http://dx.doi.org/10.30983/es.v10i1.11137

ISLAMIC ECONOMICS:
Journal of Economic Studies
e-ISSN: 2614-8129 p-ISSN: 2614-8137

ORIGINAL ARTICLE OPEN ACCES

EXPLOSIVE PRICE AND TAIL RISK IN ASEAN-5 ISLAMIC EQUITY MARKETS

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Article History :
Submission: March 20, 2026
Revision: May 29, 2026
Received: June 29, 2026
Published: June 30, 2026

Keyword :
Explosive Price;
Tail Risk;
Islamic Equity Markets;
Volatility;
Extreme Value Theory

Abstract

This study examines whether explosive prices are associated with extreme tail risk in Islamic equity markets across five ASEAN countries. Using the GSADF framework to identify explosive episodes and a GARCH–EVT approach to measure tail risk, it constructs a panel dataset covering Indonesia, Malaysia, the Philippines, Thailand, and Singapore over 2008–2025. The analysis evaluates four specifications: contemporaneous effects, forward-looking dynamics, post-collapse adjustments, and the frequency of extreme events. The results reveal no consistent relationship between explosive price dynamics and tail risk. The baseline model shows a small contemporaneous effect of approximately 9% of average monthly tail risk, but forward-looking specifications provide no predictive evidence, and post-collapse dynamics do not increase downside risk. Conditional volatility emerges as the dominant driver of tail risk, with substantially larger magnitudes. The findings also indicate strong cross-market heterogeneity, where more developed markets, such as Singapore, experience reductions in both the intensity and frequency of tail events during explosive episodes. These results are robust across alternative volatility specifications, including GJR-GARCH models. The evidence suggests a decoupling between price dynamics and risk formation. These findings have important implications for Islamic financial stability analysis and show that risk in Islamic financial markets is shaped more by volatility dynamics and market structure than by price behavior alone.

INTRODUCTION

Do explosive price dynamics in Islamic stock markets truly reflect an increase in extreme risk? Following Phillips et al. (2011), an explosive price episode is defined as a period in which asset prices exhibit explosive autoregressive behavior. Unlike a unit–root process, explosive dynamics imply that prices grow at an accelerating rate and may temporarily diverge from underlying fundamentals. This question is crucial in the context of Islamic economics, which holds that financial system stability, distributive justice, and the avoidance of excessive speculation are key normative principles. Understanding whether explosive price dynamics translate into extreme risk is important for both financial stability and Islamic finance. If explosive price movements significantly increase tail risk, they may serve as an early warning indicator of financial fragility. Conversely, if price explosiveness and tail risk are distinct phenomena, policymakers and investors should focus more on volatility dynamics than on price behavior alone when assessing systemic risk. Within this framework, explosive prices are often perceived as indicative of speculative behavior (Costa et al., 2017) that violates Sharia principles. However, whether explosive price dynamics empirically translate into increased extreme risk in Islamic stock markets remains a matter of debate.

This study tests the primary hypothesis that explosive price dynamics are highly dependent on market structure, thus being heterogeneous and not consistently increasing tail risk in Islamic stock markets. Related to the first hypothesis, this study proposes an additional hypothesis: that the formation of extreme risk is more determined by the dynamics of conditional volatility than by price movements themselves. The literature on explosive price detection using the Generalized Supremum Augmented Dickey–Fuller

(GSADF) method has advanced rapidly, enabling the identification of explosive episodes across various financial markets. While a growing number of studies extend this framework to examine related dimensions such as volatility dynamics and systemic risk (e.g., Ben Yaala & Henchiri, 2025; Călin et al., 2026), the evidence remains lacking a unified assessment of how explosive episodes translate into the distribution of extreme risk. On the other hand, the extreme risk literature based on Extreme Value Theory and GARCH consistently shows that the probability of extreme events is determined more by volatility dynamics than by price levels (Cao, 2022; Zhu et al., 2025). These two literatures create a significant analytical gap, especially in the context of Islamic markets, which have a different normative foundation.

From an Islamic economic perspective, this gap becomes even more important. The Islamic financial system is not designed to eliminate risk, but rather to distribute it equitably through risk–sharing mechanisms and linkages to real activity. In this framework, stability is defined not only as the absence of volatility but also as a condition where risk is not excessively concentrated in a particular portion of the return distribution. However, in practice, Islamic stock markets continue to operate in a modern market environment driven by expectations, liquidity, and complex price dynamics (Chaffai & Medhioub, 2018; Rizal & Damayanti, 2019). These conditions raise the possibility that the risk formation mechanism in Islamic markets still follows principles similar to those in conventional markets, particularly regarding the dominance of volatility in determining tail risk.

Based on this framework, this study develops a multi–frequency empirical strategy to explicitly test the relationship between explosive price dynamics and extreme risk. Explosive episodes are identified using GSADF on monthly price data, while tail risk is estimated from daily data using a combination of GARCH and Extreme Value Theory. This approach allows for a clear separation between medium–term price dynamics and high–frequency risk distribution, thereby enabling sharper identification of the risk formation mechanism. The analysis is conducted across four empirical dimensions: contemporaneous effects, forward–looking dynamics, post–collapse adjustment, and the frequency of extreme events. The dataset covers five Islamic stock markets in ASEAN–Indonesia, Malaysia, the Philippines, Thailand, and Singapore during the period 2008–2025, enabling a systematic exploration of cross–market heterogeneity.

