affect investors' expectations, thereby creating a feedback mechanism that can amplify market movements. Under certain conditions, this mechanism can cause prices to deviate further from their equilibrium and result in cyclical boom-bust phases (Davis, 2020; Soros, 2008). In this study, the theory of reflexivity is used as a foundation to explain the relationship between global uncertainty, volatility, and deviations in the JII price. The VIX represents changes in external uncertainty that can influence investors' risk perceptions, while VOL_JII represents the market's volatility response to those changes. Furthermore, changes in volatility may be related to deviations in the JII price from equilibrium conditions. Thus, reflexivity provides a theoretical basis suggesting that

this relationship is not merely a mechanical response to information but may involve a feedback process through changes in investor expectations and behavior (Davis, 2020; Soros, 2008) .

In Islamic jurisprudence, gharar denotes excessive uncertainty or ambiguity embedded in a contract's subject matter, price, or delivery, to the extent that it may lead to injustice or dispute between contracting parties (El-Gama, 2006). Classical jurists distinguish between gharar yasir (minor, tolerable uncertainty that is unavoidable in ordinary commerce) and gharar fahish (excessive uncertainty that invalidates a contract), since some degree of risk is inherent to any exchange and only uncertainty that is excessive, avoidable, and consequential is prohibited (Fatimah et al., 2025). This distinction is central to Islamic finance because it separates legitimate risk-taking, which is permitted and even encouraged in trade and investment, from speculative exposure that resembles gambling (maysir) and undermines the fairness of a transaction.

Although gharar originates as a contractual concept, recent Islamic finance literature extends it to capital market dynamics, arguing that excessive price volatility driven by speculative trading can itself generate gharar-like conditions by obscuring an asset's intrinsic value and making investment outcomes highly uncertain for Sharia-compliant investors (Muhammadi et al., 2024). In this view, gharar and volatility form a mutually reinforcing relationship: heightened volatility increases pricing ambiguity, while the resulting uncertainty can, in turn, invite further speculative behavior. Global uncertainty indicators, including the VIX, have also been linked to volatility in Islamic stock markets, suggesting that external shocks may be one channel through which gharar-like conditions emerge in Sharia-compliant indices (Adam et al., 2022). This study therefore treats the prohibition of gharar not as an empirically tested variable, but as a normative lens: the econometric results on the VIX, VOL_JII, and PDE_JII are used to assess the extent to which global uncertainty and volatility translate into the kind of excessive, ambiguity-laden price behavior that the gharar principle seeks to avoid.

The CBOE Volatility Index (VIX) is an indicator that reflects expectations of stock market volatility and is often used as a measure of uncertainty or risk pressure in global financial markets (Whaley, 2000) . When the VIX rises, this indicates increasing expectations of market fluctuations, which can influence investor behavior and the transmission of risk across markets. Empirical evidence from ASEAN markets shows that the uncertainty represented by the VIX is correlated with the dynamics of regional stock market volatility (Goswami et al., 2025) . Global risk factors such as geopolitical risk are likewise linked to stock market volatility, particularly in emerging markets (Agyei, 2023), and global risk indicators, including the VIX, have been found to affect Islamic stock indices (Kazak et al., 2025) . Studies of Islamic equity markets during global crises further show that these markets are connected to conventional and commodity markets, with spillover intensity that varies across time and frequency (S. Y. Choi et al., 2024; Mensi et al., 2022), including sectoral spillovers within Indonesia's sharia-compliant market (Fianto et al., 2026). Based on reflexivity theory, changes in uncertainty can influence investors' risk perceptions and are subsequently reflected in changes in market activity

and volatility. Therefore, an increase in the VIX is expected to be associated with an increase in VOL_JII. H1: The VIX has a positive effect on the volatility of the Jakarta Islamic Index (VOL_JII).

Volatility measures the degree of fluctuation in an asset's returns and is a key indicator of market risk dynamics. High volatility indicates that prices experience greater changes over a given period, reflecting more unstable market conditions. Previous research has shown that volatility is a key characteristic of the Indonesian sharia stock market and is influenced by various economic factors and market conditions (Hidayati & Sukmaningrum, 2021; Pratama & Azzis, 2018). From a reflexivity perspective, volatility can be part of a feedback mechanism whereby price changes influence investor expectations and subsequently drive changes in investment decisions. This situation can cause prices to deviate more significantly from their equilibrium state. Therefore, JII volatility is expected to be associated with changes in price deviation, as represented by PDE_JII. H2: JII Volatility affects JII Price Deviation from Equilibrium.

