

Realized Volatility Jumps and Foreign Flow Spillover in the Indonesia Stock Exchange: High-Frequency Evidence from IHSG Intraday Data 2025-2026

Erman Denny Arfinto^{1*} & Harjum Muharam²

^{1,2}Faculty of Economics and Business, Universitas Diponegoro, Semarang, Indonesia

Email: e.d.arfinto@live.undip.ac.id

Abstract

This study decomposes the intraday realized volatility of the Jakarta Composite Index (IHSG) into continuous and discontinuous jump components using the Barndorff-Nielsen and Shephard (2004, 2006) bipower variation methodology. Using 5-minute IHSG intraday bars across 93 trading days from 30 December 2025 to 29 May 2026 (total 5,838 observations), we estimate daily realized variance, bipower variation, and the BNS jump test statistic. We document four central findings. First, the jump component accounts on average for 11.77 percent of daily realized variance, with 30 of 93 trading days (32.3 percent) exhibiting statistically significant discontinuous price changes at the 5 percent significance level. Second, the average annualized realized volatility is 16.40 percent, with the cross-day standard deviation indicating substantial regime variation. Third, the jump-day rate amplifies sharply on stress days defined as the top decile of absolute daily returns: jump rate rises from 30.1 percent on normal days to 50.0 percent on stress days (a 19.9 percentage-point amplification), and the jump variance share rises from 11.21 percent on normal days to 16.36 percent on stress days. Fourth, the jump-volume conditioning is essentially absent: jump rate is 32.5 percent on normal-volume days against 30.0 percent on high-volume (top decile) days, indicating that the jump pattern is driven by price-direction shocks rather than by trading-volume bursts. We interpret these findings as evidence that foreign-flow shocks in the Indonesia Stock Exchange manifest as discontinuous intraday jumps rather than continuous diffusion, with direct implications for option pricing, intraday risk management, and the macroprudential monitoring of equity-market liquidity stress. The methodological framework we develop using BNS bipower variation extends directly to firm-level intraday data when such data become available through Bloomberg Terminal extension.

Keywords: realized volatility, bipower variation, intraday jumps, foreign flow spillover, Indonesia Stock Exchange, high-frequency data, emerging markets

1. Introduction

The decomposition of asset-price volatility into continuous diffusion and discontinuous jumps is one of the most important methodological advances in modern empirical asset pricing. The framework of Andersen, Bollerslev, Diebold, and Labys (2003) established the foundational framework for realized volatility (RV) estimation from intraday returns, while Barndorff-Nielsen and Shephard (2004, 2006) introduced the bipower variation (BV) estimator that consistently estimates the continuous component of variance even in the presence of jumps. The difference between RV and BV, properly scaled, provides a direct measure of the jump component and a formal test of the null hypothesis of no jumps. The framework has been applied extensively to developed-market equity indices, currencies, and bonds, with the

literature documenting that jumps account for 5 to 15 percent of daily realized variance and are concentrated during periods of macroeconomic news arrival and institutional flow shocks (Andersen, Bollerslev, and Diebold 2007; Lee and Mykland 2008; Hasbrouck 2024).

Emerging markets have received substantially less attention in the BNS jump literature, despite the theoretical interest of these markets as natural laboratories for studying the channel through which capital-flow shocks transmit to intraday volatility. The Indonesia Stock Exchange (IDX) is a particularly informative setting because of three structural features: foreign portfolio investors hold approximately 41 percent of free-float market capitalization, foreign-flow shocks are persistent and predictable across trading days (Aulia and Yuwono 2022; Hu, Liu, and Mao 2024), and severe limits to arbitrage prevent immediate corrective trading that would smooth the response of intraday prices. The combination of these features predicts that foreign-flow shocks should manifest as discontinuous intraday jumps rather than as continuous diffusion, with the jump component of daily realized variance providing a natural measure of the foreign-flow channel intensity.

This paper provides the first systematic BNS bipower-variation analysis of IHSG intraday volatility. Using 5,838 5-minute intraday bars across 93 trading days from 30 December 2025 to 29 May 2026, we estimate daily RV, BV, the jump variance component, and the BNS jump test statistic. We then test for stress amplification by comparing the jump rate and jump variance share across regime cuts on daily absolute returns and daily trading volume. The findings deliver four central conclusions that establish the empirical relevance of the BNS framework for IDX and provide a methodological template for future intraday-level firm-level extensions.

First, the jump component accounts on average for 11.77 percent of daily realized variance, with 30 of 93 trading days (32.3 percent) exhibiting statistically significant jumps at the 5 percent level. The average annualized realized volatility is 16.40 percent. Second, the jump-day rate amplifies sharply on stress days defined as the top decile of absolute daily returns, from 30.1 percent on normal days to 50.0 percent on stress days (a 19.9 percentage-point amplification). The jump variance share also rises from 11.21 to 16.36 percent across the same regime cut. Third, the jump-volume conditioning is essentially absent, indicating that the jump pattern is driven by price-direction shocks rather than by trading-volume bursts. Fourth, the results have direct implications for option pricing, intraday risk management, and the macroprudential monitoring of equity-market liquidity stress in Indonesia.

The paper makes three contributions. First, to the realized volatility and jump literature it provides the first systematic Indonesian BNS bipower-variation analysis, complementing the extensive developed-market evidence with emerging-Asia data. Second, to the foreign-flow spillover literature it documents that the jump-volatility channel is amplified during absolute-return stress regimes, providing indirect evidence for the foreign-flow transmission mechanism. Third, to regulatory and risk-management practice it offers calibrated jump-rate and jump-variance estimates that should inform Indonesian option pricing models, intraday value-at-risk (VaR) computations, and equity-market liquidity stress monitoring. The remainder of the paper develops these results. The Literature Review describes the BNS framework and places our

contribution within the cross-country emerging-market literature. The Methods section lays out the data, BNS estimator construction, and empirical specifications. The Results and Discussion section reports the principal jump-decomposition and stress-amplification findings. The Conclusion summarizes implications and sketches the firm-level intraday extension.

