

Priced as If Too Volatile

The Favorite–Longshot Bias in Prediction Markets and Its Collapse

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ABSTRACT Prediction-market prices are read as probabilities, and the favorite–longshot bias, the overpricing of unlikely outcomes, is the main reason to doubt that reading. Many prediction-market contracts pay what portfolios of options pay, so option prices can benchmark them without waiting for outcomes. Until mid-2025 the two largest prediction markets priced Bitcoin and Ether longshots well above Deribit’s options: Polymarket by about a quarter, on its bid and its ask alike, and Kalshi through a wide spread charged to buyers. Polymarket’s range events show the form of the bias. Within an event an open-ended tail cost on average 1.55 cents more than an interior range of similar probability, about what a distribution 7% wider than the options’ implies, while no rule that distorts each bet’s own probability produces any difference. Selling the premium and hedging it tightly with options lost money. Then each venue’s premium fell at a time of its own: Polymarket’s by about 90% within weeks in the summer of 2025, each payoff repricing as a narrower distribution implies, and Kalshi’s by more than half on 6 November 2025, a month after its quoted spreads narrowed. A pricing convention among dealers, inside a band set by hedging costs, fits the premium’s persistence and its fall. On US stocks the same test finds a weaker tail premium; on Kalshi’s currency ranges it points, tentatively, to a premium on each bet’s own probability.

KEY FINDINGS

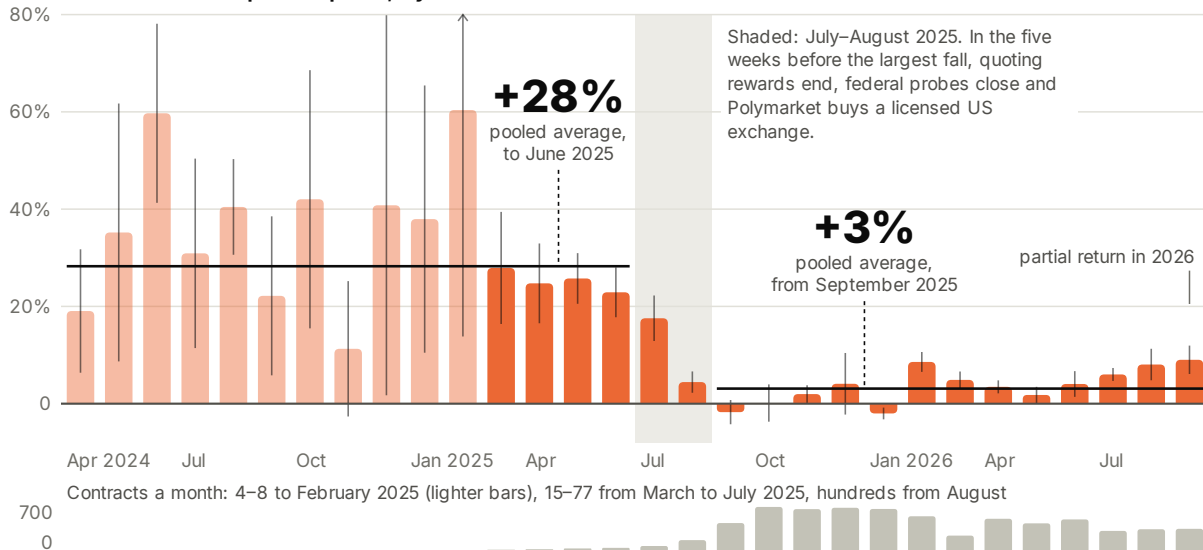
- 1 Longshots above the options on both venues.** Until June 2025, longshots that Deribit’s options priced at 2–15% traded 23–28% above that price on Polymarket, or 1.8–2.2¢ per \$1, and sellers received 2.1¢ and buyers paid 2.9¢ more than the options’ price. Kalshi’s quotes put the bid at about the options’ price and the ask 4.5¢ above it (Figures 1 and 2).
- 2 On Polymarket the premium sat in the tails.** On average within an event, an open-ended tail (such as “below \$79,000” in Figure 3) cost 1.55¢ more than an interior range of similar probability (such as “\$79,000–81,000”). A distribution 7% wider than the options’ predicts 1.75¢; overweighting each bet’s probability predicts none (Figure 4).
- 3 Each venue’s premium fell at a time of its own.** The volatility implied by Polymarket’s prices fell from 11% above the options’ to 1% above within about two months, with the largest step in the week of 28 July 2025, while Kalshi’s premium, if anything, rose. A break test dates Kalshi’s fall to 6 November 2025, from 2.3¢ to 1.0¢, its quoted bid and ask falling together a month after its quoted spreads narrowed (Figures 1D, 5 and 7).
- 4 No free lunch.** On average 84% of the price effect of a move in the options’ implied volatility reached Polymarket within a day, yet selling at its bid with a tight option hedge still lost 0.5–1.7¢ (Figures 6 and 8).
- 5 A test that can say no.** On Polymarket’s ranges on nine US stocks a tail cost 0.72¢ more than an interior outcome, a weaker version of the crypto result. On Kalshi’s EUR/USD and USD/JPY ranges the same comparison points, tentatively, to a premium on each bet’s own probability (Figures 2 and 10).

