

Price Informativeness in a Retail-Dominated After-Hours Market: Evidence from Korea's Alternative Trading System

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POVZETEK: Tega raziskava obravnava, kako informativne so cene, ki so formirane predvsem po kmetijskimi trgovci v po-urah trgovini na Nextrade (NXT) v Koreji. NXT ponuja kontinuirano trgovino po-urah v sestavljene akcije, ki se nato trgujejo na KRX. Po-urne cene, ki so formirane predvsem po kmetijskimi trgovci, so več informativne kot pred-urne cene, ki so formirane po-urah. Cene po-urah so predvsem informativne, če so formirane predvsem po kmetijskimi trgovci, čeprav so težko oceniti, ali se pri času pričnejo.

METODA: Raziskava uporablja tri komplementarne testne metode: povratnico regresijo, direktno poročanje cijen in dolgo-terminne regresije. Cene po-urah so izračunate kot volume-weighted average price (VWAP) po-urah. Raziskava je podrobno preverila, kako informativne so cene po-urah, če so formirane predvsem po kmetijskimi trgovci, in je pokazala, da so te cene predvsem informativne, čeprav so težko oceniti, ali se pri času pričnejo.

KLJUČNE UGOTOVITVE:

- Cene po-urah, ki so formirane predvsem po kmetijskimi trgovci, so predvsem informativne.
- Cene po-urah so predvsem informativne, čeprav so težko oceniti, ali se pri času pričnejo.
- Cene po-urah so predvsem informativne, če so formirane predvsem po kmetijskimi trgovci, čeprav so težko oceniti, ali se pri času pričnejo.

POMEN ZA TRGOVANJE: Raziskava kaže, da so po-urne cene, ki so formirane predvsem po kmetijskimi trgovci, predvsem informativne. To je pomembno za trgovce, ker pomoči v ocenjevanju prihodnjih cijen in trgovskih okolij. Trgovci lahko uporabljajo te cene za boljšo predvidljivost trgovskih odločitev.

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Abstract

This paper examines the informativeness of prices formed predominantly by retail investors in the after-market of Nextrade (NXT), an alternative trading system in Korea. NXT's after-market is the only venue offering continuous competitive trading in eligible stocks after the Korea Exchange (KRX) close, and retail investors account for 96.5% of after-market turnover on the average stock-day. A one-percentage-point higher return from the KRX close to the after-market volume-weighted average price (VWAP) is associated with a 0.90-percentage-point higher return from the same close to the next day's close. On 48,633 stock-days with no non-retail executions in the session, the coefficient is 0.91. In this subsample, the relation remains positive at twenty trading days, although subsequent reversal is imprecisely estimated. To assess whether evening prices improve on the preceding official close, the prior KRX close and the same evening's VWAP are each used directly as forecasts of the next day's KRX close. After adjustment for corporate actions and cash dividends, the VWAP's mean squared prediction error is 5.7% lower in the full sample and 2.3% lower on retail-only stock-days. After-market prices therefore remain informative even on stock-days with no recorded non-retail executions: on average they indicate the next day's market valuation more accurately than the preceding official close.

Keywords: after-hours trading; price informativeness; retail investors; alternative trading system; market fragmentation

JEL classification: G14, G15, G23

1. Introduction

After-hours trading allows prices to update the primary exchange's close before regular trading resumes. Whether those updates are informative depends on both available information and trading conditions. Barclay and Hendershott (2003) find noisier U.S. post-close than pre-open prices. They estimate informed-trading probabilities of 0.21 after the close and 0.13 during regular hours, yet post-close unbiasedness slopes of only about 0.45–0.60. In a separate venue-level sample, 75.4% of post-close dollar volume is executed through market makers. They link post-close noise to thin liquidity and direct negotiation of large liquidity trades.

Nextrade (NXT), an alternative trading system in Korea, offers an order-driven setting with direct records of executions by investor category. Eligible stocks trade on both NXT and the Korea Exchange (KRX) during regular hours. After the KRX close, NXT's regular after-market provides continuous competitive trading through an anonymous order book without designated market makers. NXT therefore allows after-hours price informativeness to be examined under a trading mechanism distinct from the market-maker-intensive post-close setting studied by Barclay and Hendershott. Retail investors account for 96.5% of after-market turnover on the average stock-day, compared with 80.7% in NXT's main session. This setting permits the after-market price to be evaluated against both the preceding official close and subsequent KRX prices.

The analysis uses three complementary tests. A return regression measures the next-close relation of the close-to-after-market return; a direct price comparison asks whether the after-market VWAP is closer than the KRX close to the next day's valuation; and longer-horizon regressions test persistence and reversal. The corresponding estimates are about 0.90, a 5.7% reduction in next-day mean squared prediction error, and a twenty-day slope of 0.58 after partial reversal. A secondary analysis traces how quickly the relation appears in the next NXT pre-market and KRX opening.

Retail-only stock-days provide a boundary case. They account for 48,633 observations, about 21% of the sample, yet retain a next-close slope near 0.9, a 2.3% prediction-error reduction, and a positive long-horizon relation. The evidence therefore extends beyond markets in which retail investors merely dominate turnover.

These findings complement evidence that retail order flow predicts future returns (Kelley and Tetlock, 2013; Boehmer et al., 2021), that aggressive retail orders can predict subsequent firm-level news (Kelley and Tetlock, 2013), and that retail order flow contributes to price discovery (Chakrabarty et al., 2024). The distinction here is that the object of analysis is the informativeness of transaction prices rather than the information attributable to signed investor flows. Relative to studies of NXT entry and aggregate market quality (Woo, 2026; Kim, 2026; Mun, 2026), the paper focuses on post-close price information, including stock-days with no recorded non-retail executions.