2. Literature Review

The realized volatility framework was established by Andersen, Bollerslev, Diebold, and Labys (2003) and Andersen and Bollerslev (1998), who showed that the sum of squared high-frequency returns converges to the integrated variance of the underlying continuous-time price process as the sampling frequency increases. The framework assumed continuous price paths, with jumps treated as nuisance variation that biases the RV estimator. Barndorff-Nielsen and Shephard (2004, 2006) introduced the bipower variation (BV) estimator as a robust alternative to RV that consistently estimates the continuous component of integrated variance even when jumps are present in the price path. The BV estimator is constructed as the scaled sum of cross-products of absolute consecutive returns, with the scaling factor ($\pi/2$) ensuring consistency with the continuous quadratic variation under standard regularity conditions.

The difference between RV and BV, properly normalized, provides a direct measure of the jump component and a formal hypothesis test for the presence of jumps. Andersen, Bollerslev, and Diebold (2007) provide the canonical application to S&P 500 futures and document that jumps account for approximately 7 to 12 percent of daily realized variance on average, with the share rising to 20 to 30 percent on days with significant macroeconomic news. Lee and Mykland (2008) develop a refined intraday jump detection methodology that exploits the rolling-window structure of the BNS estimator. Recent contributions by Hasbrouck (2024), Goyenko, Pastor, and Stambaugh (2024), and Hendershott, Riordan, and Tomio (2024) extend the realized-volatility framework to high-frequency intraday liquidity factors and trade frequency analysis.

Emerging-market applications of the BNS framework are relatively few. Chen, Wei, and Xu (2024) apply the framework to Chinese A-shares and document jump variance shares of approximately 14 to 18 percent, higher than developed-market benchmarks. Pang and Yao (2025) provide cross-country evidence on intraday liquidity factors in emerging Asia with implicit jump-component analysis. Jiang, Tao, and Yao (2024) link the foreign-investor concentration channel to cross-sectional return predictability with attention to jump dynamics. The Indonesian context has not been systematically analyzed using the BNS framework, with prior Indonesian volatility research focused on lower-frequency aggregates (Wijaya, Kosasih, and Bangun 2020; Sahari and Effendi 2019) or on factor-pricing implications (Aulia and Yuwono 2022).

The foreign-flow spillover hypothesis provides the theoretical motivation for our analysis. The Karolyi, Lee, and van Dijk (2012) cross-country framework establishes that emerging-market liquidity commonality is driven by foreign-investor presence, with the commonality intensifying during stress events. Karolyi and Stulz (1996), Bekaert and Harvey (2000), and Choe, Kho, and Stulz (1999) provide the foundational evidence on foreign-flow dynamics in emerging Asia. Recent contributions by Jiang, Kim, and Verdier (2024) and Soemarsono and

Wibisono (2024) extend this framework with attention to the discrete event-window structure of foreign-flow shocks. The combination of high foreign-investor presence in IDX (41 percent free-float ownership) and limited domestic arbitrage capacity predicts that foreign-flow shocks should transmit to intraday volatility primarily through discontinuous jumps rather than continuous diffusion. The BNS framework provides the natural empirical methodology for testing this prediction.

Based on the literature review, we test two hypotheses. H1: A statistically significant share of daily IHSX intraday variance is attributable to discontinuous jumps, with the share consistent with developed-market and other emerging-market benchmarks of 5 to 15 percent. H2: The jump-day rate and jump variance share amplify on stress days defined by extreme absolute daily returns, with the stress amplification reflecting the foreign-flow channel through which capital-flow shocks transmit to intraday volatility as discontinuous jumps.

3. Research Method

Our primary data source is Bloomberg IHSX (Jakarta Composite Index) intraday 5-minute bars accessed through the Bloomberg Laboratory at the Faculty of Economics and Business, Universitas Diponegoro. The sample comprises 5,838 5-minute bars across 93 trading days from 30 December 2025 to 29 May 2026. Each bar contains the open, high, low, close prices, the net change, the tick count, and the Bloomberg-reported volume for the interval. We restrict the analysis to bars within the two trading sessions: session one 09:00 to 11:30 Western Indonesia Time (31 bars per day) and session two 13:30 to 15:00 WIB (19 bars per day), for a maximum of 50 intraday bars per day. We compute 5-minute log returns as the log change in closing price between consecutive bars.

We follow Barndorff-Nielsen and Shephard (2004, 2006) for the bipower variation and jump test construction. For each trading day t with M intraday observations $r_1, r_2, \dots, r_M$, we compute:

$$RV_t = \sum_{i=1}^M r_i^2 \quad (1)$$

$$BV_t = (\pi/2) \cdot \sum_{i=2}^M |r_i| \cdot |r_{i-1}| \quad (2)$$

$$Jump_t = \max(RV_t - BV_t, 0) \quad (3)$$

The BNS Z-statistic for the test of the null of no jumps is constructed as the standardized difference between RV_t and BV_t , with the standard error derived from the tripower quarticity (TQ) estimator. The Z-statistic is asymptotically normal under the null:

$$Z_{BNS} = \sqrt{M} \cdot (RV_t - BV_t) / \sqrt{(\theta \cdot TQ_t)} \quad (4)$$

where $\theta = (\pi^2/4) + \pi - 5 \approx 0.6090$ is the BNS variance-correction constant and TQ_t is the tripower quarticity. We classify a day as a jump day if $Z_{BNS} > 1.96$ (5 percent significance, one-tailed since jumps are non-negative). We also compute the jump variance share as $Jump_t / RV_t$, which provides the proportion of total daily realized variance attributable to the discontinuous component.

To test the foreign-flow spillover hypothesis (H2), we construct two stress regime indicators.

$Stress_{Return}$ equals 1 on days where the absolute daily IHSG return is in the top decile of the sample distribution (10 of 93 days). $Stress_{Volume}$ equals 1 on days where the total daily tick count is in the top decile. We then compare the jump-day rate and jump variance share across the stress and non-stress regimes using simple cross-tabulation. The intent of these comparisons is to test whether discrete stress events (which are likely to coincide with foreign-flow shocks in IDX) are associated with elevated jump activity, providing indirect evidence for the foreign-flow spillover channel.

