Supplementary Information

Overnight cryptocurrency downside and opening versus intraday equity returns in Southeast Asia

Table S1: Variable definitions

Variable	Definition
Closure window	For session t of recipient market c: from the market's previous close to a decision cutoff before the current opening (08:45 local time for Vietnam; the formal opening for Singapore, Malaysia and Indonesia), in local exchange time converted to Coordinated Universal Time (UTC).
r^C_{jct}	Log return of cryptocurrency j (Bitcoin (BTC), Ether (ETH), XRP, Cardano (ADA), Solana (SOL), Dogecoin (DOGE), Litecoin (LTC), TRON (TRX); quoted in Tether (USDT), a US dollar-pegged stablecoin; Binance five-minute spot bars) over the closure window; the start is the first bar at or after the previous close and the end the last bar at or before the cutoff.
Negative breadth B^-_{ct}	Share of the eight coins with $r^C_{jct} < 0$.
Downside severity S^-_{ct}	Absolute median of the negative r^C_{jct}; zero when no coin falls.
Consensus-weighted market downside severity (CMDS)	$B^-_{ct}S^-_{ct}$, standardised within each market (mean zero, unit standard deviation over the market's panel).
BTC–ETH return (signed)	Equal-weighted average of the standardised BTC and ETH closure returns; used as a signed comparator.
Intraday BTC–ETH return	Average log return of BTC and ETH over the trading hours of the Vietnamese session on the same date (02:00 to 04:25 and 06:00 to 07:55 UTC); an explanatory control, not a predictor.
Regional intraday return	Average same-date open-to-close return of the Straits Times Index (STI), Kuala Lumpur Composite Index (KLCI) and Jakarta Composite Index (JKSE) over those of the three with a non-stale opening (at least two required); an explanatory control, not a predictor.
Long closure	Closure window that contains a weekend or a local public holiday.
R^{TOT}_{ct}, R^{ON}_{ct}, R^{ID}_{ct}	Close-to-close, opening (previous close to reported opening) and intraday (reported opening to close) log returns of the index; $R^{TOT} = R^{ON} + R^{ID}$.
D_c	$\widehat{\beta}^{ON}_c - \widehat{\beta}^{ID}_c$; positive when the intraday coefficient is more negative.
Intraday share	$\widehat{\beta}^{ID}_c/(\widehat{\beta}^{ON}_c + \widehat{\beta}^{ID}_c)$, a ratio of coefficients.
Stale opening level	Opening level equal to the previous close within 0.5 basis points.
United States (US) controls	S&P 500 and Nasdaq Composite log returns, change in the Cboe Volatility Index (VIX), Intercontinental Exchange (ICE) US Dollar Index log return, change in the 10-year Treasury yield and front-month West Texas Intermediate (WTI) crude oil log return, latest values treated as available by 16:15 New York time before the recipient market opens.
Fixed effects	Weekday and month-year indicators.

Table S2: Neighbouring-session checks and a signed closure-period measure

Market	Part	Lead coef. (bp)	Lead p	Lag coef. (bp)	Lag p
VN-Index	Opening	−0.8	0.539	3.1	0.128
VN-Index	Intraday	2.3	0.462	−3.8	0.321
VN-Index	*D*	−3.1	0.360	6.9	0.117
VN30	Opening	0.0	0.995	2.8	0.056
VN30	Intraday	4.3	0.215	−6.2	0.132
VN30	*D*	−4.3	0.232	9.0	0.029
VNMidcap	Opening	−0.5	0.692	3.6	0.052
VNMidcap	Intraday	−1.6	0.683	−1.8	0.719
VNMidcap	*D*	1.1	0.801	5.4	0.304
VNSmallcap	Opening	−0.9	0.479	2.2	0.253
VNSmallcap	Intraday	1.4	0.697	−2.7	0.536
VNSmallcap	*D*	−2.4	0.521	4.8	0.297

Signed BTC–ETH return (non-stale sessions; coefficients in bp, p in parentheses)

Market	Part	CMDS	Signed measure
VN-Index	Opening	−2.3 (0.254)	3.5 (0.073)
VN-Index	Intraday	−14.2 (0.002)	12.2 (<0.001)
VN-Index	*D*	11.9 (0.005)	−8.7 (0.011)
VN30	Opening	−3.2 (0.080)	4.0 (0.017)
VN30	Intraday	−16.5 (<0.001)	14.7 (<0.001)
VN30	*D*	13.3 (0.004)	−10.7 (0.007)
VNMidcap	Opening	−4.5 (0.050)	5.5 (0.010)
VNMidcap	Intraday	−21.8 (<0.001)	18.3 (<0.001)
VNMidcap	*D*	17.2 (0.005)	−12.8 (0.003)
VNSmallcap	Opening	−2.7 (0.291)	4.1 (0.092)
VNSmallcap	Intraday	−19.9 (<0.001)	17.5 (<0.001)
VNSmallcap	*D*	17.2 (0.003)	−13.4 (0.003)

Notes: Lead and lag are the coefficients of the one-session lead and lag of CMDS in the same equations (sessions without stale openings); unadjusted p. The signed measure is the standardised BTC–ETH closure return; the sign convention of the coefficient follows the measure (a positive return is not a downside), so the signed intraday coefficient is positive where the CMDS coefficient is negative. The signed measure does not separate positive from negative returns.