2. Institutional setting, data, and empirical design

2.1 Institutional setting

NXT began trading on 4 March 2025. Its pre-market runs from 08:00 to 08:50, its main session from 09:00:30 to 15:20, and its after-market from a 15:40 opening call through continuous trading to 20:00. NXT pauses around the KRX opening and closing call auctions; the official KRX close is set at 15:30.

Eligible stocks are excluded from KRX's 16:00–18:00 single-price session, although fixed-closing-price and negotiated facilities remain available. NXT is the only venue offering continuous competitive post-close trading in these stocks, through an anonymous order-driven market without designated market makers.

2.2 Data, sample, and price measures

The panel covers 998 stocks over 345 trading dates from 4 March 2025 to 31 July 2026, with 226,424 baseline stock-days. NXT provides session-level trading value and volume by twelve investor categories; FnGuide DataGuide provides KRX prices, turnover, shares outstanding, industry codes, and earnings-disclosure dates. Subsequent returns use corporate-action- and cash-dividend-adjusted KRX closes on the exchange-wide trading calendar.

Session VWAPs are calculated as trading value divided by trading volume and represent volume-weighted average transaction prices over each session. NXT aggregates combine the after-market opening call with subsequent continuous trading. KRX daily VWAP includes opening- and closing-auction trades absent from NXT's main-session average. As a reconstruction check, KRX

VWAP lies within its daily high–low range on 99.90% of stock-days. The after-market VWAP equals the KRX close on only 0.18%, consistent with, although not proving, exclusion of the fixed-closing-price facility. It falls outside the KRX daily range on 5.5% of stock-days, versus 0.008% for NXT’s main-session VWAP.

A stock-day is retail-only when recorded non-retail turnover in NXT’s regular after-market is zero. This refers to executed turnover on day t and does not imply the absence of non-retail orders or constrain subsequent trading composition.

Let C and O denote raw KRX closing and opening prices, C^* the adjusted KRX close, and A , M , V , and P the NXT after-market VWAP, NXT main-session VWAP, KRX daily VWAP, and next-day NXT pre-market VWAP, respectively. Same-day price ratios are unaffected by a common adjustment factor. The price measures and return variables constructed from these prices are defined in Table 1, Panel A; Panel B reports summary statistics for the main price variables and the adjusted next-close return.

The main explanatory variable is the close-to-after-market return.

[Insert Table 1 about here]

2.3 Empirical design

The primary analysis follows the unbiasedness-regression logic used by Barclay and Hendershott (2003) to evaluate after-hours prices. The adjusted next-close return is defined as

$$r_{i,t+1} = \log(C_{i,t+1}^* / C_{it}^*).$$

The baseline regression is

$$r_{i,t+1} = \beta r_{it}^{\text{after}} + \alpha_i + \delta_t + \varepsilon_{it}.$$

The coefficient β measures how much of the close-to-after-market price change is reflected in the subsequent close-to-close return. A value near one indicates an approximately one-for-one relation; a smaller value is consistent with a larger transitory component, although subsequent information arrival can also affect the estimate. Because the specification uses a session VWAP, fixed effects, and adjusted returns, β is interpreted as a conditional measure of price informativeness rather than the structural reliability ratio in Barclay and Hendershott (2003).

Stock and date fixed effects absorb persistent security differences and market-wide movements; standard errors are two-way clustered by stock and date. A second specification adds the KRX close–VWAP gap as a conditioning control. Because the gap may reflect genuine intraday movement, it is not interpreted as closing-price error. Industry-by-day and market-by-size-quintile-by-day fixed effects provide stronger controls for common shocks.

A positive return coefficient does not itself show that the after-market price is a better valuation benchmark. The second test therefore compares the squared next-close return with the squared difference between that return and the after-market return. This directly compares the preceding KRX close and the same evening’s VWAP against the same adjusted next close, using equal stock-day weights and day-clustered inference.

The third core test examines persistence. At horizon h , define $r_{i,t+h} = \log(C_{i,t+h}^* / C_{it}^*)$. This cumulative adjusted return is regressed on the same after-market return using common starting observations. Reversal is estimated directly from $r_{i,t+20} - r_{i,t+1} = \log(C_{i,t+20}^* / C_{i,t+1}^*)$. Because long-horizon windows overlap, inference is supplemented with date-level HAC standard errors indexed by the KRX trading calendar.

A secondary analysis examines timing. The next NXT pre-market price is summarized by $r_{i,t+1}^{\text{pre}}$, and the incremental move after the prior after-market VWAP by $\Delta r_{i,t+1}^{\text{pre}} = r_{i,t+1}^{\text{pre}} - r_{it}^{\text{after}}$. The next-day return is also decomposed into $r_{i,t+1}^{\text{open}}$, the portion reflected by the KRX opening, and $r_{i,t+1}^{\text{intra}}$, the subsequent KRX open-to-close return. A joint opening regression includes both r_{it}^{after} and $r_{i,t+1}^{\text{pre}}$ to assess how much incremental association with the earlier after-market return remains once the later pre-market price is observed.

Retail-only and other stock-days differ in trading activity and firm characteristics. The secondary timing comparison is therefore repeated after matching each retail-only observation one-to-one without replacement to another day of the same stock within ± 30 KRX trading days. Matching imposes calipers of 0.5 and 0.7 on the absolute differences in log after-market and main-session turnover, respectively, and uses standardized Euclidean distance based on log after-market turnover, log main-session turnover, log market capitalization, $\log(\text{HIGH}/\text{LOW})$, and the absolute after-market return. Outcomes are not used. The comparison is descriptive for the overlap sample, not a causal estimate of investor composition or trading conditions.