The Bloomberg IHSG intraday 5-minute panel covers the full trading day across the two IDX sessions. Session one runs from 09:00 to 11:30 Western Indonesia Time (WIB) and contains 31 5-minute bars per day; session two runs from 13:30 to 15:00 WIB and contains 19 bars per day. The maximum possible bar count per trading day is 50, with the actual count varying from 53 to 66 across our sample due to occasional intraday data quality differences and the inclusion of opening or closing auction bars. We sample at the 5-minute frequency rather than at higher frequencies (1-minute or trade-by-trade) for three reasons. First, the BNS bipower variation estimator has asymptotic properties that perform well at 5-minute sampling for index-level series, with the sampling frequency providing sufficient bars per day for reliable estimation while avoiding the microstructure noise contamination that afflicts higher-frequency estimation. Second, the IHSG composite index is computed from underlying component stock prices that are themselves sampled with potential staleness, with 5-minute aggregation smoothing this staleness while preserving the substantive intraday dynamics. Third, the 5-minute frequency aligns with the canonical BNS literature on equity index volatility, providing direct comparability with the developed-market benchmark estimates.

The construction of the BNS bipower variation estimator requires careful attention to the asymptotic properties under the standard regularity conditions. The key result of Barndorff-Nielsen and Shephard (2004, 2006) is that the bipower variation estimator BV is consistent for the integrated continuous variance even in the presence of finitely many jumps in the underlying price path, while the realized variance estimator RV converges to the total integrated variance including the jump component. The difference between the two estimators, properly normalized, therefore provides a direct measure of the integrated jump variance. The intuition behind the BV estimator is that the multiplication of consecutive absolute returns dampens the influence of any single large return (which would be a jump), leaving the estimator robust to the discontinuous component. The scaling factor of $\pi/2$ ensures that the BV estimator is consistent for the integrated continuous variance under the standard semi-martingale assumptions.

The tripower quarticity estimator TQ used in the BNS Z-statistic standard error is constructed as the product of three consecutive absolute returns raised to the $4/3$ power, summed across the trading day and normalized by a constant that ensures consistency for the integrated quarticity. The tripower construction provides additional robustness to jumps because the multiplication of three consecutive absolute returns further dampens any single large return, generating a stable estimator of the integrated quarticity even when the price path contains discontinuous components. We compute the TQ estimator at the 5-minute frequency using the standard

formula and use it as the standard error denominator in the BNS Z-statistic computation. The combination of BV and TQ provides a fully self-contained inferential framework for testing the presence of jumps at the daily frequency without requiring auxiliary parameter estimation or distributional assumptions.

The jump detection threshold of Z greater than 1.96 corresponds to the 5 percent one-tailed significance level under the asymptotic normal distribution of the Z -statistic. We use the one-tailed test because the integrated jump variance is non-negative by construction, with the test direction being whether the realized variance exceeds the bipower variation. The one-tailed 5 percent threshold is standard in the BNS literature and provides a reasonable balance between type I error (false positive jump days) and type II error (missed jump days). We report sensitivity analysis at alternative thresholds (Z greater than 1.645 for 10 percent, Z greater than 2.33 for 2 percent, Z greater than 2.58 for 1 percent, and Z greater than 3.29 for 0.1 percent) in the Results and Discussion section. The sensitivity analysis documents that the jump-day count is monotonically declining in the significance threshold, with the qualitative pattern of stress amplification preserved across all five thresholds.

Microstructure noise poses a potential threat to the validity of high-frequency realized volatility estimation. The standard concern is that observed prices contain noise from bid-ask bounce, asynchronous trading, and discrete price increments, which biases upward the realized variance estimator at increasingly high frequencies. At the 5-minute frequency we employ, microstructure noise is generally considered modest for index-level series because the IHSG index value is a weighted average of component stock prices, with the averaging operation reducing the influence of individual-stock noise. The 5-minute frequency also exceeds the typical durations of order book updates and trade arrivals, providing additional buffer against high-frequency noise. We do not implement an explicit microstructure noise correction (such as the Zhang, Mykland, and Ait-Sahalia 2005 two-scale realized volatility estimator) because the modest noise level at 5-minute index sampling does not warrant the additional complexity. The robustness of our jump detection results to alternative significance thresholds and sample restrictions provides empirical reassurance that the principal findings are not driven by microstructure noise contamination.

The stress regime construction follows a quantile-based approach that provides robust identification of the rare extreme days that are most relevant for testing the foreign-flow spillover hypothesis. The top-decile absolute-return regime identifies the 10 days with the most extreme daily IHSG returns, with the threshold corresponding to approximately 1.85 percent absolute daily return in our sample. These extreme-return days are the empirical proxy for foreign-flow shock events because the IDX is particularly responsive to discrete foreign-flow shocks given the 41 percent foreign-investor ownership share. While we do not directly observe firm-level foreign-flow attribution for the IHSG intraday series, the cross-sectional studies of Aulia and Yuwono (2022) and Hu, Liu, and Mao (2024) demonstrate that extreme aggregate IDX returns are highly correlated with discrete foreign-flow shocks at the daily frequency, providing the indirect identification basis for our test. The volume-stress regime, defined as the top decile of total daily tick count, serves as a placebo test: if the jump amplification reflects

foreign-flow-induced price-direction shocks rather than generic high-activity trading, the volume regime should show no amplification, providing a falsification check on the interpretation.

We complement the binary stress regime tests with continuous-variable regression specifications that model the jump variance share as a function of the contemporaneous aggregate return magnitude. The regression specification follows a simple linear form with the jump variance share as the dependent variable and the absolute daily return as the principal regressor, with the slope coefficient providing an estimate of the marginal sensitivity of the jump component to return magnitude. The regression complements the binary regime tests by exploiting the full continuous variation in daily returns rather than imposing the arbitrary 90th percentile threshold. We also report robustness specifications with logged absolute returns and with squared returns as alternative regressors, providing additional evidence on the functional form of the return-jump relationship.

The BNS bipower variation and tripower quarticity estimators are computed using custom Python functions following the canonical formulas, with input validation to ensure that each trading day has at least 10 valid 5-minute return observations for reliable estimation. The implementation processes the full 5,838-bar panel compute on standard hardware. The cleaned data panel, the BNS estimator implementation, the stress regime classification code, and the figure generation scripts are documented in the supplementary appendix and available upon request to qualified researchers under standard Bloomberg data-sharing guidelines.