Previous studies largely examine either explosive price behavior or tail risk separately. Studies employing GSADF mainly focus on identifying bubble episodes (Phillips et al., 2015; Li et al., 2021), whereas tail risk studies predominantly concentrate on volatility and extreme return distributions (Bollerslev et al., 2015; Cao, 2022). Consequently, the mechanism through which explosive price translate into extreme risk remains insufficiently understood. Furthermore, existing evidence is almost entirely derived from conventional financial markets, leaving the Islamic finance context largely unexplored. Our study addresses these limitations by integrating bubble detection and tail–risk estimation within a unified framework.

Empirical results indicate no consistent relationship between explosive price dynamics and tail risk. Although the baseline model suggests a positive contemporaneous effect, its magnitude is relatively small in economic terms. More importantly, the forward–looking specification finds no evidence that explosive episodes have any predictive power for future extreme risk. At the same time, post–collapse dynamics do not lead to increased tail risk. Instead, conditional volatility emerges as the primary determinant of extreme risk, with a much larger and more stable effect than price dynamics. Furthermore, this study documents significant cross–market heterogeneity. Explosive episodes are associated with decreases in the intensity and frequency of extreme events in Singapore. Conversely, the relationship between price explosiveness and risk tends to be weaker or even positive in Thailand.

Our findings have important implications for the ongoing debate regarding the relationship between bubble dynamics and financial fragility. First, our findings challenge studies that implicitly assume that explosive price behavior is a reliable precursor of financial instability. Previous evidence documents a positive association between price explosiveness and crash risk (Yang & Ferrer, 2023), our study shows that such a relationship is neither universal nor stable across alternative empirical specifications. Second, our results extend Andersen and Sornette (2004), who argue that bubble episodes may emerge with or without a corresponding increase in volatility. Consistent with this argument, we find that explosive price dynamics do not translate into tail risk. Instead, tail risk appears to be driven primarily by volatility dynamics rather than by price behavior itself.

Based on these findings, this study makes several key contributions. First, it bridges the gap between the explosive price detection and tail risk literature by integrating both approaches within a coherent empirical framework. Unlike previous studies that only identify the presence of bubbles, this study directly evaluates their implications for the distribution of extreme risk. Second, this study demonstrates a decoupling between price dynamics and risk formation. Third, in the context of Islamic economics, this study makes a more fundamental contribution by showing that the stability of Islamic markets is not solely determined by compliance with normative principles, but also by market volatility and structure.

LITERATURE REVIEW

Phillips et al. (2011, 2015) and Phillips and Shi (2020) develop methods based on recursive unit root tests, the Supremum Augmented Dickey–Fuller (SADF), and the Generalized Supremum ADF (GSADF) to detect price bubbles. The use of these methods grows rapidly and is widely applied in various disciplines, including the stock markets (Zhang et al., 2020; Potrykus, 2023), commodities (Huang & Xiong, 2020; Ozgur et al., 2021; Fang et al., 2023), housing (Zhang et al., 2024), cryptocurrencies (Li et al., 2021), and even the exchange rate markets (Khaliq et al., 2024). However, most studies in this tradition stop at the detection stage, without evaluating the implications of these episodes for extreme market risks.

The existence of price explosiveness in an asset does not automatically provide information about the distribution of risk faced by investors because the probability of extreme risk in that asset is more driven by volatility than the asset price itself (Bollerslev et al., 2015; Cao, 2022; Kaibuchi et al., 2022; Guo et al., 2026). Therefore, the puzzle of the relationship between price explosiveness and the likelihood of extreme risk remains unanswered. This study bridges the gap between price explosiveness and the potential for extreme risk by using four alternative models. This study relates to Andersen and Sornette (2004), who show that some bubble episodes are accompanied by increased volatility, while others are not. Therefore, the relationship between price dynamics and tail risk is heterogeneous and remains an open question in the literature. More specifically, this study goes beyond the work of Hudepohl et al. (2021) and Yang & Ferrer (2023), who demonstrate that price explosiveness is positively correlated with the risk of market crashes.

This unresolved relationship becomes particularly important when viewed from the perspective of Islamic finance, where speculative behavior is normatively constrained. The main principle of Islamic economics, or specifically the Islamic capital market, is the non–prohibition of riba (interest), gharar (excessive uncertainty), and maysir (speculation), while emphasizing the importance of risk−sharing and return−sharing mechanisms and limiting investment in unethical sectors (Alam et al., 2017). This principle leads to distinct characteristics between Islamic and conventional stock markets. In practice, these principles are reflected in a financial model based on asset ownership and real economic activity (asset−driven), as well as in sectoral screening that excludes industries that do not comply with Sharia principles. Investment in Islamic stock markets is more oriented toward the real sector than in conventional systems.

A consequence of this Islamic structure is that companies included in Islamic indices tend to have lower levels of leverage and receivables exposure, which, in theory, correlate with more manageable volatility and risk (Brahmana & Kontesa, 2024). However, in terms of investor behavior, there are fundamental similarities between Islamic and conventional markets, where investment decisions remain driven by the expectation of profit from rising stock prices (Rizal & Damayanti, 2019). Overall, Islamic finance does not aim to eliminate risk, but rather to manage it through a more balanced distribution mechanism linked to real assets. Unlike conventional systems, which tend to separate risk from the underlying asset, this approach demonstrates that the structural characteristics of Islamic finance can shape more efficient dynamics of market stability (Jabeen & Kausar, 2022).