As a diagnostic, the after-market return is also decomposed into the after-market–main-session, main-session–KRX VWAP, and KRX close–VWAP price differences. The identity adds no identifying variation.

$$r_{it}^{\text{after}} = g_{it}^{\text{after-main}} + g_{it}^{\text{main}} - g_{it}^{\text{close}}$$

3. Results

3.1 Market characteristics and sample composition

The after-market accounts for 17.4% of NXT turnover; its mean and median retail shares are 96.5% and 98.8%, with a 93.0% value-weighted share (Table 2). For a fixed 408-stock sample, the extended-hours share of NXT turnover rises from 16.9% in March 2025 to 40.8% in July 2026 (Figure 1).

Retail-only observations number 48,633, or 21.5% of the sample. Their median after-market turnover and market capitalization are substantially lower than on other days, motivating the matched timing comparison.

[Insert Table 2 and Figure 1 about here]

3.2 Next-day price informativeness and accuracy

The baseline next-close slope is 0.8927 ($t = 33.29$; Table 3A). Adding the KRX close–VWAP gap leaves it essentially unchanged at 0.8955 ($t = 31.95$), while the gap itself is insignificant. The component diagnostic gives 0.8960 for the after-market–main-session gap, 0.8769 for the main-session–KRX VWAP gap, and -0.8810 for the KRX close–VWAP gap. Their similar magnitudes,

with the accounting signs, support using the close-to-after-market return as a compact summary of the relation.

The retail-only slope is 0.9145 ($t = 20.02$; Table 3B). Other retail-share bins also have positive coefficients without a monotonic pattern; industry-by-day effects leave the retail-only estimate at 0.8923, while the common-FE interaction is insignificant. The key result is a positive retail-only relation, not equivalence.

A daily cross-sectional estimator closer to Barclay and Hendershott (2003) gives 0.810 using the final NXT price, versus their U.S. range of 0.45–0.60 (Table 3C).

Direct price comparisons reinforce the regression evidence (Table 3D). Replacing the preceding KRX close with the after-market VWAP reduces next-day mean squared prediction error by 5.68% overall ($t = 4.51$) and 2.28% on retail-only days ($t = 2.65$). RMSE falls from 3.97% to 3.85% and from 2.69% to 2.66%, respectively. This directly compares two observed prices against the same subsequent valuation.

[Insert Table 3 about here]

3.3 Persistence and reversal

The full-sample slope declines from 0.8955 at $t+1$ to 0.5808 at $t+20$, retaining about 65% of the next-day relation (Figure 2; Table 4A). The directly estimated post-day-one change is -0.3147 ($t = -3.84$) and remains significant with date-level HAC errors.

[Insert Figure 2 about here]

Retail-only long-horizon slopes remain positive, but reversal is less stable across specifications. With common fixed effects, the twenty-day slope is 0.8591 and the post-day-one change is 0.0053 (95% interval $[-0.395, 0.406]$); group-specific effects give 1.1272 and 0.2127 ($t = 1.14$). The between-group reversal difference is sensitive to covariance estimation. Tail treatments in Table 4B likewise support a positive retail-only long-horizon relation, not a distinct reversal path.

3.4 Timing of subsequent adjustment

Timing affects the economic interpretation because it determines how much predictable adjustment remains after the after-market price is observed. In the full sample, opening and intraday slopes are 0.973 and -0.078 , summing to the 0.896 next-close slope (Table 4C). In a joint opening regression, the prior after-market and next-morning pre-market coefficients are 0.1173 and 0.8166. Thus, most of the relation is reflected before or by the KRX opening, leaving little systematic same-direction adjustment during the regular session.

Retail-only observations reach a similarly strong positive next-close relation through a different raw short-run path. Their next-close slope is 0.9145, close to the full-sample estimate. Yet the after-market-to-pre-market incremental-return coefficient is -0.2038 ($t = -6.04$) on retail-only days, compared with 0.0616 ($t = 2.92$) on other stock-days, while the retail-only opening and intraday slopes are 0.682 and 0.232. Part of the after-market move is therefore unwound before the KRX opening and the positive relation is subsequently rebuilt during regular trading. Relative to the full sample, more of the next-close relation remains to emerge after the pre-market and opening

on retail-only days; the difference concerns the short-run path of incorporation rather than the eventual informativeness of the retail-only price.

Yet the pre-market and opening differences fall to 0.0046 and 0.0084 after same-stock matching (Table 4D), and retail share has no monotonic relation with the pattern. The raw timing difference therefore cannot be attributed to retail participation itself. The descriptive analysis also does not identify its mechanism or establish realizable abnormal profits.

[Insert Table 4 about here]

3.5 Robustness and heterogeneity

The next-close relation survives stronger common-shock controls and alternative after-market price measures (Table 5). Industry-by-day and market-by-size-quintile-by-day effects leave slopes between 0.873 and 0.889. The final NXT after-market price gives 0.823, and its deviation from the session VWAP adds information when entered jointly with the VWAP-based after-market return.

The relation is also positive outside earnings windows, on retail-only non-announcement days, under tail and panel restrictions, across calendar exclusions and all three subperiods, and across after-market turnover quintiles.

[Insert Table 5 about here]

4. Conclusion

This paper uses the launch of Nextrade to connect two strands of price-discovery research: the informativeness of prices formed outside regular trading hours and the information contained in retail-dominated trading. NXT provides an unusual setting in which continuous post-close trading takes place in an anonymous order book while retail investors account for more than 96% of after-market turnover, with no recorded non-retail executions on about one-fifth of stock-days.

The evidence shows economically substantial price informativeness. A one-percentage-point higher return from the KRX close to the after-market VWAP is associated with about a 0.90-percentage-point higher return to the next KRX close, and the relation is similarly strong on retail-only days. The after-market VWAP also predicts the next day's valuation more accurately than the preceding KRX close, while a substantial positive relation remains after twenty trading days despite partial reversal in the full sample. These findings survive stronger common-shock controls, alternative price measures, announcement exclusions, liquidity splits, and sample restrictions. Timing provides an important qualification: most of the relation is already reflected in the next NXT pre-market or by the KRX opening, leaving little systematic same-direction adjustment during the regular session. Retail-only days show a different raw short-run path, but the timing difference disappears in matched same-stock comparisons and therefore cannot be attributed to retail participation itself.