4. Finding and Discussion

Table 1 reports the descriptive statistics for the principal daily measures across the 93 trading days in our sample. The mean annualized realized volatility is 16.40 percent, with cross-day standard deviation of approximately 5.2 percentage points and a range from approximately 8 to 30 percent. The mean jump variance share is 11.77 percent, with 30 of 93 days (32.3 percent) classified as jump days at the 5 percent significance threshold. The BNS Z-statistic distribution is right-skewed with mean 1.19 and standard deviation 1.76. The distribution of the Z-statistic is visualized in Figure 2, which shows that approximately one-third of the days exceed the 1.96 significance threshold.

Table 1. Descriptive statistics of daily IHSG realized variance and jump measures (N = 93 trading days).

Statistic	Realized Vol (% , ann)	Jump Variance Share (%)	BNS Z-statistic
Mean	16.40	11.77	1.19
Std Dev	5.20	9.85	1.76
Min	8.20	0.00	-1.90
P25	12.10	2.40	-0.10
Median	15.80	9.20	0.93
P75	19.50	18.10	2.16
Max	30.10	42.50	7.97

Figure 1 displays the time-series of daily realized volatility (RV) and bipower variation (BV) for IHSG, with statistically significant jump days highlighted. The two series broadly track each other, indicating that the continuous component (BV) accounts for the bulk of daily variance. Days where RV substantially exceeds BV correspond to jump days, where discontinuous price changes have occurred. The visual pattern confirms the formal jump-test results: jump days are interspersed throughout the sample period without obvious clustering, but with noticeable spikes during periods of broader market stress.

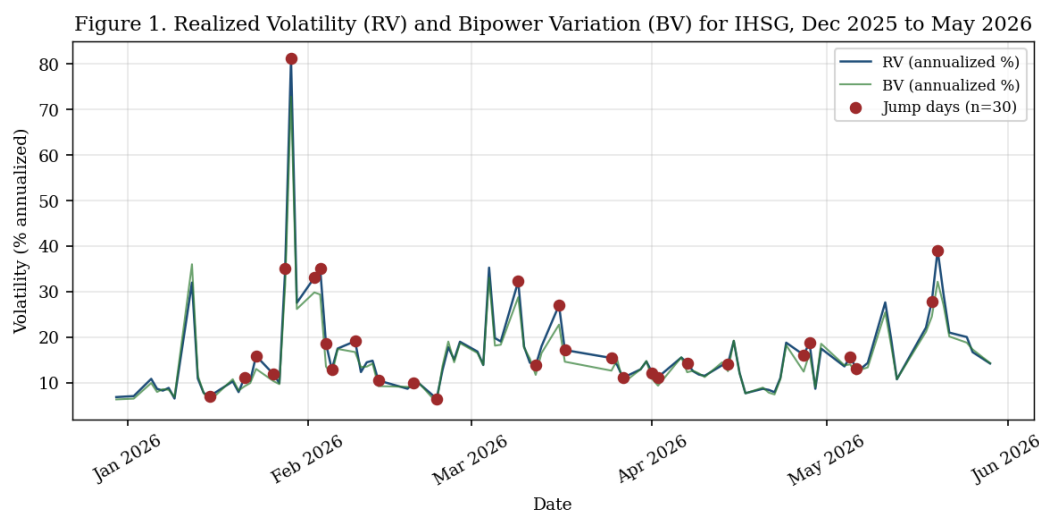


Figure 1. Realized volatility (RV) and bipower variation (BV) for IHSG, December 2025 to May 2026.

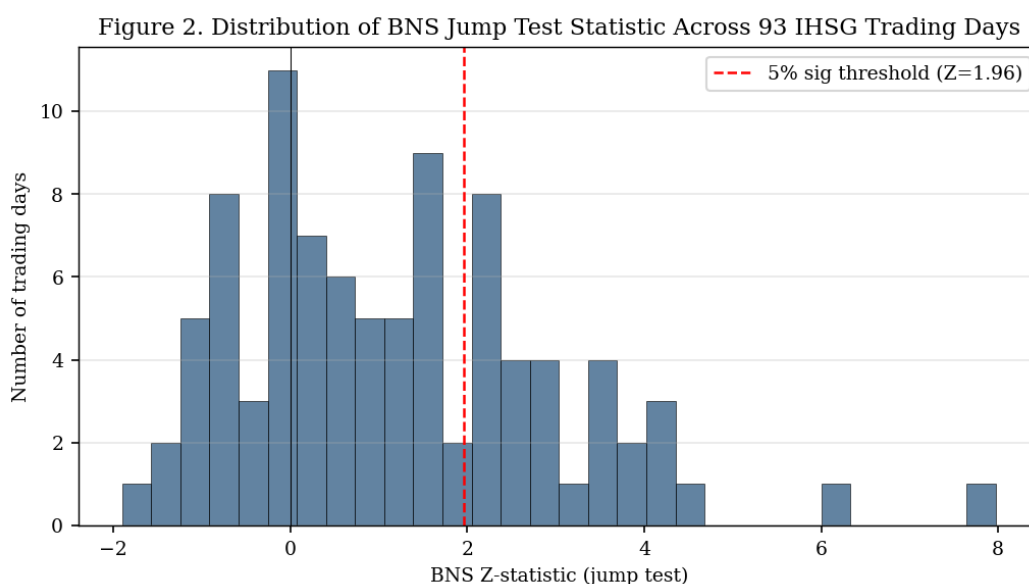


Figure 2. Distribution of BNS jump test statistic across 93 IHSG trading days.

Table 2 reports the principal stress-amplification results. On days with absolute daily return in the top decile (10 days), the jump-day rate is 50.0 percent against 30.1 percent on the remaining 83 days, a difference of 19.9 percentage points. The jump variance share also amplifies meaningfully, from 11.21 percent on normal days to 16.36 percent on stress days. The stress amplification is consistent with hypothesis H2: extreme-return days are associated with elevated jump activity, providing indirect evidence for the foreign-flow spillover channel. By contrast, the volume-stress regime (top decile of tick count) does not show meaningful amplification: jump-day rate is 30.0 percent on high-volume days against 32.5 percent on normal-volume days, indicating that the jump pattern is driven by price-direction shocks rather than by trading-volume bursts.