In the context of Islamic finance, which has a distinct risk profile (Alhammadi et al., 2020), empirical evidence on the relationship between price dynamics and tail risk remains limited. Most studies on Islamic financial markets focus on performance (Al−Khazali et al., 2014), efficiency (Alam et al., 2016; Ali et al., 2018), or volatility (Ahmed & Farooq, 2018), without explicitly linking explosive price dynamics to the distribution of extreme risks. This gap motivates this study to compare how extreme risks react to price explosiveness. In addition, the heterogeneity of financial markets in the ASEAN region shows significant variations in terms of liquidity, market depth, and investor structure (Zhou et al., 2023; Goswami et al., 2025; Rahmadi et al., 2025), who motivate this study to examine five ASEAN countries, covering Indonesia, Malaysia, the Philippines, Thailand, and Singapore as case studies.

METHOD

Data

The research sample consists of five ASEAN Islamic stock indices: Thailand, Malaysia, Indonesia, the Philippines, and Singapore. Daily and monthly price data for each index are obtained from the London Stock Exchange Group (LSEG) Data and Analytics platform, which provides comprehensive, high−quality historical data worldwide. All indices used are based on the S&P Broad Market Index (BMI) Shariah, a series of Islamic indices developed by S&P Dow Jones Indices.

The selection of the S&P BMI Shariah Index is based on several methodological considerations. First, this index has broad market coverage, reflecting the entire Islamic stock market in each country, thereby reducing the selection bias that typically arises with sector− or capitalization−based indices. Second, the Islamic screening methodology is consistent across countries, enabling high comparability across markets. Third, it is available at high frequency (daily), which is important for GARCH−EVT−based volatility and tail estimation. Therefore, the use of the S&P BMI Shariah ensures that observed cross−country differences reflect market dynamics rather than differences in index definitions. For each country, the daily data are cleaned through several stages. First, trading dates are robustly parsed to accommodate the various calendar formats that may appear in the source files. Second, closing prices are converted to a numeric format by removing non−numeric separators. Third, invalid observations, missing values, and duplicate dates are removed. Fourth, the sample is restricted to the period from November

2008 to December 2025 to ensure cross-country consistency. Fifth, all data are sorted chronologically from oldest to most recent.

Empirical Design and Identification Strategy

This study analyzes whether episodes of explosiveness in Islamic stock markets across five ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) are associated with increased extreme risk at the tails of the return distributions. More specifically, this study investigates differences in conditional expectations of extreme risk across market regimes after controlling for risk persistence, volatility, and global risk conditions, through three research questions. First, are months classified as explosive correlated with higher tail risk in the same month? Second, do explosively volatile conditions predict tail risk in subsequent months? Third, does tail risk increase when the market exits an explosive regime?

Using a multifrequency empirical strategy, market regimes are identified from monthly prices using GSADF. Tail risk is then estimated from daily returns using a combination of the GARCH model and Extreme Value Theory (EVT). This approach is chosen because explosive behavior is a relatively persistent phenomenon and is better captured over medium time horizons. At the same time, tail risk occurs at high frequency and cannot be reliably measured from monthly returns alone.

Following Phillips et al. (2011), Phillips et al. (2015), and Pavlidis et al. (2016), this study begins by identifying explosive behavior using the GSADF method on monthly-level price data. The basic ADF specification can be written as:

$$\Delta s_t = \alpha_{r_1,r_2} + \beta_{r_1,r_2} s_{t-1} + \sum_{i=1}^{k} \gamma_{r_1,r_2}^{i} \Delta s_{t-i} + \epsilon_t \tag{1}$$

where s_t is the monthly price of the Shariah index for each of the five ASEAN countries, Δs_{t-i} denotes lagged first differences included to account for serial correlation, $\epsilon_t \sim \mathcal{N}\left(0, \sigma_{r_1,r_2}^2\right)$ is an error term assumed to be normally distributed, and α_{r_1,r_2}, β_{r_1,r_2}, and γ_{r_1,r_2}^{i} are parameters to be estimated. The subscripts r_1 and r_2 represent the proportions of the total sample size T used to determine the starting and ending points of each subsample period.

The null hypothesis is that the series contains a unit root, $H_0: \beta_{r_1,r_2} = 0$, whereas the alternative hypothesis states the presence of explosive behavior in the variable s_t, $H_1: \beta_{r_1,r_2} > 0$. The ADF test statistic used to test this hypothesis is given by:

$$\mathrm{ADF}_{r_1}^{r_2} = \hat{\beta}_{r_1,r_2} / \mathrm{SE}\left(\hat{\beta}_{r_1,r_2}\right) \tag{2}$$

Phillips et al. (2011) estimate equation (1) recursively to obtain a sequence of the ADF statistics, $ADF_0^{r_2}$. The supremum value of this series, known as the SADF statistic, is defined as follows:

$$SADF(r_0) = \sup_{r_2 \in [r_0,1]} \mathrm{ADF}_0^{r_2} \tag{3}$$

Furthermore, to allow greater flexibility in the choice of estimation window and thereby improve the power of the test, Phillips et al. (2015) propose the GSADF test, which can be written as follows:

$$GSADF(r_0) = \sup_{r_2 \in [r_0,1], r_1 \in [0, r_2 - r_0]} \mathrm{ADF}_{r_1}^{r_2} \tag{4}$$

The empirical implementation of the GSADF procedure follows Vasilopoulos et al. (2022) and uses the *exuber* package in R, which provides a computationally efficient framework for recursive right-tailed unit root testing and date-stamping of explosive episodes. In particular, the identification of explosive periods through the date−stamping procedure follows their approach, where the minimum episode duration is determined by the rule:

$$\text{min\_duration} = \log(T),$$

where T is the number of monthly observations, the final output is a dummy variable:

$$Exuber_{i,m} = \begin{cases} 1 & \text{if month } m \text{ is classified as explosive,} \\ 0 & \text{otherwise.} \end{cases}$$