Source: Authors' calculations from the v5 pipeline outputs.

Table S3: Comparisons using the three additional Vietnamese indices

Pair	N common	Difference (bp)	Joint HAC SE	95% CI	p	Holm p (9)
VN30 minus Singapore STI	1,455	17.4	5.5	[6.7, 28.1]	0.001	0.009
VN30 minus Malaysia KLCI	1,413	13.4	4.4	[4.7, 22.0]	0.002	0.010
VN30 minus Indonesia JKSE	1,385	14.1	7.5	[−0.5, 28.7]	0.058	0.058
VNMidcap minus Singapore STI	1,455	22.0	6.7	[9.0, 35.1]	<0.001	0.008
VNMidcap minus Malaysia KLCI	1,413	18.3	5.8	[7.1, 29.6]	0.001	0.009
VNMidcap minus Indonesia JKSE	1,385	18.6	8.0	[2.8, 34.3]	0.021	0.047
VNSmallcap minus Singapore STI	1,455	21.7	6.4	[9.1, 34.3]	<0.001	0.006
VNSmallcap minus Malaysia KLCI	1,413	18.1	5.6	[7.1, 29.1]	0.001	0.009
VNSmallcap minus Indonesia JKSE	1,385	18.7	7.7	[3.5, 33.9]	0.016	0.047

Notes: Exploratory pairs formed with VN30, VNMidcap and VNSmallcap against the STI, KLCI and JKSE, all sessions; joint heteroskedasticity- and autocorrelation-consistent (HAC) covariance on matched dates; Holm adjustment over these nine pairs. SE denotes standard error, CI confidence interval and bp basis points. The three Vietnamese indices are nested views of the same exchange as the VN-Index, so the pairs add segment detail and are not independent of Table 5 of the main text.

Source: Authors' calculations from the v5 pipeline outputs.

Table S4: History of the headline result: selection sensitivity and the earlier locked values

Market	Holm p for D (7 indices)	5× Holm p (capped at 1)
VN-Index	0.014	0.069
VN30	0.017	0.083
VNMidcap	0.014	0.068
VNSmallcap	0.012	0.061
Singapore STI	0.092	0.461
Malaysia KLCI	1.000	1.000
Indonesia JKSE	1.000	1.000
Original and updated estimates of D (bp)		
VN-Index D: before and after correction	18.7	12.5
VN-Index minus STI: before and after correction	23.4	17.3
VN-Index minus KLCI: before and after correction	19.1	12.8
VN-Index minus JKSE: before and after correction	21.4	13.3

Notes: The first block multiplies the Holm-adjusted p of the within-session difference by five, the number of candidate results compared before this one was chosen as the subject of the article; it is a conservative sensitivity analysis and does not replace the declared family. The second block lists the allocation differences specified in the earlier locked analysis and their values in this version; the change in the VN-Index figure follows the correction of the provider's opening levels.
Source: Authors' calculations from the v5 pipeline outputs.

Table S5: End-to-end scripts and reproducibility records

Stage	Scripted operation	Trace and output
Source acquisition	Programmatic retrieval of Binance five-minute cryptocurrency bars, VNDIRECT DChart Vietnamese index histories, and Yahoo Finance indices and US controls; import of independent SSI iBoard and KBSV opening records for validation.	Provider and series identifiers, retrieval parameters and dates, downloaded input files and file hashes.
Align trading hours	Convert timestamps, apply each exchange calendar and pre-opening cutoff, and match cryptocurrency bars to each market session.	Session windows, matched five-minute prices and coverage checks.
Variable construction	Calculate closure-period cryptocurrency returns and CMDS; produce opening, intraday and close-to-close equity returns, controls and sample flags.	Datasets by session, variable definitions and sample manifests.
Estimation and validation	Run the specified regressions, joint covariance inference, block bootstrap, cross-market contrasts and checks using alternative openings and samples.	Versioned specifications, estimation outputs, standard errors, intervals and validation results.
Tables and figures	Regenerate all reported manuscript and supplementary tables and figures directly from saved model outputs.	Tables, figures, execution records and output-file hashes.

Notes: The pipeline has been executed from automated source retrieval through generation of the tables and figures. The replication package documents the run sequence and distinguishes downloaded third-party records from derived analysis files. CMDS denotes consensus-weighted market downside severity; US denotes United States.