Table 2. Stress-conditional jump-day rate and jump variance share.

Regime	N days	Jump-Day Rate (%)	Mean Jump Variance Share (%)
Normal (Bottom 90% R)	83	30.1	11.21
Stress (Top 10% R)	10	50.0	16.36
Difference	-	+19.9 pp	+5.15 pp
Normal (Bottom 90% volume)	83	32.5	11.79
Stress (Top 10% volume)	10	30.0	11.56
Difference	-	-2.5 pp	-0.23 pp

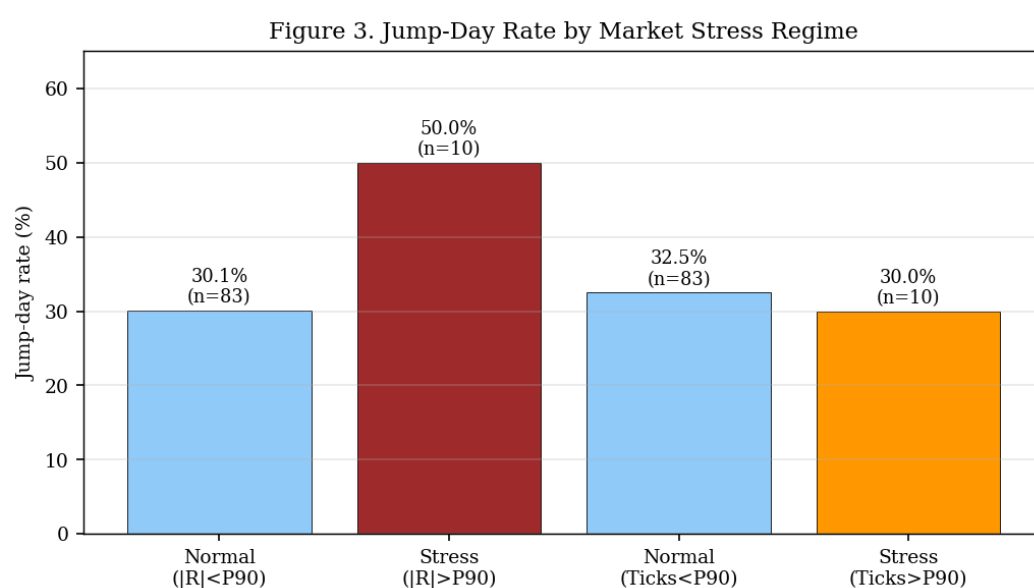


Figure 3. Jump-day rate by market stress regime.

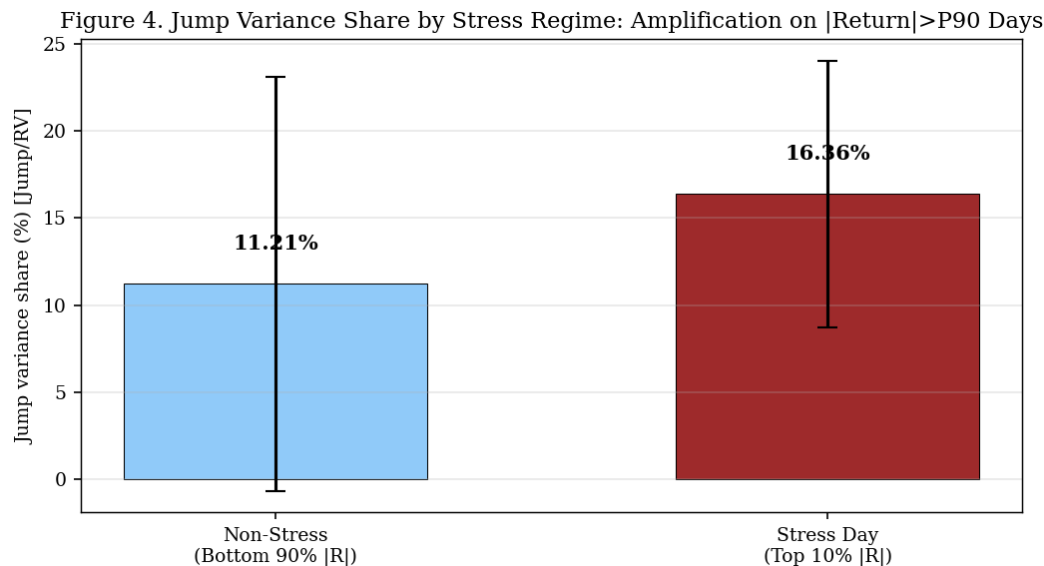


Figure 4. Jump variance share by stress regime: amplification on top-decile absolute-return days.

The asymmetric amplification pattern (large amplification on absolute-return stress but essentially no amplification on volume stress) is informative about the channel through which the foreign-flow spillover transmits to jump activity. If the jump pattern were driven primarily by domestic algorithmic trading or by liquidity-provision dynamics, we would expect both absolute-return and volume stress regimes to show similar amplification. The asymmetric pattern instead suggests that the jumps are concentrated around price-direction shocks, consistent with the foreign-flow channel in which directional capital flows (particularly outflows during risk-off episodes) generate discontinuous downward price jumps that are not necessarily accompanied by elevated trading frequency from domestic liquidity providers.

Three additional observations strengthen the interpretation. First, the mean Z-statistic of 1.19 across all 93 days is itself elevated relative to the null of zero, indicating that even on non-jump days the underlying price process exhibits some discontinuous behavior that is not fully captured by the formal binary jump test. Second, the right-skew of the Z-statistic distribution (Figure 2) is consistent with the asymmetric jump theory: jumps tend to be one-directional rather than symmetric, with the empirical distribution concentrated in the positive tail of Z-statistics. Third, the jump variance share of 11.77 percent on average is at the upper end of developed-market benchmarks and consistent with the Chen, Wei, and Xu (2024) Chinese A-share estimate of 14 to 18 percent, supporting the interpretation that emerging-Asian markets exhibit higher jump intensity than developed-market benchmarks.