To identify the impact of this explosive behavior on tail risk, this study uses four empirical models. These models are constructed from monthly variables combined across a panel of country−month pairs (i,m), including a tail−risk measure aggregated from daily data, an explosive−event dummy, and monthly average volatility. Tail risk is calculated using the GARCH−EVT approach, as described by McNeil and Frey (2000). This approach requires two stages. First, daily returns are calculated as:

$$r_t = ln(P_t) - ln(P_{t-1}) \tag{5}$$

where P_t is the daily closing price. The daily return is then modeled using GARCH(1,1):

$$r_t = \mu + \varepsilon_t, \quad \varepsilon_t = \sigma_t z_t \tag{6}$$

$$\sigma_t^2 = \omega + \alpha\varepsilon_t^2 + \beta\sigma_t^2 \tag{7}$$

where z_t is the standardized residual.

The second stage uses the Peaks−over−Threshold (POT) approach of EVT to model the tail distribution of the standardized residuals. Observations exceeding a certain threshold are modeled using the Generalized Pareto Distribution (GPD). From these estimates, daily tail risk measures, such as Value−at−Risk (VaR) and Expected Shortfall (ES), are obtained. Next, the tail risk measure is aggregated to a monthly frequency by taking the average (mean) as follows:

$$TailRisk_{i,m}^{mean} = \frac{1}{N_m}\sum_{t\in m} ES_t \tag{8}$$

The number of extreme events is also computed as a measure of frequency:

$$TailEventFreq_{i,m} = \sum_{t\in m} 1(r_t < VaR_t) \tag{9}$$

After constructing all variables, the relationship between explosive price dynamics and tail risk is analyzed using a two−way fixed−effects panel model estimated with the feols function in R (Bergй et al., 2026). The first specification is written as:

$$\begin{aligned} TailRisk_{i,m}^{mean} = {} & \alpha_i + \lambda_m + \beta_1 Exuber_{i,m} + \sum_k \beta_{2k}\left(Exuber_{i,m} \times D_{ik}\right) + \gamma Vol_{i,m} \\ & + \delta TailRisk_{i,m-1}^{mean} + \varepsilon_{i,m}, \end{aligned} \tag{10}$$

where α_i denotes country fixed effects, λ_m represents time fixed effects, $Exuber_{i,m}$ is a binary indicator equal to 1 when the period is classified as an explosive price episode and 0 otherwise, D_{ik} denotes country−specific dummy variables, and $Vol_{i,m}$ is the average monthly volatility. The main coefficient β_1 captures the effect of the explosive price on the reference category, while the interaction term with the country dummy captures cross−market heterogeneity. Substantively, these parameters represent the difference in conditional expectations of tail risk between explosive and non−explosive months, after controlling for global risk, volatility, and tail risk persistence. This study also employs a second model, namely forward−looking specification, to test whether explosive price predicts tail risk at one− and three−month horizons:

$$\begin{aligned} TailRisk_{i,m+h}^{mean} = {} & \alpha_i + \lambda_m + \beta_1 Exuber_{i,m} + \sum_k \beta_{2k}\left(Exuber_{i,m} \times D_{ik}\right) + \gamma Vol_{i,m} \\ & + \delta TailRisk_{i,m-1}^{mean} + \varepsilon_{i,m}, \quad h \in \{1,3\} \end{aligned} \tag{11}$$

where β_1 and β_{2k} are the parameters that measure whether the current explosive regime is associated with increased extreme risk at future horizons. The third model replaces the regime variable with a collapse indicator. This model tests whether tail risk increases when the market exits the explosive price regime, that is, when the explosive episode ends.

$$TailRisk_{i,m}^{mean} = \alpha_i + \lambda_m + \beta_1 Collapse_{i,m} + \sum_k \beta_{2k} \left(Collapse_{i,m} \times D_{ik}\right) + \gamma Vol_{i,m} + \delta TailRisk_{i,m-1}^{mean} + \varepsilon_{i,m}, \tag{12}$$

where $Collapse_{i,m} = \mathbf{1}(Exuber_{i,m-1} = 1 \ \wedge \ Exuber_{i,m} = 0)$ captures the transition out of the explosive regime. The fourth model uses the frequency of extreme events as the dependent variable. This specification tests whether the explosive regime is also associated with more frequent extreme events per month.

$$TailEventFreq_{i,m} = \beta_0 + \beta_1 Exuber_{i,m} + \sum_k \beta_{2k} \left(Exuber_{i,m} \times D_{ik}\right) + \gamma Vol_{i,m} + \delta TailEventFreq_{i,m-1} + \theta VIX_m + \alpha_i + \varepsilon_{i,m}. \tag{13}$$

RESULTS AND DISCUSSION

Results

Descriptive Statistics

Table 1 presents the descriptive statistics of the variables used in the analysis. The average monthly tail risk is 0.0013, with a median of 0.0009 and a maximum of 0.0198, indicating that extreme downside risk is generally low but occasionally spikes during periods of market stress. The mean exceeding the median suggests a right−skewed distribution, which is consistent with the presence of infrequent but severe tail events commonly observed in financial markets. The explosive price indicator (*Exuber*) has a mean of 0.0282 and a median of 0, suggesting that episodes of price explosiveness are relatively rare during the sample period. This pattern is expected because explosive price behavior represents exceptional market conditions rather than normal market dynamics. The standard deviation of 0.1655 and the binary nature of the variable further indicate substantial variation across countries and periods in the occurrence of explosive episodes.

