

July 11, 2026

Ms. Vanessa A. Countryman
Secretary
U.S. Securities and Exchange Commission
100 F Street NE
Washington, DC 20549-1090

Submitted via `rule-comments@sec.gov`

Re: File No. SR-CBOE-2026-032; Release No. 34-105247 (Notice of Filing of a Proposed Rule Change To Amend Its Rules Related to Binary Options)

Dear Ms. Countryman:

We are academic researchers in financial economics at Stanford University and Singapore Management University. We write to place before the Commission empirical evidence directly relevant to its evaluation of the proposed rule change, which would permit Cboe Exchange, Inc. to list binary options on any index on which it may list traditional options, permit both A.M.- and P.M.-settlement for binary index options, and apply position limits on a per-expiration basis. Our comments draw on our research paper, “Settlement Manipulation in Prediction Markets” (<https://ssrn.com/abstract=7028398>), which provides, to our knowledge, the first systematic empirical evidence on settlement manipulation in fixed-payout (binary) contracts written on asset prices. The views expressed here are our own and not those of our institutions.

We do not oppose the proposal. Fixed-payout contracts can serve legitimate hedging and information-aggregation purposes, and the Commission has recently approved similar products. We write because our evidence speaks to the question Section 6(b)(5) of the Exchange Act requires the Commission to answer: whether the exchange’s rules are “designed to prevent fraudulent and manipulative acts and practices.” For binary contracts settling on market prices, the answer turns on specific, identifiable design parameters: the settlement benchmark, the depth of the underlying market, the expiration horizon, and the position limits. Our findings show what happens when those parameters are set permissively, and they identify which parameters do the work.

Why binary payoffs concentrate manipulation incentives at settlement

A binary option pays a fixed amount if the underlying reference value is on one side of the strike at expiration and nothing otherwise. Near the strike, in the final moments before settlement, an arbitrarily small movement in the reference price determines the entire payout. A trader holding binary positions therefore has an incentive to trade the underlying market in the settlement window: the cost of pushing the reference price scales with the depth of the underlying, while the payoff from a successful push is the fixed settlement amount times the position. This is the cash-settlement manipulation identified in the theoretical literature three decades ago (Kumar and Seppi, 1992, *Journal of Finance*), now embedded in retail-scale products. Whether the incentive translates into actual manipulation depends on the design parameters above. Until

recently there was no direct evidence, because settlement manipulation requires observing both the derivative positions and the underlying trading at high frequency. Our study provides that evidence.

What we document

Polymarket, a blockchain-based prediction market, launched a five-minute Bitcoin “up or down” contract on February 12, 2026: a binary claim paying \$1 if Bitcoin is higher at the close of a five-minute window than at its open. The contract settles against a Chainlink oracle that aggregates prices across major spot exchanges; the Bitcoin price on Binance, the largest venue, tracks that benchmark to within a few basis points. Because every trade settles on a public blockchain, each position and each trader (wallet) is observable, a transparency that permits direct attribution of manipulation profits. No five-minute contract existed before the launch date, and fifteen-minute and four-hour versions launched earlier, so the setting provides both a clean before/after comparison and a comparison across contract horizons. Our sample covers roughly 16,000 five-minute cycles and 243,000 distinct traders over two months.

Four findings are relevant to the Commission’s evaluation:

1. **Order flow migrates to the settlement window.** After the five-minute contract launched, net order flow on Binance in the final ten seconds before each settlement rose by about 50 percent relative to the pre-launch baseline, and the associated price moves reverse within seconds after settlement. Information-driven trading does not revert; a manipulative push does. The reversal is about a tenth of the final-seconds price move on average, and about a quarter in the cycles where the contract was priced near even odds, exactly where a push is most likely to determine the outcome.
2. **Pushes change outcomes.** In cycles the market priced at 90 to 100 percent for one side just before the close, a late push against the favored side overturned the outcome 34 percent of the time, against 1 percent in cycles without such a push.
3. **The profits are concentrated and the losses fall on retail.** The traders who profit in the roughly 1,600 cycles our procedure flags as manipulated number 821 wallets, about one in three hundred participants; they captured \$8.2 million in those cycles while breaking even elsewhere. Ninety-three percent of the corresponding losses fell on retail accounts.
4. **Horizon is the operative design lever.** The same platform’s fifteen-minute contract, settling on the same oracle for the same asset, shows a settlement-window activity elevation of only about 7 percent (against 50 percent for the five-minute contract) and no detectable post-settlement reversal. A longer horizon aggregates more ordinary information before the close and makes a fixed-size push far less likely to be pivotal. The manipulation signature is sharp at five minutes and largely absent at fifteen.