The results extend evidence on after-hours price discovery to a retail-dominated, order-driven setting and are consistent with prior findings that retail trading can contain information relevant for price formation (Kelley and Tetlock, 2013; Boehmer et al., 2021; Chakrabarty et al., 2024). In Korea, they complement Woo (2026), who documents price discovery between NXT pre-market

and KRX opening prices. The analysis does not establish that retail investors possess private information, that retail trading causally improves informational efficiency, or that the observed short-horizon relations generate implementable abnormal profits. Rather, it shows that transaction prices formed predominantly—and, on many days, exclusively in recorded executions—by retail investors can provide economically meaningful, accurate, and persistent information about subsequent market valuation.

Table 1. Variable definitions and summary statistics

Panel A. Variable definitions and price measures

Variable	Definition
r_{it}^{after}	Return from the KRX close to the NXT after-market VWAP, $\log(A/C)$
$r_{i,t+1}^{\text{pre}}$	Return from the day-t KRX close to the next NXT pre-market VWAP, $\log(P_{i,t+1} / C_{it})$
$\Delta r_{i,t+1}^{\text{pre}}$	Incremental return from the after-market VWAP to the next NXT pre-market VWAP, $r_{i,t+1}^{\text{pre}} - r_{it}^{\text{after}} = \log(P_{i,t+1} / A_{it})$
$g_{it}^{\text{after-main}}$	Difference between NXT after-market and main-session VWAPs, $\log(A/M)$
g_{it}^{main}	Difference between the NXT main-session VWAP and KRX daily VWAP, $\log(M/V)$
g_{it}^{close}	Difference between the KRX close and KRX daily VWAP, $\log(C/V)$
$r_{i,t+1}$	Adjusted return from the day-t KRX close to the next KRX close, $\log(C_{i,t+1}^* / C_{i,t}^*)$
$r_{i,t+1}^{\text{intra}}$	Next-day KRX open-to-close return, $\log(C_{i,t+1} / O_{i,t+1})$
$r_{i,t+1}^{\text{open}}$	Portion of the next-close return reflected by the KRX opening, $r_{i,t+1} - r_{i,t+1}^{\text{intra}}$

Panel B. Summary statistics of main price variables and adjusted next-close return ($\times 100$)

	Mean	SD	p5	p25	Median	p75	p95
r^{after}	-0.006	0.926	-0.999	-0.294	-0.014	0.249	0.905
$g^{\text{after-main}}$	-0.060	1.588	-2.330	-0.676	-0.040	0.574	2.089
g^{main}	0.022	0.340	-0.375	-0.098	0.010	0.129	0.446
g^{close}	-0.032	1.313	-1.999	-0.606	-0.011	0.581	1.873
r_{t+1}	0.034	3.967	-5.628	-1.792	-0.111	1.575	6.313

Panel A defines the price measures and return variables used in the analysis. Panel B reports selected log-return variables in percentage points ($\times 100$) for the baseline estimation sample; SD denotes standard deviation and p5, p25, p75, and p95 denote the corresponding percentiles.

Table 2. Market characteristics and sample composition

Panel A. NXT sessions and investor composition, 4 March 2025 – 31 July 2026, 998 stocks

Session	Hours	Share of NXT turnover	Retail share (mean)	Retail share (median)	Retail share (value-wtd)
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Pre-market	08:00–08:50	21.5%	0.895	0.921	0.874
Main market	09:00:30–15:20	61.2%	0.807	0.815	0.827
After-market	15:40–20:00	17.4%	0.965	0.988	0.930
Outside KRX regular hours (pre + after)	—	38.8%			

Panel B. Retail-only versus other stock-days (medians unless noted)

	Retail-only	Other
Stock-days	48,633	177,791
After-market turnover (KRW mn)	32.4	360.0
Main-session NXT turnover (KRW mn)	249.5	1,965.3
Market capitalization (KRW bn)	337.9	864.9
Within ± 1 day of an earnings announcement	5.69	7.23
after-market return (%)	0.222	0.288
next-day return (%)	1.201	1.871

Hours are execution windows. NXT accepts after-market orders from 15:30 but the first execution is a call auction at 15:40; order acceptance is suspended 08:50–09:00:30 and 15:20–15:30 while KRX runs its call auctions. Retail share is the retail fraction of session turnover; means and medians are taken across stock-days, and the value-weighted column is the aggregate share. A stock-day is retail-only when non-retail turnover in NXT's regular after-market is exactly zero; the maximum recorded value in that group is 0 won and the smallest positive value elsewhere is 944 won. The after-market VWAP lies outside the KRX daily high–low range on 5.5% of stock-days, against 0.008% for the NXT main-session VWAP.

Table 3. Next-day price informativeness and valuation accuracy

Panel A. Baseline after-market return and price-component diagnostic

	(1) Baseline	(2) + close–VWAP gap	(3) Component diagnostic
r^{after}	0.8927 (33.29)	0.8955 (31.95)	
$g^{\text{after-main}}$			0.8960 (31.84)
g^{main}			0.8769 (16.94)
g^{close}		0.0155 (0.54)	–0.8810 (–26.65)
Within R^2	0.0532	0.0533	0.0533
N	226,424	226,424	226,423

Panel B. Mutually exclusive bins by after-market retail share

After-market retail share	β	t	N
100% (no non-retail executions)	0.9145	20.02	48,633
99% to below 100%	1.0017	23.88	57,742