Conditional volatility (*GarchVol*) has an average of 0.0113 and a relatively small standard deviation of 0.0039, suggesting moderate variation in market volatility across the sample. The maximum volatility of 0.0377, however, indicates several periods characterized by heightened market uncertainty. Since volatility is widely recognized as a key determinant of tail risk, this variation provides sufficient information to identify its role in empirical models. The collapse indicator (*Collapse*) has a mean of 0.0049 and a median of 0, indicating that post−collapse episodes occur infrequently, consistent with the episodic nature of bubble corrections.

Table 1. Descriptive Statistics of the Main Variables

Variable	Mean	Median	SD	Min	Max	N
TailRisk	0.0013	0.0009	0.0018	0.0000	0.0198	1030
Exuber	0.0282	0.0000	0.1655	0.0000	1.0000	1030
GarchVol	0.0113	0.0109	0.0039	0.0055	0.0377	1030
Collapse	0.0049	0.0000	0.0697	0.0000	1.0000	1025

Source: Author's Estimates

Identification of Explosive Price Episodes

Table 2 reports GSADF test results, which indicate pronounced heterogeneity in the presence of explosive price episodes in ASEAN Islamic equity markets. Specifically, Thailand and Singapore are the two markets that consistently reject the null hypothesis of a unit root on the right side of the distribution. For Thailand, the GSADF statistic of 2.48 exceeds the 10% critical value and approaches the 5% critical value, while Singapore shows a GSADF of 2.91, clearly exceeding the 1% critical value. The Philippines shows weaker, marginal evidence of explosive price, with a GSADF of 1.98, only slightly above the 10% threshold but still below the 5% critical value. Conversely, Malaysia and Indonesia show no evidence of explosive prices. Their respective GSADF values of 1.17 and 0.91 are well below all critical values, providing no statistical basis for rejecting the null hypothesis.

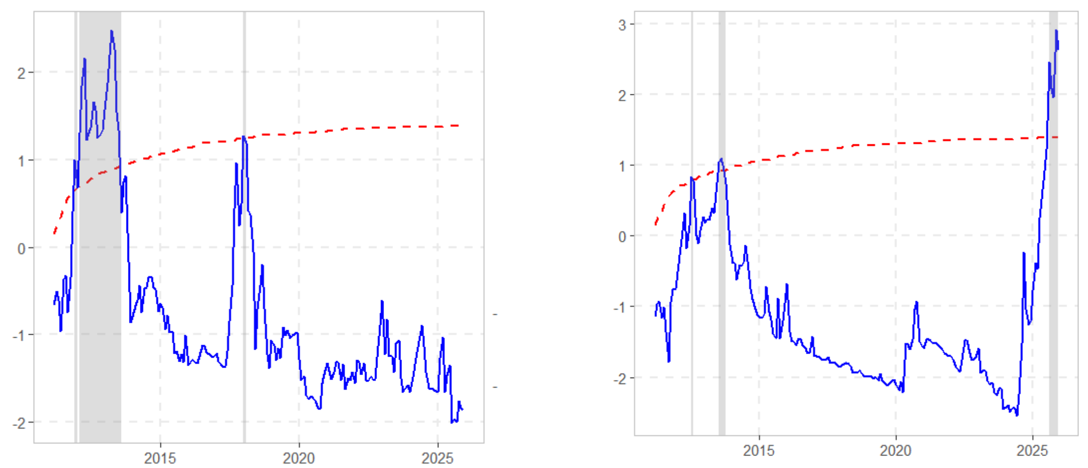
Table 2. GSADF – Based Identification of Explosive Price Episodes

Country	GSADF	CV (95%)	Decision	Episode	Duration
Thailand	2.48	2.13	Reject (5%)	Feb 2012 – Aug 2013	18 months
Malaysia	1.17	2.13	Not Reject	–	–
Indonesia	0.91	2.13	Not Reject	–	–
Philippines	1.98	2.13	Reject (10%)	–	–
Singapore	2.91	2.13	Reject (1%)	Aug 2025 – Dec 2025	5 months

Source: Author's Estimates

Note: The Decision column is based on a comparison between the GSADF value and the critical value, and is confirmed using the GSADF diagnostic procedure. The notations "Reject (1%)," "Reject (5%)," and "Reject (10%)" indicate the highest significance level at which the null hypothesis of a unit root can be rejected. All estimations were performed using a fixed lag length (lag = 1) and a minimum window size of 27 observations, in accordance with the sample size – based rule of thumb.

Following the identification of explosive price episodes, we examine their timing and duration as shown in Figure 1. In Thailand, a single major episode is identified, lasting approximately 18 months from February 2012 to August 2013. This episode is relatively long and features a sustained expansion phase that peaked in April 2013. There are no additional episodes outside this period, so the explosive price episode in Thailand is concentrated in a single, distinct phase at the beginning of the observation period. In contrast, in Singapore, this episode is shorter and occurs towards the end of the observation period, and is classified as ongoing.