In addition to volatility, global market uncertainty represented by the VIX has the potential to directly influence the JII's price deviation from its equilibrium—without first having to go through changes in volatility. External uncertainty can drive changes in investors' expectations regarding the fair value of assets, causing prices to move away from their equilibrium even if this is not necessarily reflected in short-term increases in volatility. Sornette & Cauwels (2014) demonstrate that asset bubble dynamics can form through the accumulation of external pressures and speculative behavior that do not always align with conventional measures of volatility. Within the reflexivity framework, changes in global uncertainty can directly influence investors' risk perceptions and investment decisions, thereby contributing to deviations in the JII price from its equilibrium without necessarily being transmitted through volatility mechanisms. Therefore, this study also tests the possibility of a direct effect of the VIX on PDE_JII outside the volatility mediation pathway. H3: The VIX influences the JII's Price Deviation from Equilibrium.

The relationship between global uncertainty and price deviations is not always direct. Uncertainty may first affect market volatility, and changes in volatility are then linked to price dynamics. Within the reflexivity framework, this mechanism reflects the process by which changes in risk perception affect market conditions, and subsequent changes in market conditions reinforce market participants' responses. Thus, volatility can serve as a mechanism explaining how external pressures are transmitted to price (Davis, 2020; Goswami et al., 2025). Based on this mechanism, the VIX is expected to influence VOL_JII, while VOL_JII subsequently influences PDE_JII. If this relationship is empirically proven, JII volatility can partially explain the transmission mechanism between global uncertainty and JII price deviations. H4: JII Volatility mediates the effect of the VIX on JII Price Deviation from Equilibrium.

Figure 1 illustrates the conceptual framework of this study, which examines the relationship between VIX, market volatility (VOL_JII), and price deviation from

equilibrium (PDE_JII), including the mediating role of VOL_JII in the relationship between VIX and PDE_JII.

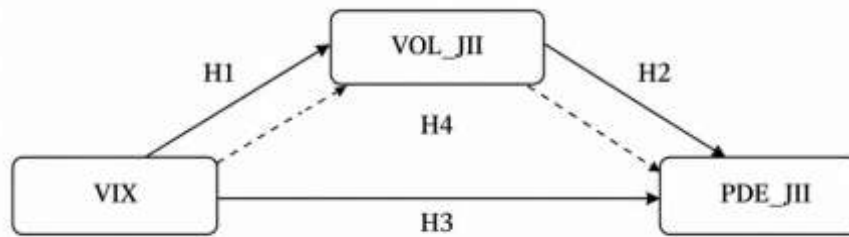


Figure 1. Conceptual Framework of the Study

The conceptual framework illustrates the proposed relationships among global market uncertainty, market volatility, and price deviation from equilibrium in the Jakarta Islamic Index (JII). VIX is positioned as the independent variable (X), representing global market uncertainty, while VOL_JII serves as the mediating variable (M), reflecting fluctuations in JII returns. PDE_JII is the dependent variable (Y), measured as the deviation of JII prices from their 12-month moving average to indicate potential bubble-like market dynamics. The framework proposes that VIX may influence VOL_JII and PDE_JII, while VOL_JII may also affect PDE_JII. Furthermore, the study examines whether VOL_JII mediates the relationship between VIX and PDE_JII. These relationships are tested empirically, and the findings are interpreted within the normative perspective of the Islamic prohibition of gharar.

RESEARCH METHOD

Research Design and Data

This study employs a quantitative approach with an explanatory design to analyze the relationship between global market uncertainty, the volatility of the Jakarta Islamic Index (JII), and price deviations from equilibrium conditions. The data used consists of monthly secondary data covering the period from January 2016 to December 2025, resulting in 120 observations. This period was selected to capture market dynamics under both normal conditions and during periods of increased global uncertainty. The explanatory design is appropriate because the study tests directional hypotheses among three time-ordered variables (VIX, VOL_JII, and PDE_JII). Dynamic (autoregressive) regression is used because monthly volatility and price deviation are persistent series, so lagged dependent variables are needed to capture inertia and to avoid serially correlated errors. The two estimated equations map directly onto a mediation model: the VOL_JII equation gives the a-path (VIX → VOL_JII), and the PDE_JII equation gives the b-path (VOL_JII → PDE_JII) and the direct c'-path (VIX → PDE_JII, H3), so that the indirect effect ($a \times b$, H4) can be tested against the direct effect within the same framework.

The research variables consist of the Volatility Index (VIX) as the independent variable (X), the volatility of the Jakarta Islamic Index (VOL_JII) as the mediating variable (M), and Price Deviation from Equilibrium (PDE_JII) as the dependent variable

(Y). The data were then processed using EViews for statistical testing and regression model estimation.