95% to below 99%	1.0538	27.00	73,839
Below 95%	0.8186	23.05	46,210

Panel C. Barclay–Hendershott benchmark: daily cross-sectional slopes

	Slope	t
Korea, post-close: final NXT price (20:00)	0.810	39.0
U.S. Nasdaq 2000, post-close (Barclay–Hendershott)	0.45–0.60	—

Panel D. Next-day valuation accuracy without fitted forecasting coefficients

Sample	N	MSE decrease (%)	KRX RMSE (%)	NXT RMSE (%)	t (day cluster)
All stock-days	226,424	5.68	3.97	3.85	4.51
Retail-only	48,633	2.28	2.69	2.66	2.65

Panels A and B report t-statistics from stock/date two-way clustered CR0 standard errors and include stock and date fixed effects. Panel A column (1) is the baseline after-market return; column (2) adds the KRX close–VWAP gap; column (3) is the price-component diagnostic described in Section 2.3. Panel B estimates the after-market-return coefficient separately within each retail-share bin, controlling for the KRX close–VWAP gap. Panel C averages daily cross-sectional slopes without fixed effects and its t-statistic is time-series based; U.S. values are from Figure 6 of Barclay and Hendershott (2003) for 250 high-volume Nasdaq stocks in 2000, and the comparison is descriptive. The NXT after-market session VWAP gives 0.898 under the same daily cross-sectional estimator. Panel D compares $r_{i,t+1}^2$ with $(r_{i,t+1} - r_{it}^{\text{after}})^2$, using equal stock-day weights. Its t-statistic tests the mean paired loss difference with day-clustered errors. RMSE is in percentage points of log return, not investment profitability.

Table 4. Persistence and reversal with supplementary timing evidence

Panel A. Main long-horizon estimates and formal group comparison

Specification / group	β at t+1	β at t+20	Change: t+1 to t+20
Full sample	0.8955 (31.95)	0.5808 (7.16)	−0.3147 (−3.84)
Retail-only (separate regression)	0.9145 (20.02)	1.1272 (5.93)	0.2127 (1.14)
Common FE: other stock-days	0.8978 (31.07)	0.5749 (6.92)	−0.3230 (−3.85)
Common FE: retail-only (linear combination)	0.8538 (18.29)	0.8591 (4.11)	0.0053 (0.03)
Common FE: group difference	−0.0441 (−0.86)	0.2842 (1.33)	0.3283 (1.57)

Panel B. Sensitivity of long-horizon estimates to tail treatments (common fixed effects)

Treatment / group	N	β at t+1	β at t+20	Change	95% CI of change
Winsorized 1/99%: retail-only	226,424	0.8774 (20.21)	0.8256 (4.37)	−0.0518 (−0.28)	[−0.413, 0.309]
Winsorized 1/99%: group difference	226,424	−0.2035 (−4.04)	0.1433 (0.67)	0.3467 (1.67)	[−0.060, 0.754]
$ r^{\text{after}} < 5\%$: retail-only	225,343	0.8486 (18.69)	0.8330 (3.88)	−0.0156 (−0.07)	[−0.425, 0.394]
$ r^{\text{after}} < 5\%$: group difference	225,343	−0.1095 (−1.94)	0.2612 (1.11)	0.3707 (1.61)	[−0.081, 0.822]

Notes for Panels A and B. Parentheses report t-statistics from stock/date two-way clustered CR0 standard errors. All horizon regressions use the same starting observations. Panel A reports the full-sample estimate and the separate retail-only regression first, followed by the formal group comparison from a common-fixed-effect specification. The common-effects model includes the after-market return, the KRX close–VWAP gap, a retail-only indicator, and the after-market return $\times$ retail-only interaction, with common stock and date fixed effects; the retail-only coefficient is the corresponding linear combination. The change outcome is $r_{i,t+20} - r_{i,t+1} = \log(C^*_{i,t+20}/C^*_{i,t+1})$. Panel B applies alternative tail treatments to the common-effects specification. Under winsorization, the after-market return, close–VWAP gap, and both horizon outcomes are capped at pooled 1st and 99th percentiles on the same starting sample; under trimming, a single $|r^{\text{after}}_{it}| < 5\%$ mask applies at both horizons.

Table 4. Persistence and reversal with supplementary timing evidence (continued)**Panel C. Timing of subsequent adjustment**

Sample	Opening slope	Intraday slope	Next-close slope
All stock-days	0.973 (47.8)	-0.078 (-3.4)	0.896 (32.0)
Retail-only	0.682 (19.3)	0.232 (5.2)	0.914 (20.0)
Joint opening regression, full sample			
Regressor	β	t	N
Prior after-market return	0.1173	3.91	222,802
Next-morning pre-market return	0.8166	27.83	222,802

Panel D. Same-stock matching: retail-only minus other timing differences

	Before matching	After matching
Retail-only minus other: after-market $\rightarrow$ next pre-market coefficient	-0.2657 (-7.24)	0.0046 (0.11)
Retail-only minus other: opening coefficient	-0.2939 (-8.05)	0.0084 (0.21)

Notes for Panels C and D. Panel C first reports coefficients on the after-market return from separate opening, intraday, and next-close regressions, each controlling for the KRX close-VWAP gap and using stock and date fixed effects with stock/date two-way clustered CR0 standard errors. The three timing outcomes use a common sample. The joint-opening block then includes both the prior after-market return and the next-morning NEXT pre-market return, together with the close-VWAP gap; N = 222,802. Panel D reports retail-only-minus-other slope differences before and after the same-stock match. The pre-market row uses the incremental return from the after-market VWAP to the next pre-market and retains 31,029 original matched pairs with pre-market observations on both dates; the opening row uses the full 31,881-pair matched sample. Matching is 1:1 greedy nearest-neighbor without replacement within the same stock and ± 30 KRX trading days, with calipers of 0.5 and 0.7 on the absolute differences in log after-market and main-session turnover and standardized Euclidean distance based on log after-market turnover, log main-session turnover, log market capitalization, log(HIGH/LOW), and the absolute after-market return; outcomes are not used. The full matched sample spans 958 stocks, retains 65.6% of retail-only observations, and has all five absolute standardized mean differences below 0.05. Separate matched next-close slopes are 0.9009 for retail-only observations and 0.8952 for matched other observations. All matched comparisons are descriptive for the overlap subsample.