(a) Thailand (b) Singapore

Figure 1. Identified Episodes of Explosive Behavior in Islamic Equity Markets

Explosive Price and Islamic Stock Market Tail Risk

Before proceeding to the econometric analysis, it is important first to establish the basic differences in market structure across countries. Table 3 presents descriptive statistics highlighting significant cross−market heterogeneity in terms of liquidity, volatility, and tail risk. Using inverse volatility as a proxy for market depth, Malaysia recorded the highest liquidity at 114.95, followed by Singapore at 105.79, suggesting relatively deeper market conditions. In contrast, Indonesia and the Philippines recorded liquidity levels of only 73.60 and 79.34, respectively, indicating lower liquidity. Interestingly, Thailand exhibited the highest frequency of explosive episodes at 0.0971, despite its medium liquidity level at 80.83. Furthermore, Singapore exhibited high liquidity and a relatively low tail risk level of 0.0011, indicating the presence of a liquidity−absorption mechanism. Conversely, markets with lower liquidity, such as Indonesia, exhibited a higher tail risk level at 0.0015. Based on this pattern, the next analysis formally tests whether the effect of price explosiveness on tail risk is conditional on market structure.

Table 3. Market Structure and Risk Characteristics across ASEAN Islamic Equity Markets

Market	Mean Explosive Price	Mean Tail Risk	Mean Tail Max	Mean Tail Freq	Mean Volatility	Inverse Volatility
Indonesia	0.0000	0.0015	0.0216	0.0501	0.0136	73.6049
Malaysia	0.0000	0.0009	0.0130	0.0500	0.0087	114.9461
The Philippines	0.0000	0.0014	0.0202	0.0500	0.0126	79.3405
Singapore	0.0437	0.0011	0.0147	0.0502	0.0095	105.7872
Thailand	0.0971	0.0014	0.0185	0.0501	0.0124	80.8272

Source: Author's Estimate

Note: Inverse volatility is defined as the inverse of average monthly volatility and is used as a proxy for liquidity and market depth. In theory, deeper and more liquid markets have lower volatility. Tail Risk refers to the average expected shortfall, while Tail Max and Tail Frequency reflect the maximum intensity and frequency of extreme events, respectively.

Table 4 reports the baseline specification based on two−way fixed effects. The relationship between explosive price movements and tail risk exhibits a pattern that is both statistically significant and economically limited, and is highly dependent on market structure. For example, the $Exuber$ coefficient of 0.0001 (standard error 0.0000) indicates that explosive price episodes are associated with a relatively small increase in tail risk, amounting to 9% of Thailand's average monthly tail risk of 0.0014. This magnitude suggests that, despite the positive association, explosive prices do not lead to large−scale amplification of extreme risk. In other words, price explosiveness is not inherently associated with increased fragility of the return distribution. However, this interpretation changes fundamentally when cross−market heterogeneity is taken into account. In Singapore, the $Exuber \times Singapore$ interaction term of -0.0008 (standard error 0.0002) yields a total effect of approximately -0.0007, equivalent to a reduction in tail risk of approximately 64%.

The Vol coefficient of 0.2059 ($p < 0.01$) indicates that a one percentage point increase in volatility increases tail risk by approximately 0.0021, which is one order of magnitude greater than the explosive prices effect. Meanwhile, the effect of the previous tail risk value of −0.1283 indicates mean reversion, with the spike in tail risk being temporary and followed by partial normalization. These two findings confirm that tail risk dynamics are more consistent with the volatility and extreme risk literature than with the explosive price.

When the analysis is extended to the forward−looking dimension, the results further clarify the separation between price explosiveness and risk formation. Over a one−month horizon, the *Exuber* coefficient of 0.0002 (standard error 0.0003) provides no evidence of a systematic relationship with future tail risk. The small magnitude and instability of the estimate suggest that explosive prices provide no predictive information about extreme risk. This pattern remains consistent over a three−month horizon, with a coefficient of 0.0003 (standard error 0.0003), which again does not indicate a stable empirical relationship.

Analysis of post−collapse dynamics offers a more important result. The effect of the end of the explosive episode of −0.0004 (standard error 0.0004) does not indicate an increase in tail risk. In fact, the negative direction of the coefficient suggests that the end of the explosive price episode is not correlated with increased risk, but rather with a change that is statistically indistinguishable from zero. The absence of a differential effect in Singapore—with an interaction term of 0.0002—suggests that the post−explosive adjustment phase does not produce the same cross−market heterogeneity as the explosive price phase.

The frequency dimension of extreme events provides an additional perspective that strengthens this conclusion. The *Exuber* coefficient of 0.1607 (standard error 0.2408) does not indicate a systematic increase in the number of extreme events in Thailand. However, heterogeneity again emerges as a key factor. The $Exuber \times Singapore$ interaction of −0.7037 (standard error = 0.3576) indicates that the explosive price episode in Singapore is correlated with a decrease in the frequency of extreme events of approximately 0.70 events per month, resulting in a total effect of approximately −0.543 events. This magnitude is economically significant and consistent with the results on the severity dimension, which show that both the intensity and frequency of tail events decrease during periods of price explosiveness in more developed markets.