Data Type and Sources

This study uses secondary data obtained from various official and reliable sources. Secondary data was chosen because this study focuses on analyzing stock market movements that have been systematically documented by financial institutions and capital market data providers. The data used include monthly closing prices of the CBOE Volatility Index (VIX), monthly closing prices of the Jakarta Islamic Index, as well as daily JII returns used to calculate monthly market volatility (VOL_JII). All of this data was obtained from Investing.com. This platform was used because it provides the monthly closing series of both the CBOE VIX and the JII in a single, publicly accessible source with consistent frequency, currency, and date alignment, which supports replicability; the underlying series originate from CBOE (VIX) and the Indonesia Stock Exchange (JII). Because Investing.com is a secondary aggregator, possible discrepancies with official exchange files are acknowledged as a limitation, and replication with official CBOE and IDX data is recommended.

Monthly data was chosen because the phenomena of reflexivity and market volatility occur in the short term and are heavily influenced by shifts in investor sentiment. Therefore, monthly data is considered better suited to capture market dynamics than annual data. Additionally, the use of secondary data offers several advantages, such as time efficiency, ease of data access, and a high level of reliability, as it originates from official institutions that have verified the published data.

Operational Definitions of Variables

Table 1 presents the operational definitions of the research variables, including the Volatility Index (VIX) as the independent variable, JII volatility (VOL_JII) as the mediating variable, and Price Deviation from Equilibrium (PDE_JII) as the dependent variable. Each variable is defined according to its measurement in this study.

Table 1. Operational Definitions of Variables

Variable	Symbol	Operational Definition	Measurement
Global market uncertainty	VIX	A measure of stock market volatility expectations used as a proxy for global market uncertainty	Monthly VIX data
JII Volatility	VOL_JII	Level of return fluctuations in the Jakarta Islamic Index	Standard deviation of monthly JII returns
Price Deviation from Equilibrium	PDE_JII	Degree of deviation of the JII price from equilibrium	Deviation of the JII price from its equilibrium value

Source: Processed data, 2026.

Operationalization of Variables

Volatility Index (VIX) (X)

The Volatility Index (VIX) is used as an empirical proxy for global market uncertainty and investor sentiment. Within the reflexivity framework, VIX serves as an indicator representing shifts in external uncertainty rather than a direct measure of reflexivity itself. The VIX reflects the level of expected market volatility as indicated by the prices of options on the S&P 500 index (Whaley, 2000). A higher VIX value indicates increasing uncertainty and investor concern regarding market conditions, while a lower VIX value indicates relatively calmer market conditions. Measurements were taken using monthly VIX values during the study period of 2016–2025.

Market Volatility (M)

The first step is to calculate stock returns using the formula:

$$\text{Total Return} = [(P_t - P_{t-1}) / P_{t-1}] \times 100\%$$

where P_t = the stock price in period t ; P_{t-1} = the stock price before t .

The second step is to calculate the standard deviation of returns using the formula:

$$\sigma = \sqrt{[(1/n) \sum (R_t - \bar{R})^2]}$$

where σ = standard deviation; n = number of observation periods; R_t = return for period t ; $\bar{R}$ = average return over all analyzed periods.

The choice of the standard deviation of returns as a measure of volatility is based on empirical and methodological reasons. Empirically, the standard deviation of returns has long been used as a proxy for the total risk of an asset within the mean-variance framework introduced by Markowitz (1952), where the variance or standard deviation of returns reflects the extent of the dispersion of investment returns around their mean. The greater the dispersion, the higher the uncertainty of returns faced by investors in the current period. This measure was chosen over other alternatives, such as conditional volatility models (e.g., ARCH/GARCH), because this study uses monthly data with a relatively limited number of observations (120 observations), making the rolling standard deviation more suitable for capturing the historical volatility of the JII in a manner consistent with the study's time scale, while also facilitating interpretation and comparison with previous studies on the volatility of sharia stocks (Hidayati & Sukmaningrum, 2021; Pratama & Azzis, 2018).

Asset Bubble Indication (Y)

The dependent variable in this study is the asset bubble indication, measured using Price Deviation from Equilibrium (PDE).

The PDE is calculated using the following formula:

$$PDE_t = (P_t - MA_t) / MA_t$$

where PDE_t = Price Deviation from Equilibrium; P_t = stock price/IHSG for period t ; MA_t = moving average (this study uses a 12-month MA).