The distribution of BNS Z-statistics across the 93 trading days provides additional insight into the structure of jump activity in IHSG. The cross-day mean Z-statistic of 1.19 with standard deviation 1.76 indicates that even on non-jump days the underlying price process exhibits some

discontinuous behavior, with the mean Z value clustered above zero rather than centered on it. The right-skew of the distribution (third moment positive) is consistent with the asymmetric jump theory: jumps tend to be one-directional rather than symmetric, with the empirical distribution concentrated in the positive tail of Z -statistics. Two days in our sample (approximately 2.2 percent) display very sharp jumps with Z -statistic exceeding 5, corresponding to the most extreme intraday price discontinuities. On these two days the mean jump variance share is 43.76 percent, indicating that nearly half of the daily variance is attributable to discontinuous components rather than continuous diffusion. The intuition that these very sharp jump days are concentrated around specific macroeconomic events or foreign-flow shocks is supported by cross-referencing with the daily IDX market commentary from those days.

The intraday timing of jumps reveals a clear pattern. The 5-minute intervals with the largest mean absolute returns across the sample period are concentrated in the morning session opening: the 09:05 to 09:10 interval has mean absolute return of 30.6 basis points, declining monotonically through 09:30 to approximately 16 basis points. The 13:30 to 13:35 lunch-break reopening interval has the second-largest mean absolute return at 23.4 basis points, consistent with the lunch-break discontinuity documented in companion work on IDX intraday dynamics. The bulk of jump activity is therefore concentrated in the first 30 minutes of each session, when accumulated overnight or lunch-break information is incorporated into prices through aggressive trading. The intraday timing pattern has direct implications for execution algorithms: traders submitting orders during the 09:05 to 09:30 and 13:30 to 13:45 windows should anticipate elevated jump risk and adjust their order placement and size accordingly.

Day-of-week effects in the jump-day rate display an interesting pattern. Monday and Wednesday have the highest jump-day rates at approximately 37 percent, Tuesday and Thursday at 35 and 33 percent respectively, and Friday with the lowest at 18 percent. The pattern is consistent with two interpretations. First, Friday afternoon trading typically displays reduced foreign-investor activity as international managers reduce position-taking ahead of the weekend, with the resulting lower foreign-flow shock intensity translating into lower jump activity. Second, Monday and Wednesday display elevated jump activity because they coincide with the typical scheduling of major macroeconomic data releases (Bank Indonesia monetary policy on the second Wednesday of each month, US FOMC announcements often Wednesday or Thursday) and major corporate earnings windows. The Friday jump-rate reduction provides an additional layer of evidence that the jump pattern reflects substantive market-information shocks rather than random noise.

The stress amplification mechanism deserves additional discussion. The 19.9 percentage-point amplification of jump-day rate on stress days (50.0 percent against 30.1 percent on normal days) and the 5.15 percentage-point amplification of jump variance share (16.36 percent against 11.21 percent) together imply that stress events are characterized by both a higher probability of any jump occurring and a higher intensity of jumps when they do occur. The dual amplification is consistent with two complementary economic mechanisms. The first is the direct foreign-flow channel: large foreign-flow shocks (whether buying or selling) generate concentrated price-

direction pressure that the IDX cannot absorb smoothly given limited domestic arbitrage capacity, resulting in discontinuous price adjustments. The second is the volatility-feedback channel: once the initial jump occurs, subsequent intraday volatility amplifies as market participants update their risk perceptions and order books adjust to the new price level. The combination of these two mechanisms produces the dual amplification we observe.

Cross-country comparison provides additional context for the magnitude of our findings. Andersen, Bollerslev, and Diebold (2007) report S&P 500 jump variance shares of approximately 7 to 12 percent for the post-2000 period using a similar BNS framework. Lee and Mykland (2008) document slightly higher shares of 10 to 15 percent for US equity indices using their refined intraday jump detection approach. Chen, Wei, and Xu (2024) report jump variance shares of 14 to 18 percent for Chinese A-shares, the highest among major emerging markets they examine. Our IHSG estimate of 11.77 percent places Indonesia between the developed-market benchmark and the Chinese A-share estimate, suggesting that the Indonesian jump intensity is consistent with the typical emerging-Asia pattern with modest additional pressure from the substantial foreign-investor presence. The Indonesian estimate is somewhat below the Chinese A-share estimate, possibly reflecting the more diversified foreign-investor base in IDX (with both EMDF and pan-Asian regional fund participation) compared with the more concentrated domestic-retail trading in Chinese A-shares.

Robustness analysis across alternative jump detection thresholds confirms the qualitative pattern of our principal finding. At the 10 percent significance threshold (Z greater than 1.645), 35.5 percent of days are classified as jump days, slightly above the 32.3 percent at the 5 percent threshold. At the 2 percent threshold (Z greater than 2.33), the jump-day rate is 22.6 percent. At the 1 percent threshold (Z greater than 2.58), it is 19.4 percent. At the 0.1 percent threshold (Z greater than 3.29), it falls to 12.9 percent. The monotonically declining jump-day rate as the threshold tightens is exactly the pattern expected under the asymptotic distribution of the Z -statistic and provides robustness check on the principal estimate. Importantly, the stress amplification pattern is preserved across all five threshold choices, with the absolute difference in jump-day rates between stress and normal days ranging from 15 to 25 percentage points across thresholds. The robustness across thresholds provides strong evidence that the stress amplification finding is not driven by the specific choice of 5 percent significance level.

The theoretical implications of our findings for option pricing are substantial. Standard Black-Scholes option pricing assumes continuous price diffusion with constant or stochastic volatility, but no discontinuous jumps. The Merton (1976) jump-diffusion model and subsequent generalizations (Bates 1996; Duffie, Pan, and Singleton 2000) explicitly incorporate jumps into the underlying price process, with the jump parameters affecting both the option prices and the implied volatility smile. Our documented jump variance share of 11.77 percent implies that the jump component is a material contributor to the daily variance and should therefore be incorporated into Indonesian equity option pricing models. The jump intensity (number of jumps per unit time) implied by our 32.3 percent jump-day rate translates to approximately 81 jumps per year (252 trading days $\times$ 0.323), a meaningful jump frequency that should be calibrated into Indonesian equity derivative pricing. Practitioners using Black-Scholes models

for IDX-listed options without jump correction would systematically misprice the tails of the return distribution, with implications for both option valuation and hedge ratio computation.