Table 4. Explosive Behavior and Tail Risk Dynamics in ASEAN Islamic Equity Markets

Explanatory Variables	**baseline**	**Forward looking**		**Collapse Dynamic**	**Frequency**
		h=1	h=3		
Exuber	0.0001*	0.0002	0.0003		0.1607
	(0.0000)	(0.0003)	(0.0003)		(0.2408)
Collapse				−0.0004	
				(0.0004)	
Exuber Ч Singapore	−0.0008*	−0.0007	−0.0006	−0.0002	−0.7037
	(0.0004)	(0.0004)	(0.0005)	(0.0004)	(0.3576)
Vol	0.2006**	0.0043	0.0341	0.2058**	32.8845*
	(0.0300)	(0.0252)	(0.0235)	(0.0474)	(19.9667)
Lag of TailRisk	−0.1283**	0.0104	−0.0059	−0.1243**	−0.0573*
	(0.0381)	(0.0412)	(0.0349)	(0.0498)	(0.0348)
Observations	1025	1020	1010	1025	1025
R^2	0.62	0.57	0.58	0.62	0.05

Source: Author's Estimation

Note: This table reports panel regression estimates examining the relationship between explosive price behavior and tail risk dynamics across ASEAN Islamic equity markets. Four model specifications are presented: (i) Baseline, which captures contemporaneous effects of exuberance on tail risk; (ii) Forward−looking models (h = 1 and h = 3), which assess whether exuberance predicts future tail risk at one− and three−month horizons; (iii) Collapse dynamics, which evaluates whether tail risk changes following the termination of an explosive episode; and (iv) Frequency model, which examines the effect of exuberance on the occurrence of extreme events rather than their magnitude. Standard errors are reported in parentheses. * and ** denote statistical significance at the 5% and 1% levels, respectively.

Robustness test

To ensure robustness, this study replaces the standard GARCH specification with the GJR−GARCH model to capture possible asymmetry in returns. Table 5 reports the robustness result based on the GJR−GARCH model, which shows that the main finding remains robust. This is important because GJR−GARCH allows negative shocks to have a different impact on volatility than positive shocks, making it more suitable for stock markets that generally exhibit a leverage effect. These robustness results strengthen the argument that the relationship between explosive price dynamics and tail risk is consistent across volatility specifications.

In the baseline specification, the $Exuber$ coefficient is 0.0002 and is significant at the 5% level, indicating that in the reference market, explosive price episodes remain correlated with contemporaneous increases in tail risk. However, the magnitude remains economically small. Compared with the generally low monthly tail risk levels, this effect remains limited. More importantly, the cross−market heterogeneity emerges: the $Exuber \times Singapore$ interaction term is -0.0010 and significant, indicating a negative total effect in Singapore. This implies that, relative to the reference market, explosive episodes in Singapore are actually correlated with a larger reduction in tail risk than in the previous standard GARCH specification. Sparingly, the introduction of volatility asymmetry does not invalidate the main result; rather, it emphasizes that the relationship between price explosiveness and risk is highly dependent on market structure.

In the forward−looking model with h $=$ 1, the leading coefficient, $Exuber = 0.0003$, still shows little predictive power, but the interaction term, $Exuber \times Singapore = -0.0008$, is significant at the 5% level. This means that over a one−month horizon, the heterogeneity pattern persists: Singapore exhibits a trend opposite to the reference market. However, at horizon h $=$ 3, neither the leading coefficient (0.0003) nor the interaction term ($-$ 0.0006) is stronger, confirming that the predictive value of explosive price dynamics for tail risk is weak and fades quickly.

In the collapse model, the coefficient of $Collapse = -0.0003$ remains small and does not indicate a spike in tail risk after an explosive episode. This is consistent with the main finding that exit from exuberance is not a central mechanism in the formation of extreme risk. Meanwhile, in the frequency model, the main coefficient for $Exuber$ is 0.0117, which is nearly zero, whereas the interaction term $Exuber \times Singapore$ is -0.0413 and is significant at the 1% level. Although the scale differs from the severity model, the direction is consistent: in Singapore, explosive episodes are correlated with a lower frequency of extreme events.

Consistent with the main result, the Vol variable remains the most stable determinant in both the baseline and collapse models, with a coefficient of 0.2696 in both specifications and significant at the 1% level. This is larger than the previous standard GARCH result, indicating that after accounting for volatility asymmetry, volatility's role in explaining tail risk is strengthened. This robustness reinforces the main conclusion: explosive price dynamics do not systematically translate into tail risk. The primary determinant remains the volatility dynamics, while market heterogeneity especially Singapore versus the reference market is key to empirical interpretation.

Table 5. Robustness Check of Explosive Behavior and Tail Risk Dynamics in ASEAN Islamic Equity Markets

Explanatory Variables	baseline	Forward looking		Collapse Dynamic	Frequency
		h=1	h=3		
Exuber	0.0002*	0.0003	0.0003		0.0117
	(0.0000)	(0.0002)	(0.0002)		(0.2408)
Collapse				−0.0003	
				(0.0004)	
Exuber Ч Singapore	−0.0010*	−0.0008*	−0.0006	−0.0002	−0.0413**
	(0.0002)	(0.0004)	(0.00054)	(0.0005)	(0.3576)
GarchVol_mean	0.2696**	0.0069	0.0265	0.2696**	2.9373**
	(0.0304)	(0.0244)	(0.0204)	(0.0434)	(8.6970)
TailRisk_mean_lag1	−0.1835**	−0.0112	−0.0211	−0.1777**	−0.0854*
	(0.0461)	(0.0419)	(0.0360)	(0.0515)	(0.0341)
Observations	1025	1020	1010	1025	1025
R^2	0.66	0.58	0.59	0.66	0.31

Source: Author's Estimation

Note: This table reports robustness estimates using a GJR−GARCH specification to account for asymmetric volatility. Standard errors are in parentheses, ** denote significance at 5% and 1%.