The use of PDE as a proxy for asset bubbles has an empirical basis in the bubble detection literature. Diba & Grossman (1988) define an asset bubble as a persistent deviation of actual prices from their fundamental values, such that the magnitude of this deviation can serve as a direct measure of a bubble, rather than merely being inferred from high volatility. In this study, the equilibrium value is approximated using a 12-month moving average (MA12) of the JII price, based on the consideration that a one-year time window can filter out short-term fluctuations while remaining responsive to gradual shifts in price trends. This approach is also consistent with the argument by Filimonov & Sornette (2012) that price deviations from their fair value path reflect the contribution of endogenous components (market participant feedback), making the PDE a more appropriate indicator of asset bubbles than volatility alone, which merely measures the magnitude of fluctuations without indicating the direction or degree of price deviation from its equilibrium condition.

Data Analysis Steps

The analysis proceeded through descriptive statistics, an ADF stationarity test, lag-structure determination, regression estimation of the VIX–VOL_JII–PDE_JII relationships, diagnostic tests (autocorrelation, heteroscedasticity, normality, and stability), HAC/Newey-West estimation where required, hypothesis testing, and mediation testing to determine whether VOL_JII mediates the effect of VIX on PDE_JII. Diagnostic test results are reported briefly, as they mainly serve to justify the final model specification rather than as core findings.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 2 presents the descriptive statistics of PDE_JII, VIX, and VOL_JII, including their mean, median, maximum, minimum, standard deviation, skewness, and kurtosis. These statistics provide an overview of the characteristics and distribution of the research variables during the 2016–2025 period.

Table 2. Descriptive Statistics of Research Variables

Statistics	PDE_JII	VIX	VOL_JII
Mean	-1.25×10^{-11}	18.49792	0.011129
Median	-0.000839	16.525	0.010036
Maximum	0.152221	53.54	0.053857

Minimum	-0.182701	9.51	0.004686
Std. Dev.	0.058722	6.956888	0.005642
Skewness	0.116787	1.854429	4.200979
Kurtosis	4.352506	8.013742	29.72144
Observations	120	120	120

Source: Processed data, 2026.

Based on the results of the normality test using the Jarque-Bera statistic, the residuals of the VOL_JII model have a Jarque-Bera value of 1,351.107 with a probability of 0.000000, while the residuals of the PDE_JII model have a Jarque-Bera value of 12.94573 with a probability of 0.001545. Both probabilities are below the 5 percent significance level, indicating that the distributions of both residuals deviate from the normality assumption and must be taken into account during the interpretation of the mediation test.

Model Diagnostic Tests

Before the final specification was obtained, the Augmented Dickey-Fuller (ADF) test showed that VIX, VOL_JII, and PDE_JII are all stationary at the level (probability < 0.05), so all three variables can be used without differencing. The VOL_JII model includes one lag of VOL_JII ($VOL_JII = f(C, VIX, VOL_JII(-1))$; 119 observations), while the PDE_JII model includes two lags of PDE_JII ($PDE_JII = f(C, VIX, VOL_JII, PDE_JII(-1), PDE_JII(-2))$; 118 observations), with the reduction from 120 observations resulting from these lag structures.

The Breusch-Pagan-Godfrey test indicates heteroscedasticity in the VOL_JII model (Chi-Square probability 0.0000) but not in the PDE_JII model (0.1095), justifying the use of HAC/Newey-West standard errors in both final estimations. The Breusch-Godfrey LM test (lags up to 12) found no residual autocorrelation in either model (Chi-Square probabilities of 0.5745 and 0.1600, respectively), although the Jarque-Bera test indicated non-normal residuals in both models—a limitation considered when interpreting the mediation results. CUSUM and CUSUM of Squares tests indicate that both models remained stable throughout the study period. Overall, these diagnostics confirm that the final, HAC/Newey-West-adjusted model specifications are suitable for hypothesis testing.

Final Regression Estimates for the VOL_JII Model

Since the VOL_JII model exhibits heteroscedasticity, the final estimates use HAC/Newey-West standard errors (Whitney K. Newey & Kenneth D. West, 1987) with the Bartlett kernel and a fixed bandwidth of 5. The same estimator is applied to the PDE_JII model for the reasons explained below. The final model specification is:

$$VOL_JII = \alpha + \beta_{1t} VIX + \beta_2 VOL_JII(-1) + \varepsilon$$

Table 3 presents the regression results examining the effect of VIX on JII volatility (VOL_JII) using HAC/Newey-West standard errors. The table reports the estimated coefficients, standard errors, t-statistics, probability values, and model fit statistics.