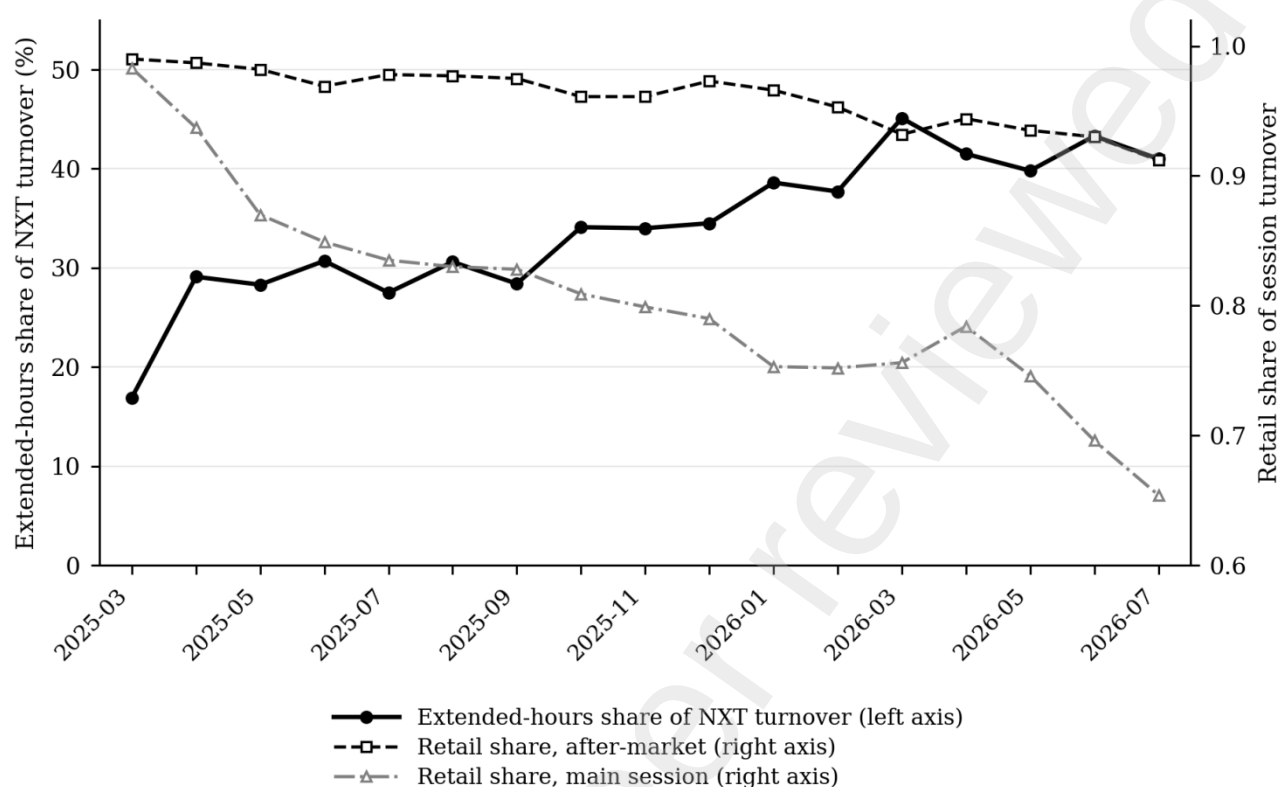
Table 5. Robustness and heterogeneity

Specification	β	t	N
Baseline (after-market return; close–VWAP gap controlled)	0.8955	31.95	226,424
Common-shock controls			
Industry (KSIC 2-digit, 60) $\times$ date fixed effects	0.8728	36.71	226,424
Market $\times$ size-quintile $\times$ date fixed effects	0.8888	34.53	226,424
Retail-only checks			
Retail-only, industry $\times$ date FE	0.8923	18.58	48,633
Retail-only interaction, common fixed effects	−0.0441	−0.86	226,424
Alternative after-market price measures			
Return to final NXT after-market price (20:00)	0.8226	29.66	226,424
KRX close $\rightarrow$ after-market VWAP	0.8918	32.38	226,424
Final price relative to session VWAP	0.6065	10.77	226,424
Information events			
Non-announcement days (93.1%)	0.8769	29.41	210,796
After-market return $\times$ announcement	0.1675	2.80	226,424
Retail-only and non-announcement days	0.8771	19.87	45,867
Stability across time and liquidity			
2025.03–2025.08 / 2025.09–2026.02 / 2026.03–2026.07	0.936 / 0.925 / 0.856	26.9 / 18.9 / 17.5	—
After-market turnover quintiles Q1–Q5	0.686 / 0.871 / 1.030 / 1.059 / 0.988	15.3–34.1	—
Excluding March 2025 phase-in	0.8959	31.86	223,279
Excluding 20–31 December (calendar window)	0.8982	31.79	222,719
Outliers and sample restrictions			
Winsorized 1/99%	1.0617	28.30	226,424
Absolute after-market return $< 5\%$	0.9485	23.38	225,343
Stocks with ≥ 250 trading days (463)	0.8708	24.07	149,213

Unless otherwise indicated, β is the coefficient on the after-market return with the KRX close–VWAP gap controlled.