Discussions

This study confirms that not all countries experience explosive price episodes in Islamic capital markets across the five ASEAN countries, with only Singapore and Thailand showing statistically significant results. More specifically, the implications of these explosive episodes for extreme risk do not establish an empirically consistent relationship. In the baseline model, explosive price episodes are only weakly associated with average monthly tail risk, at about 9%. Other specifications, however, do not show a significant impact. This finding differs from Hudepohl et al. (2021) and Yang & Ferrer (2023), who link price explosiveness to an increased risk of crashes. Consistent with the tail risk literature, which emphasizes volatility's dominant role relative to price dynamics, this study's findings indicate that volatility has a significantly greater influence on tail risk than price explosiveness. A significant impact of volatility is observed in all specifications. This finding also confirms the argument of Bollerslev et al. (2015) and Cao (2022), who find that the distribution of extreme risks is determined more by volatility dynamics than by price trends. However, an equally important finding of this study is the strong cross−market heterogeneity. The interaction coefficient between $Exuber \times Singapore$ across all model specifications consistently differs from the explosive price effect in Thailand, the reference category.

From the perspective of Extreme Value Theory (EVT), our findings are theoretically consistent with the notion that extreme losses emerge from the behavior of the tail distribution rather than from price movements themselves. EVT focuses on the probability and severity of rare events that arise when volatility clusters and return distributions become fat−tailed. Consequently, an explosive increase in asset prices does not necessarily imply a corresponding increase in tail risk unless it is accompanied by a substantial change in the volatility process. The absence of a systematic relationship between explosive price dynamics and tail risk across our four empirical specifications suggests that price exuberance and risk formation are distinct processes.

The inconsistent relationship between explosive prices and tail risk, and the significance of volatility, indicate that explosive price dynamics cannot serve as a sole indicator of the fragility of Islamic financial markets. The results of this study provide a deeper nuance: stability is determined not only by adherence to Sharia principles, but also by how risk is generated and distributed through market mechanisms. Furthermore, the dominance of volatility as the primary determinant of tail risk indicates that the development of Islamic financial markets in ASEAN must place greater emphasis on strengthening risk management mechanisms, rather than solely controlling price dynamics. This aligns with the extreme risk literature, which emphasizes that the distribution of returns—particularly in the tails—is determined by the dynamics of conditional variance rather than the price level itself (Zhu et al., 2025). Our findings can also be interpreted within the framework of Islamic finance theory. Islamic equity markets operate under Sharia screening mechanisms that restrict excessive leverage, interest−based activities, and investments in non−permissible sectors. As a result, firms included in Islamic indices generally exhibit lower financial leverage than conventional firms. The transmission of speculative behavior into extreme risk may be partially mitigated by the structural characteristics imposed by Sharia−compliant screening.

Furthermore, the findings regarding cross−market heterogeneity have crucial implications for the development strategy of Islamic financial markets in ASEAN. The sharp differences among the five countries, particularly between Thailand and Singapore, suggest that market structure plays a crucial role in determining how price dynamics translate into risk. In a market like Singapore, which boasts high liquidity (see Table 3), exuberance actually correlates with reduced tail risk, both in terms of the intensity and frequency of extreme events. This indicates that in more mature markets, rapid price dynamics do not necessarily reflect destabilizing speculative behavior. Conversely, in a relatively shallow market like Thailand, price explosiveness remains correlated with increased risk, albeit to a limited extent. This difference suggests that the development of Islamic financial markets cannot be approached uniformly across ASEAN countries.

The policy implications of these findings are also quite profound. The results of this study indicate that, in the context of Islamic markets, regulators cannot simply monitor the price dynamics of Islamic stocks; they must also develop monitoring systems based on volatility and tail risk, such as expected shortfall or other measures of extreme risk. Furthermore, this study's results make an important contribution to understanding how Islamic principles interact with modern market dynamics. However, the findings of this study indicate that while these principles can influence market structure, they do not automatically eliminate extreme risk. Instead, risk persists through the volatility mechanism, which is universal across both conventional and Islamic financial systems.

CONCLUSION

This study examines whether explosive price dynamics are consistently associated with tail risk in Islamic stock markets in the ASEAN region. Driven by the gap between the explosive price detection literature and the tail risk literature, this study integrates the GSADF framework with the GARCH−EVT approach to provide a unified empirical evaluation. Using panel data from five ASEAN Islamic stock markets over the period 2008−2025, this analysis evaluates four empirical specifications: contemporaneous effects, forward dynamics, post−collapse adjustment, and the frequency of extreme events.

Empirical findings consistently show that explosive price dynamics are not consistently associated with tail risk. Although there is a small contemporaneous effect in the baseline model, its economic magnitude remains limited. The forward−looking specification provides no evidence that explosive price episodes can predict future tail risk (1 to 3 months ahead), and post−collapse dynamics do not lead to an increase in extreme downside risk. Across all models, conditional volatility emerges as the dominant determinant of tail risk, with a significantly larger and more stable influence than explosive price dynamics. These results remain robust when accounting for volatility asymmetry using the GJR−GARCH specification.

The main contribution of this study lies in documenting strong cross-market heterogeneity. In more developed markets like Singapore, explosive price dynamics are correlated with a decrease in both the intensity and frequency of extreme risks. In contrast, in other markets the relationship is weaker and, in some cases, even positive. This finding underscores the important role of market structure, liquidity, and institutional depth in determining how price dynamics are transmitted into risk. From a policy perspective, these results suggest that monitoring price movements alone is insufficient to assess financial fragility in Islamic markets. Instead, greater attention needs to be paid to volatility dynamics and tail risk measurement. More broadly, these findings imply that explosive price behavior does not necessarily reflect financial instability and demonstrate that volatility dynamics and return distribution determine risk formation in Islamic financial markets.

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