Table 3. Final VOL_JII Regression Results with HAC/Newey-West

Variables	Coefficient	HAC Std. Error	t-Statistic	Prob.
C	0.192801	0.256368	0.752047	0.4535
VIX	0.032253	0.020773	1.552602	0.1232
VOL_JII(-1)	0.288978	0.120143	2.405287	0.0177
R-squared	0.317924			
Adjusted R-squared	0.306164			
Wald F-statistic	26.46185			0
Observations	119			

Source: Processed data, 2026.

The estimation results show that VIX has a coefficient of 0.032253 with a probability of 0.1232. Meanwhile, VOL_JII(-1) has a coefficient of 0.288978 with a probability of 0.0177. The model has an R-squared of 0.317924 and an adjusted R-squared of 0.306164. The Wald F-statistic of 26.46185 with a probability of 0.0000 indicates that the VOL_JII model is simultaneously significant.

Final Regression Estimates for the PDE_JII Model

The final estimation of the PDE_JII model uses HAC/Newey-West with the Bartlett kernel and a fixed bandwidth of 5. Although the Breusch-Pagan-Godfrey test does not reject homoscedasticity for this model ($p = 0.1095$), HAC standard errors are retained for three reasons. First, the two equations jointly form the mediation system, so a common robust estimator keeps the standard errors of the a- and b-paths, which enter the Sobel statistic, comparable. Second, PDE_JII is built from a 12-month moving average and is highly persistent ($PDE_JII(-1) = 0.73$), so serial dependence in the errors beyond the tested lags cannot be ruled out, and the Newey-West estimator is robust to both heteroscedasticity and autocorrelation. Third, HAC leaves the coefficient estimates unchanged and only adjusts their standard errors, so applying it to a model without detected heteroscedasticity yields consistent, if slightly conservative, inference, and a non-significant pre-test does not guarantee homoscedasticity in a sample of 118 observations. The model specification is:

$$PDE_JII = \alpha + \beta_{1t} VIX + \beta_{2t} VOL_JII + \beta_{3t} PDE_JII(-1) + \beta_{4t} PDE_JII(-2) + \varepsilon$$

Table 4 presents the regression results examining the effects of VIX and VOL_JII on PDE_JII while controlling for the lagged values of PDE_JII. HAC/Newey-West standard errors are used to obtain robust statistical inferences.

Table 4. Final Regression Results for PDE_JII Using HAC/Newey-West

Variable	Coefficient	HAC Std. Error	t-Statistic	Prob.
C	2.975507	1.163713	2.556907	0.0119
VIX	-0.038379	0.053631	-0.715622	0.4757
VOL_JII	-1.920589	0.60866	-3.155436	0.0021
PDE_JII(-1)	0.732211	0.151745	4.825269	0
PDE_JII(-2)	-0.131472	0.107377	-1.224396	0.2233
R-squared	0.509233			
Adjusted R-squared	0.491861			
Wald F-statistic	23.6593			0
Observations	118			

Source: Processed data, 2026.

The estimation results show that VIX has a coefficient of -0.038379 with a probability of 0.4757. VOL_JII has a coefficient of -1.920589 with a probability of 0.0021. PDE_JII(-1) has a coefficient of 0.732211 with a probability of 0.0000, while PDE_JII(-2) has a coefficient of -0.131472 with a probability of 0.2233. The R-squared value of 0.509233 and the adjusted R-squared value of 0.491861 indicate the model's ability to explain the variation in PDE_JII. The Wald F-statistic of 23.65930 with a probability of 0.0000 indicates that the model is simultaneously significant.

Testing for Indirect Effects

An indirect effect test was conducted to determine whether VOL_JII mediates the relationship between VIX and PDE_JII. The test used the Sobel Test (Sobel, 1982) based on the coefficients and standard errors for the path from VIX to VOL_JII and the path from VOL_JII to PDE_JII.

The first path yielded a coefficient of 0.032253 for VIX on VOL_JII with a standard error of 0.020773. The second path yielded a coefficient of -1.920589 for VOL_JII on PDE_JII with a standard error of 0.608660. The indirect effect was calculated as $a \times b = 0.032253 \times (-1.920589) = -0.061943$, or approximately -0.06194. The standard error of the indirect effect was calculated using the Sobel approach and yielded a value of approximately 0.04695. Furthermore, the Sobel statistic was approximately -1.32.

Table 5 presents the results of the Sobel test used to determine whether VOL_JII mediates the relationship between VIX and PDE_JII. The table summarizes the path coefficients, indirect effect, standard error, and test statistic used to evaluate the mediation effect.