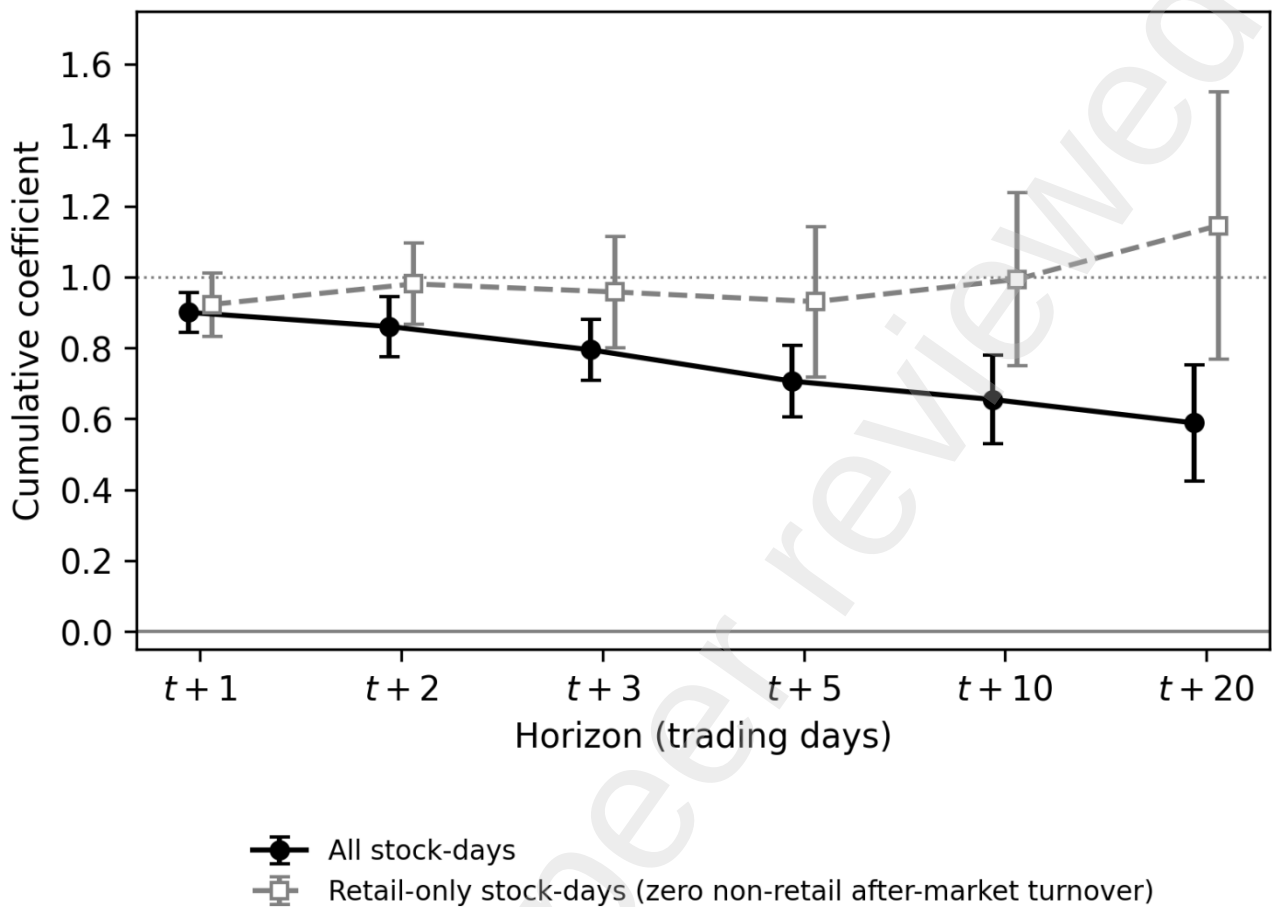
Regressions include stock and date fixed effects with two-way stock/date-clustered standard errors unless alternative date effects are indicated. The retail-only interaction row reports the after-market return $\times$ retail-only interaction rather than a level slope. The two final-price component rows enter jointly, alongside the KRX close–VWAP gap, and correspond to $\log(A/C)$ and $\log(P20:00/A)$, respectively. Earnings windows combine preliminary-release and report-filing dates mapped to the nearest KRX trading date and expanded by one trading day on either side. For the subperiod and turnover-quintile rows, coefficients and t-statistics are reported in sequence. The December exclusion is a calendar-window check rather than an exact exclusion of ex-dividend dates.

Figure 1. Growth of NXT's extended-hours sessions and investor composition



Monthly series for a fixed sample of 408 stocks traded on NXT on at least 300 days, so that the trend is not driven by changes in the tradable universe. The left axis reports the combined pre-market and after-market share of NXT turnover, that is, the share falling outside KRX regular trading hours; the right axis reports the retail fraction of session turnover, averaged across stock-days.

Figure 2. Persistence of the after-market price relation



Coefficients from regressions of corporate-action- and cash-dividend-adjusted KRX cumulative returns from day t to $t+h$ on the after-market return, controlling for the KRX close–VWAP gap and stock and date fixed effects. All horizons use common starting observations. Full-sample and retail-only regressions are estimated separately; the retail-only series therefore corresponds to the group-specific fixed-effect specification in Table 4A. Bars show 95% confidence intervals from stock/date two-way clustered CR0 standard errors. Retail-only status is defined using NXT after-market executions on day t and does not constrain investor composition over the subsequent horizon. The wider retail-only intervals at longer horizons imply that the figure documents persistence rather than a precisely estimated difference in reversal.