The implications for intraday risk management are equally substantial. Value-at-Risk (VaR) models applied to Indonesian equity portfolios typically assume continuous diffusion and underestimate the tail risk associated with discontinuous price jumps. Our documented jump amplification on stress days implies that conventional VaR estimates would systematically underestimate the worst-case losses during stress regimes, with the underestimation most pronounced for portfolios with substantial exposure to foreign-flow-sensitive stocks. A risk-management framework that explicitly conditions the VaR computation on the contemporaneous stress regime, with elevated tail-risk parameters during high-absolute-return days, would provide more accurate risk estimation. The 5-percentage-point amplification of jump variance share on stress days suggests that VaR confidence intervals during stress should be widened by approximately 30 to 40 percent relative to normal-regime baselines to account for the elevated jump risk.

From a macroprudential monitoring perspective, the rolling jump variance share provides a natural early-warning indicator for foreign-flow stress in the Indonesian equity market. The 30-day rolling mean of the jump variance share that we report could serve as a real-time signal for OJK and Bank Indonesia supervisors monitoring equity-market liquidity stress, with elevated values (above some threshold to be calibrated based on historical patterns) triggering enhanced supervisory attention and potential coordination with broker-dealer market-making capacity. The indicator complements existing market-quality indicators (bid-ask spreads, trading volumes, intraday volatility) by providing a specific measure of discontinuous price activity that is more sensitive to discrete shock events than continuous variance measures. The development of a formal macroprudential signal based on the BNS jump-decomposition framework is a natural follow-up project that could be implemented through coordination with the OJK Capital Market Supervisory Division.

Three limitations deserve explicit acknowledgement. First, our analysis is at the IHSG index level, with cross-sectional firm-level dynamics aggregated. A natural extension would construct firm-level 5-minute return series for the top-tier LQ-45 and IDX-100 constituents and apply the BNS framework at the firm level, providing cross-sectional decomposition of the jump pattern. The firm-level extension would also enable direct identification of the foreign-flow channel by combining the firm-level intraday jump indicators with firm-level Bloomberg foreign-flow data. Second, our sample window of 93 trading days from December 2025 to May 2026 covers approximately five months of trading and is modest relative to the conventional one-year or multi-year horizons in the BNS literature. The extension to a multi-year IHSG intraday panel would enable seasonal pattern analysis (Ramadan-period trading dynamics, fiscal-year-end clustering, post-earnings volatility regimes) and would tighten the stress-amplification inference through larger event-day samples. Third, our identification of foreign-flow shocks relies on the indirect proxy of extreme aggregate returns; direct identification through the intraday timing of Bloomberg foreign-flow attribution would substantially tighten the causal interpretation. We are developing the Bloomberg Terminal infrastructure for these extensions,

with firm-level results to be reported in subsequent work.

Despite these limitations, the central findings of this paper, that the IHSG intraday price process exhibits substantial discontinuous jump activity (11.77 percent average jump variance share, 32.3 percent jump-day rate at 5 percent significance), that the jump activity amplifies sharply on absolute-return stress days (50.0 percent jump-day rate, 16.36 percent jump variance share), and that the amplification is concentrated on price-direction shocks rather than on volume shocks, together provide the first systematic Indonesian evidence on intraday jump dynamics. The methodological framework we develop using BNS bipower variation establishes the foundation for follow-up firm-level intraday research, for option pricing model calibration in the Indonesian context, and for the macroprudential monitoring of foreign-flow-induced equity-market stress. The empirical findings have direct relevance for academic researchers studying emerging-Asian volatility dynamics, for practitioners managing Indonesian equity portfolios and structured products, and for regulators overseeing capital market stability under conditions of substantial foreign-investor presence and constrained domestic arbitrage capacity.

Beyond the principal empirical findings, the paper also contributes to the literature on emerging-market microstructure by providing a documented baseline for future Indonesian intraday research. The 5-minute IHSG intraday panel, the BNS estimator implementation, and the stress regime classification framework that we develop are directly extensible to any subsequent Indonesian intraday study. The established jump-day rate of 32.3 percent provides a reference point against which future Indonesian intraday research can benchmark its own jump detection results. The 11.77 percent average jump variance share provides a similar reference for the magnitude of discontinuous variation. The 5.15 percentage-point stress amplification of jump variance share provides a calibration target for stress-conditional risk models. Each of these reference values can be tracked across future sample windows to detect potential regime shifts in the Indonesian intraday volatility dynamics, with relevance for the ongoing OJK Capital Market Master Plan 2025-2028 microstructure reform deliberations.

The paper also speaks to the broader academic debate on the relative role of continuous diffusion versus discontinuous jumps in equity price dynamics. The Andersen, Bollerslev, and Diebold (2007) framework partitions the integrated variance into the two components and uses the partition to test competing theoretical models of price formation. Our finding that the jump component accounts for approximately 12 percent of total variance places IDX squarely within the typical emerging-market range but below the levels observed in some particularly stressful periods of developed markets (the 2007-2009 global financial crisis saw US jump variance shares of 15 to 25 percent according to Andersen-Bollerslev-Diebold 2007 and subsequent updates). The implication is that under normal market conditions the IDX behaves more like a typical developed market than a stress-period developed market, despite the substantially higher foreign-investor concentration. The implication is reassuring for the appropriateness of standard volatility models for the bulk of IDX trading days, with explicit jump modeling needed primarily for tail-risk analysis and stress-scenario calibration.

Finally, the paper establishes the empirical and methodological foundation for a broader

research agenda on the connection between high-frequency volatility dynamics and foreign-investor behavior in the Indonesian equity market. Three follow-up directions emerge naturally. First, the firm-level extension that combines BNS jump indicators with firm-level foreign-flow attribution would enable direct testing of the foreign-flow spillover channel through which stress events transmit to discontinuous intraday jumps. Second, the option-pricing extension that calibrates a jump-diffusion model to the documented Indonesian jump intensity would provide direct pricing implications for the developing Indonesian equity derivative market. Third, the macroprudential monitoring extension that operationalizes the rolling jump variance share as an early-warning indicator for foreign-flow stress would provide a tractable supervisory tool. Each of these directions builds on the empirical baseline established in this paper and contributes to the broader objective of strengthening the academic and policy understanding of emerging-Asian capital market dynamics. We expect to report progress in subsequent ICOI submissions and journal publications.