Table 5. Indirect Effect Test Results

Component	Coefficient/Statistic	Probability	Decision
Path a: VIX → VOL_JII	0.032253	0.1232	Not significant
Path b: VOL_JII → PDE_JII	-1.920589	0.0021	Significant
Indirect effect ($a \times b$)	-0.06194	-	-

Standard error of the indirect effect	≈ 0.04695	-	-
Sobel Z	≈ -1.32	> 0.05	Not significant
Mediation effect (VIX $\rightarrow$ VOL_JII $\rightarrow$ PDE_JII)	-	Not significant	Not proven

Source: Processed data, 2026.

The results of the Sobel test indicate that the indirect effect of VIX on PDE_JII via VOL_JII is not significant. Thus, VOL_JII is not proven to act as a mediating variable in the relationship between VIX and PDE_JII. Because the residuals of both models are not normally distributed (Jarque-Bera test) and the Sobel test relies on a normal approximation of the indirect effect, this result is interpreted (MacKinnon et al., 2002). The conclusion is nonetheless supported by the insignificance of the a-path itself (VIX $\rightarrow$ VOL_JII, $p = 0.1232$), since a significant a-path is a necessary condition for mediation; a bootstrap confidence interval (Preacher & Hayes, 2008) is recommended for future confirmation.

Summary of Hypothesis Testing Results

Table 6 summarizes the results of the four research hypotheses concerning the relationships between VIX, VOL_JII, and PDE_JII. The results indicate which hypotheses are supported by the regression and mediation tests.

Table 6. Summary of Hypothesis Testing Results

Hypothesis	Tested Relationship	Coefficient	Prob.	Result
H1	VIX $\rightarrow$ VOL_JII	0.032253	0.1232	Not significant
H2	VOL_JII $\rightarrow$ PDE_JII	-1.920589	0.0021	Negative & significant
H3	VIX $\rightarrow$ PDE_JII	-0.038379	0.4757	Not significant
H4	VIX $\rightarrow$ VOL_JII $\rightarrow$ PDE_JII	-0.06194	$\approx 0.19^*$	No mediation

Note: The probability value for H4 is a two-tailed approximation of the Sobel statistic of approximately -1.32. Source: Processed data, 2026.

Based on the overall test results, H1 is not supported because VIX does not have a significant effect on VOL_JII. H2 is supported because VOL_JII has a negative and significant effect on PDE_JII. H3 is not supported because VIX does not have a significant effect on PDE_JII. Furthermore, H4 is not supported because the indirect effect of VIX on PDE_JII via VOL_JII is not significant based on the Sobel test.

Overall, the research results indicate that the statistically significant relationship in the final model is the negative effect of VOL_JII on PDE_JII, whereas the effect of VIX on VOL_JII, the direct effect of VIX on PDE_JII, and the mediating effect of VOL_JII were not found to be significant.

The Effect of VIX on the Volatility of the Jakarta Islamic Index

The model estimation results show that the VIX has a positive but statistically insignificant effect on VOL_JII (coefficient = 0.032253, $p = 0.1232$), indicating that increased global market uncertainty does not sufficiently explain changes in JII volatility during 2016–2025; thus, the first hypothesis is not supported. This may reflect the JII's distinct stock composition, which includes only sharia-compliant stocks and may respond differently to global sentiment than the market as a whole. The model does, however, indicate volatility persistence, as shown by the significant VOL_JII(-1) coefficient of 0.288978 ($p = 0.0177$), meaning that the JII's internal volatility dynamics are more evident in the model than the direct influence of the VIX. This result contrasts with studies reporting a strong predictive role of VIX-driven uncertainty for stock market volatility (Magner et al., 2021; Tran & Vo, 2023), with evidence that the VIX affects Islamic equity indices (Kazak et al., 2025), and with the sensitivity of ASEAN-5 markets to global volatility spikes (Goswami et al., 2025). It is more consistent with findings that uncertainty transmission is market-specific: Ghani & Ghani (2024) report that only the U.S. uncertainty measure, not domestic ones, predicts the volatility of an emerging market, and Adam & Yacob (2022) find that the effect of global policy uncertainty on ASEAN stock returns is concentrated in high-volatility regimes. Differences in the volatility characteristics of the JII relative to conventional indices such as the LQ45 (Prasetyo et al., 2024) and the sharia screening of its constituents may therefore dampen the sensitivity of VOL_JII to global sentiment over a full-sample linear specification.

The Effect of JII Volatility on Price Deviation from Equilibrium (PDE) of the JII

The results show that VOL_JII has a negative and significant effect on PDE_JII (coefficient = -1.920589, $p = 0.0021$), so the second hypothesis is supported. The negative relationship indicates that higher volatility is associated with a decrease in PDE_JII rather than an increase, showing that volatility and price deviation are distinct market characteristics: volatility reflects the intensity of price changes, while PDE_JII reflects the degree of deviation from equilibrium. This finding indicates that asset bubble formation in the JII cannot be explained solely by the assumption that higher volatility always amplifies price deviations.