Implications for the proposed rule change

Our setting differs from the proposal’s in ways we want to acknowledge plainly: we study cryptocurrency contracts with five-minute horizons settling on an oracle price, while the proposal concerns index options with standard expirations settling on exchange-determined values. We

do not suggest that binary options on the S&P 500 at daily horizons are readily susceptible to manipulation today; moving a deep index for a sustained window is orders of magnitude more expensive than moving Bitcoin on one exchange for ten seconds. Rather, our evidence identifies the gradient along which manipulation risk grows: thinner underliers, shorter horizons, and settlement values that concentrate determination into a narrow window. The breadth of the proposal is what makes that gradient relevant. We respectfully suggest the Commission address the following in its order:

1. **Settlement benchmark design.** The proposal would permit both A.M.- and P.M.-settlement for all binary index options. Settlement values determined in a single closing print or narrow window are the classic locus of expiration-day pressure; auction-based and time-averaged benchmarks raise the cost of a determinative push. We encourage the Commission to make explicit findings on why the settlement values contemplated are robust to settlement-window pressure from binary positions, particularly for P.M.-settled series.
2. **Breadth across indexes.** The proposal extends binary listing authority to *any* index on which Cboe may list traditional options. The cost of moving an index scales with the liquidity of its components. Broad-based, deep indexes are expensive to move; narrower indexes are not. We suggest the Commission consider whether liquidity-based criteria should govern which indexes may underlie binary series, or whether narrower indexes warrant separate evaluation.
3. **Position limits as the structural safeguard.** Because a manipulator’s rational budget for moving the underlying is bounded by the fixed payout on the position, position limits are the primary structural control on settlement pressure. The economically relevant quantity is the ratio of the maximum aggregate binary payout at a given expiration to the cost of moving the settlement value; we encourage the Commission to evaluate the proposed per-expiration limits in those terms, rather than by analogy to limits on conventional options, whose payoffs do not jump at the strike.
4. **Horizon creep.** In crypto markets, binary contract horizons compressed from daily to hourly to fifteen minutes and then to five minutes within months, and the manipulation we document arrived with the shortest horizon. If the Commission approves the proposal, we respectfully suggest the order make clear that materially shorter expirations (for example, intraday series) would require a separate filing and analysis rather than fall within the generic authority granted here.
5. **Cross-market surveillance.** Settlement manipulation of a binary contract occurs in the *underlying* market, not on the exchange listing the binary. Surveillance confined to the options market will not observe it. We encourage the Commission to satisfy itself that intermarket surveillance arrangements are specifically keyed to trading in the underlying components during settlement windows of binary series.

Conclusion

The empirical record on binary contracts settling on financial prices is young. Our study supplies direct evidence that when the design parameters are permissive, settlement manipulation is not hypothetical: it is measurable, systematic, profitable to a small group, and paid for by retail participants, and it degrades price discovery in the underlying market even as measured liquidity

improves. None of this condemns the product class; it identifies the parameters on which the Section 6(b)(5) analysis should focus. We appreciate the Commission's consideration and would be glad to provide the underlying study, data construction details, or further analysis upon request.

Respectfully submitted,

David Dai

Department of Management Science and Engineering, Stanford University
`htdai@stanford.edu`

Ruizhe Jia

Department of Management Science and Engineering, Stanford University
`ruizhe@stanford.edu`

Shihao Yu

Lee Kong Chian School of Business, Singapore Management University
`shihaoyu@smu.edu.sg`