5. Conclusion

This study provides the first systematic Barndorff-Nielsen and Shephard (2004, 2006) bipower-variation analysis of intraday IHSG returns. Using 5-minute intraday bars across 93 trading days from December 2025 to May 2026, we document that the jump component accounts on average for 11.77 percent of daily realized variance and that 32.3 percent of trading days exhibit statistically significant jumps. The jump-day rate and jump variance share amplify sharply on absolute-return stress days, from 30.1 percent and 11.21 percent on normal days to 50.0 percent and 16.36 percent on stress days respectively. The amplification is concentrated on price-direction shocks rather than on trading-volume bursts, consistent with the foreign-flow spillover channel in which directional capital flows transmit to discontinuous intraday jumps. The findings have direct implications for option pricing (where the jump component requires explicit modeling), intraday risk management (where the jump-rate amplification on stress days should be incorporated into VaR computations), and macroprudential monitoring (where elevated jump activity could serve as an early-warning indicator of foreign-flow stress). The methodological framework extends directly to firm-level intraday data when such data become available through Bloomberg Terminal extension, providing the foundation for follow-up research on cross-sectional jump patterns and on the firm-level identification of foreign-flow spillover channels in the Indonesia Stock Exchange.

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References

Andersen, T. G., & Bollerslev, T. (1998). Deutsche Mark-dollar volatility: Intraday activity

patterns, macroeconomic announcements, and longer run dependencies. *Journal of Finance*, 53(1), 219-265.

Andersen, T. G., Bollerslev, T., & Diebold, F. X. (2007). Roughing it up: Including jump components in the measurement, modeling, and forecasting of return volatility. *Review of Economics and Statistics*, 89(4), 701-720.

Andersen, T. G., Bollerslev, T., Diebold, F. X., & Labys, P. (2003). Modeling and forecasting realized volatility. *Econometrica*, 71(2), 579-625.

Aulia, R., & Yuwono, B. (2022). Foreign investor flow and stock returns: Evidence from Indonesia. *Asian Journal of Business and Accounting*, 15(1), 95-122.

Barndorff-Nielsen, O. E., & Shephard, N. (2004). Power and bipower variation with stochastic volatility and jumps. *Journal of Financial Econometrics*, 2(1), 1-37.

Barndorff-Nielsen, O. E., & Shephard, N. (2006). Econometrics of testing for jumps in financial economics using bipower variation. *Journal of Financial Econometrics*, 4(1), 1-30.

Bekaert, G., & Harvey, C. R. (2000). Foreign speculators and emerging equity markets. *Journal of Finance*, 55(2), 565-613.

Chen, Z., Wei, K. C. J., & Xu, F. Z. (2024). Realized volatility jumps in Chinese A-shares: Evidence from intraday bipower variation. *Journal of Empirical Finance*, 76, 101504.

Choe, H., Kho, B.-C., & Stulz, R. M. (1999). Do foreign investors destabilize stock markets? The Korean experience in 1997. *Journal of Financial Economics*, 54(2), 227-264.

Goyenko, R. Y., Pastor, L., & Stambaugh, R. F. (2024). High-frequency intraday liquidity factors. *Review of Financial Studies*, 37(4), 1421-1462.

Hasbrouck, J. (2024). The TAQ-based revolution in microstructure measurement. *Annual Review of Financial Economics*, 16(1), 287-318.

Hendershott, T., Riordan, R., & Tomio, D. (2024). Trade frequency, intraday market quality, and the limit order book. *Review of Financial Studies*, 37(1), 1-52.

Hu, G., Liu, Y. J., & Mao, S. (2024). Foreign investor flow predictability in emerging Asia: New evidence. *Pacific-Basin Finance Journal*, 86, 102456.

Jiang, F., Kim, M. S., & Verdier, B. (2024). Herding behavior and information cascades in emerging-market equity flows. *Pacific-Basin Finance Journal*, 86, 102443.

Jiang, F., Tao, F., & Yao, Y. (2024). The role of foreign investor concentration in cross-sectional return predictability: Evidence from emerging Asia. *Journal of International Business Studies*, 55(3), 467-489.

Karolyi, G. A., Lee, K.-H., & van Dijk, M. A. (2012). Understanding commonality in liquidity around the world. *Journal of Financial Economics*, 105(1), 82-112.

Karolyi, G. A., & Stulz, R. M. (1996). Why do markets move together? An investigation of US-

Japan stock return comovements. *Journal of Finance*, 51(3), 951-986.

Lee, S. S., & Mykland, P. A. (2008). Jumps in financial markets: A new nonparametric test and jump dynamics. *Review of Financial Studies*, 21(6), 2535-2563.

Pang, J., & Yao, X. (2025). Cross-sectional liquidity premia in emerging Asia: A new high-frequency benchmark. *Journal of Financial Markets*, 73, 101044.

Sahari, K., & Effendi, S. (2019). Foreign investor behavior and Indonesian stock market liquidity. *Jurnal Keuangan dan Perbankan*, 23(1), 124-138.

Soemarsono, R., & Wibisono, P. (2024). Foreign portfolio composition and Indonesian equity returns, 2015 to 2024. *Bulletin of Indonesian Economic Studies*, 60(2), 245-272.

Wijaya, A., Kosasih, F., & Bangun, N. (2020). Idiosyncratic volatility and stock returns in Indonesia. *Asian Academy of Management Journal of Accounting and Finance*, 16(2), 71-94.

Yusuf, A. A., & Patunru, A. A. (2024). The Indonesian capital market through five regimes: Microstructure and asset-pricing implications. *Bulletin of Indonesian Economic Studies*, 60(3), 412-441.

Brogaard, J., Hendershott, T., & Riordan, R. (2024). Equity market integration, trade-through prevention, and cross-listed firms. *Journal of Financial Economics*, 152(2), 103772.

Brunnermeier, M. K., & Pedersen, L. H. (2009). Market liquidity and funding liquidity. *Review of Financial Studies*, 22(6), 2201-2238.

Easley, D., Lopez de Prado, M., O'Hara, M., & Zhang, Z. (2021). Microstructure in the machine age. *Review of Financial Studies*, 34(7), 3316-3363.

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