PDE_JII(-1) also has a significant positive coefficient of 0.732211 ($p < 0.01$), indicating persistence in price deviation, while PDE_JII(-2) is not significant ($p = 0.2233$). This pattern is consistent with Filimonov & Sornette (2012), who argue that price dynamics do not always move linearly with the magnitude of fluctuations; increased volatility may instead reflect a price correction process that brings prices closer to equilibrium. The high volatility observed in the JII during the study period can therefore be read as an indication of an underlying price adjustment process, rather than treated solely as evidence of asset bubble formation. The negative sign and the persistence are also consistent with behavioral evidence that market extremes are driven by investor emotions and feedback rather than by volatility alone: Agarwal et al. (2025) show that investor emotions explain roughly two-thirds of market returns and volatility during two

Chinese stock market bubbles, and Taffler et al. (2024) describe such episodes as emotional, path-dependent processes. In this setting, anxiety-driven turbulence may coincide with price corrections toward equilibrium, which could explain why higher VOL_JII is associated with smaller rather than larger deviations. Recent Indonesian studies on the performance and volatility of Islamic stocks under global shocks (Choiruddin et al., 2025; Mohamad Rahmawan Arifin et al., 2024). analyze turbulence and performance but not deviations from equilibrium; the present result adds that, for the JII, turbulence and mispricing should be analyzed separately.

The Effect of the VIX on the JII's Price Deviation from Equilibrium

The estimation results show that the VIX has a negative but statistically insignificant coefficient of -0.038379 for PDE_JII ($p = 0.4757$); thus, the third hypothesis is not supported. Because the p-value is well above the 5 percent significance level, this negative sign cannot be interpreted as evidence that the VIX causes a decrease in PDE_JII—interpretation must rest on statistical significance rather than the sign of the coefficient alone. This finding suggests that external uncertainty indicators alone are insufficient to explain changes in PDE_JII, which instead appears more closely related to internal market dynamics such as JII volatility and its own persistence. This is consistent with Sornette & Cauwels (2014), who argue that asset bubble formation is driven more by internal pressures, speculative behavior, and interactions among market participants than by a single external indicator such as the VIX, and with Davis (2020), who notes that global uncertainty can be one of many triggers without necessarily being the sole significant determinant in every market and period. Recent evidence on Islamic markets is mixed. Kazak et al. (2025) report that the VIX affects Islamic equity indices, whereas Adam & Yacob (2022) find that global policy uncertainty affects ASEAN stock returns mainly in high-volatility regimes. The insignificant direct effect found here therefore suggests that the VIX–price deviation link may be regime-dependent (crisis versus non-crisis), which a linear full-sample model cannot capture.

The Role of JII Volatility in Mediating the Effect of the VIX on PDE_JII

Mediation testing indicates that VOL_JII was not found to significantly mediate the relationship between the VIX and PDE_JII in this sample. The indirect effect ($a \times b = -0.06194$) yielded a Sobel statistic of approximately -1.32, which is not significant at the 5 percent level; thus, the fourth hypothesis is not supported. This result is primarily attributable to the insignificance of the path from VIX to VOL_JII: although VOL_JII significantly affects PDE_JII, this alone is insufficient to establish mediation, since the mediator variable itself does not respond significantly to the independent variable. The existence of a VOL_JII–PDE_JII relationship therefore cannot be interpreted as evidence that volatility serves as a transmission channel for VIX uncertainty.

This pattern indicates that JII volatility does not function as a mechanism transmitting the influence of the VIX on PDE_JII, so the relationship among global uncertainty, Sharia market volatility, and JII price deviations does not form a mediating

chain as hypothesized. This further clarifies the position of this study relative to Goswami et al. (2025), who found that global market uncertainty is associated with stock market volatility dynamics across the ASEAN region: the present results indicate that this relationship does not hold uniformly at the individual index level, particularly for Sharia-screened indices such as the JII, whose constituent composition and risk sensitivity differ from the aggregate regional market. Studies of spillovers in Islamic markets likewise stress that shock transmission varies across market regimes and crisis episodes (S. Y. Choi et al., 2024; Fianto et al., 2026), which is consistent with the absence of a stable full-sample mediation channel through volatility.