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Data availability

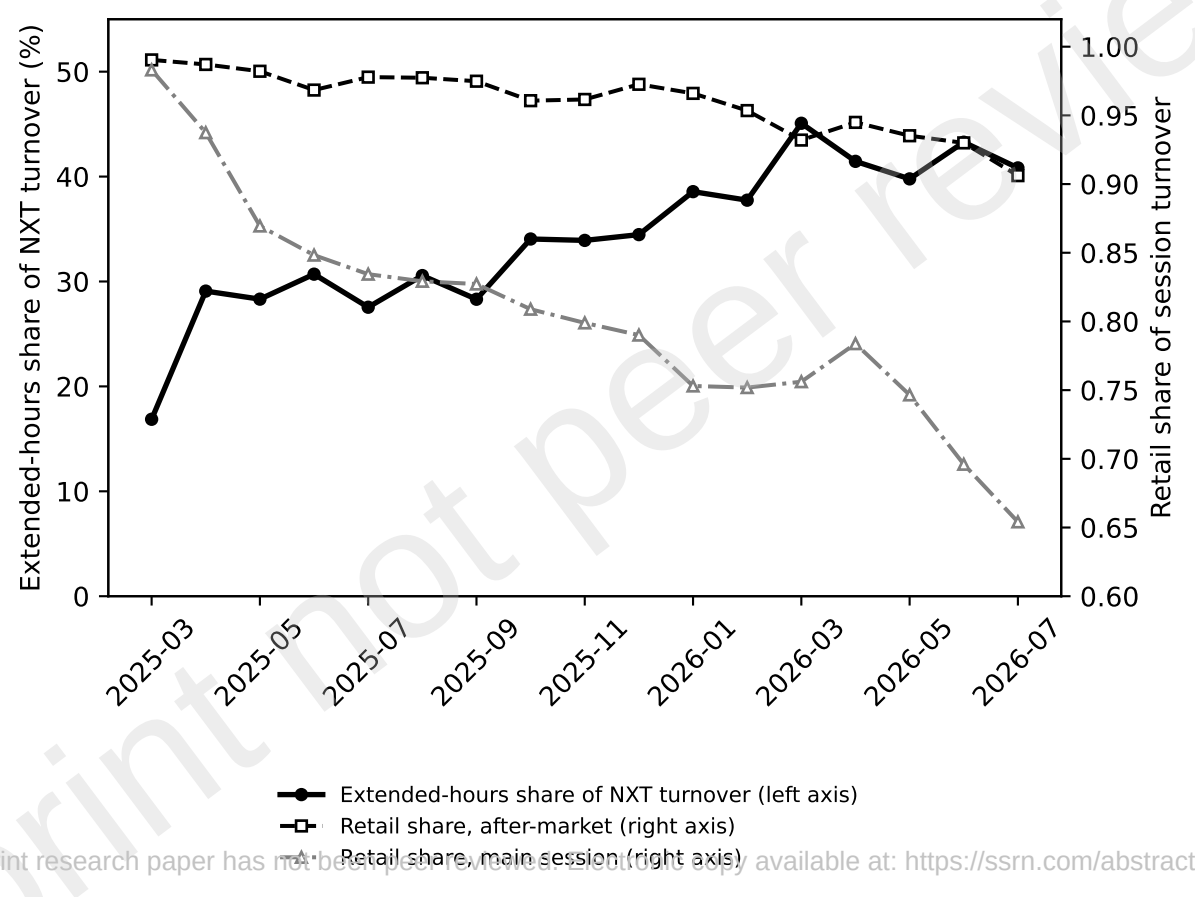
The session-level investor-category trading data used in this study were obtained from Nextrade under a data agreement and cannot be publicly redistributed. KRX market data and disclosure dates are commercially available from FnGuide DataGuide. The analysis code may be made available upon reasonable request. The derived analysis panel may also be made available upon reasonable request, subject to consultation with Nextrade (NXT) and the terms of the underlying data agreement.

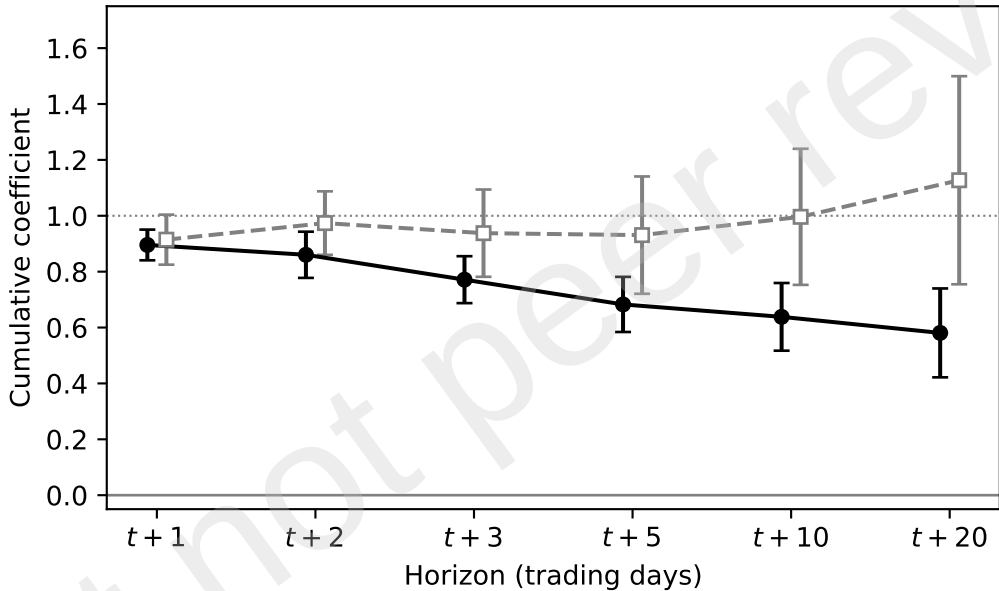
Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work, the author used ChatGPT (OpenAI) and Claude (Anthropic) for language editing and coding assistance. The research design, data construction, empirical specifications, and interpretation were developed by the author. The author reviewed and edited all AI-assisted output, verified the reported results, and takes full responsibility for the content of the published article.

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—●— All stock-days
- -□- - Retail-only stock-days