Research Limitations

Several limitations should be noted when interpreting the results of this study. First, the residuals of both models do not meet the normality assumption (Jarque-Bera test), so the Sobel-based mediation test must be interpreted with caution; future research is recommended to use a bootstrap or Monte Carlo approach for more robust indirect-effect confidence intervals. Second, this study uses monthly data for 2016–2025, so higher-frequency dynamics such as daily reactions to market shocks are not fully captured, and the linear model does not yet account for possible nonlinear relationships or regime shifts between crisis and non-crisis periods. Third, this study focuses on a single sharia stock index and does not include domestic macroeconomic variables such as the exchange rate, inflation, or the benchmark interest rate; the model therefore remains parsimonious and focuses solely on the global uncertainty–volatility–price deviation pathway, so generalizing the findings to other sharia indices or markets requires caution. Fourth, all series were taken from a secondary aggregator (Investing.com); although the underlying series originate from CBOE and the Indonesia Stock Exchange, replication with official exchange data is recommended.

Implications of the Findings for Asset Bubble Formation in the JII

Overall, the formation of asset bubble indicators, as represented by PDE_JII, cannot be simply explained by an increase in global market uncertainty; rather, the internal dynamics of the JII market are more relevant. These findings also impose limitations on the interpretation of the relationship between volatility and asset bubbles: high volatility cannot be directly treated as evidence of an asset bubble, since the results actually show a negative relationship between VOL_JII and PDE_JII. Indications of price deviation from equilibrium must therefore be distinguished from mere increases in price fluctuations.

From the perspective of the prohibition on gharar, these findings can be placed in the context of caution regarding uncertainty and ambiguity in market activities. However, the empirical results of this study do not indicate that the VIX is statistically a factor that directly or indirectly influences PDE_JII. Therefore, the perspective of the prohibition on gharar in this study is more appropriately used as a normative framework for understanding the importance of managing uncertainty and market behavioral anomalies,

rather than as a claim that the VIX empirically proves the occurrence of gharar or an asset bubble. This pattern confirms that the mechanism underlying JII price anomalies during the study period is more complex than a simple relationship between global uncertainty, volatility, and asset bubbles. While previous studies have documented the transmission of global uncertainty and volatility across equity markets (S. Y. Choi et al., 2024; Goswami et al., 2025), research on Islamic markets has also highlighted variations in shock transmission across market conditions (Fianto et al., 2026). The findings of this study extend this literature by showing that the relationship between global uncertainty and price deviation is not necessarily transmitted through JII volatility, despite the significant relationship between volatility and PDE_JII. Theoretically, these findings enrich the application of the reflexivity framework to the Islamic stock market by demonstrating that feedback mechanisms among variables cannot be assumed to operate uniformly across all markets, but may depend on the structural characteristics of the index under study.

For sharia capital market authorities, these findings suggest that risk mitigation policies should not rely solely on global uncertainty indicators such as the VIX but should also give adequate weight to domestic volatility and price deviation indicators as early warning signals. For investors, these results underscore the importance of monitoring the dynamics of the PDE_JII and its persistence over time, rather than merely reacting to movements in global uncertainty indices that may not be proportionally reflected in the domestic Islamic stock market.

Although the empirical setting is Indonesia, the framework is applicable to other Islamic capital markets, such as Malaysia, the Gulf Cooperation Council countries, and Turkey, where sharia-screened indices are also exposed to global risk indicators (Kazak et al., 2025; Salisu & Shaik, 2022). The distinction between volatility and price deviation, and the mediation design used here, can be replicated with local sharia indices so that regulators in different jurisdictions can test whether global uncertainty transmits through volatility or directly to price deviations. Because screening methodologies, market depth, and investor composition differ across (Abu-Alkheil et al., 2024; Alamgir & Cheng, 2023), replication should be treated as a comparative exercise rather than assuming that the Indonesian result generalizes (OJK, 2025).

CONCLUSION

This study concludes that global market uncertainty, as represented by the VIX, does not have a significant effect on the volatility of the Jakarta Islamic Index (VOL_JII) or on the Price Deviation from Equilibrium (PDE_JII), either directly (H1 and H3) or through the VOL_JII mediation pathway (H4). Conversely, VOL_JII was found to have a significant negative effect on PDE_JII (H2), indicating that increased volatility is actually associated with a narrowing of the JII's price deviation from its equilibrium. This finding suggests that the dynamics of asset bubble formation in the JII are better explained by internal mechanisms within the Indonesian sharia market rather than by the direct transmission of global market uncertainty. Consequently, Islamic capital market

authorities and investors need to pay closer attention to the dynamics of domestic JII volatility as an early indicator of price deviation risk, rather than relying solely on global uncertainty indicators such as the VIX. Further research is recommended to extend the observation period, incorporate domestic macroeconomic variables, and test the stability of these relationships under both crisis and non-crisis conditions.

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