Keywords: favorite–longshot bias; prediction markets; option-implied state prices; market making. JEL: G13, G14, G41, D84.

Until mid-2025, Polymarket priced crypto longshots about a quarter above the options market. Within weeks, the premium fell to 3%.

Polymarket's price of the unlikely side of each Bitcoin and Ether contract over the price of the same payoff in Deribit's options, monthly, for sides the options priced at 2–15%, more than a day before resolution. Whiskers ± 2 standard errors; arrows where the scale cuts them off.

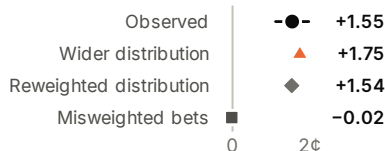
A Premium over the options' price, by month



B It sat in the tails

+1.55¢

more for an open-ended tail than for an interior range of the same probability, in the same event



Misweighting each bet's probability predicts no difference.

C Bid and ask both above

+2.1¢ / +2.9¢

over the options' price, received by sellers / paid by buyers on Polymarket before mid-2025. On Kalshi only buyers paid it.



D Only Polymarket's price moved

-1.76¢

change in Polymarket's price of the same contracts, eight weeks either side of 28 July 2025, against -0.14¢ for the options



Risk appetite, ETF flows and attention do not explain the fall.

Figure 1. The Polymarket episode at a glance

Notes: Panel A: Bitcoin and Ether threshold contracts on Polymarket, on the unlikely side of each contract when the options priced it at 2–15%, more than a day before resolution. The premium is the monthly mean of Polymarket's price minus the options' price, divided by the mean options' price, in calendar time (on the variance clock, 23% before and 3% after); whiskers are ± 2 standard errors clustered by day and event. Months before March 2025 rest on four to eight contracts each. Panel B: [Section 4](#). Panel C: takers' fills, [Section 6](#). Panel D: the same contracts in the eight weeks either side of 28 July 2025, [Section 5](#).

1 Introduction

In March 2026 Kalshi and Polymarket, the two largest prediction markets, traded \$13.1 billion and \$10.6 billion of contracts (DeFi Rate, 2026), and journalists, economists and policymakers read their prices as probabilities (Wolfers and Zitzewitz, 2006; Diercks et al., 2026). For unlikely events the main reason to doubt that reading is the favorite–longshot bias, one of the oldest regularities of betting markets: longshots are overpriced, so bets on them return less per dollar than bets on favorites (Griffith, 1949; Thaler and Ziemba,

1988). Two questions about the bias have been hard to settle. One is its form: do prices overweight the probability of each unlikely bet, or do they come from a distribution of outcomes that is too wide? The other is who sets it: bettors, through their preferences or beliefs (Snowberg and Wolfers, 2010; Gandhi and Serrano-Padial, 2015), or the intermediaries who quote prices (Shin, 1991; Levitt, 2004; Ottaviani and Sørensen, 2008). Both are hard because the true probability of a bet is never observed. The bias is measured against outcomes, which are noisy, and almost every bet is on a single event, whose price cannot show which form the bias takes.

This paper studies prediction-market contracts whose fair price can be read from another market. Both venues list contracts that pay one dollar if the price of Bitcoin or Ether is above a level at a set hour on a given date, and Polymarket also lists contracts that pay if the price ends inside a range or touches a level within a month. Each of these payoffs is an option, and Deribit, the largest crypto options exchange, prices it. From Deribit's options I compute the price of every contract's payoff, the risk-neutral probability that it pays, and compare it with the contract's price on each venue (Figure 3). The comparison needs no outcome data and no model of bettors' beliefs, since it sets two prices of nearly the same payoff side by side. I run the same comparison wherever another option market prices a prediction market's contracts, on nine US stocks and on two currency pairs.

Figure 1 summarizes what it shows on Polymarket, whose public data identify every trader and include events cut into several ranges. Call the unlikely side of a contract its longshot; the main sample is longshots that the options price at 2–15%. Until mid-2025 Polymarket priced these longshots about a quarter above the options: 23% to 28%, depending on how the two markets' expiry times are bridged, or 1.8 to 2.2 cents per dollar (panel A). The premium had the shape of a distribution that is too wide. Within an event, an open-ended tail cost on average 1.55 cents more than an interior range of similar probability, which a distribution 7% more volatile than the options' roughly reproduces and no rule that weights each bet's own probability can (panel B). Both quotes stood above the options' price: traders who sold longshots at the resting bids received 2.1 cents more, and those who bought at the resting asks paid 2.9 cents more (panel C). Then, within about two months, with the largest step in the two weeks from 28 July 2025, the premium fell to about 3%, while the options' price of the same contracts barely moved (panel D).

Kalshi, an exchange regulated by the Commodity Futures Trading Commission (CFTC), lists the same digitals, and against the same options its longshots carried a premium of about the same size in another form. Before July 2025 the midpoint of its quotes no more than five cents wide stood 2.2 cents above the options' price, but those quotes put the bid at about the options' price and the ask 4.5 cents above it, a wide spread charged to buyers. Kalshi did not reprice in July 2025; its premium, if anything, rose. The break tests used for Polymarket date Kalshi's own fall to 6 November 2025, when the premium in those quotes fell from 2.3 to 1.0 cents. Its quoted spreads had narrowed a month earlier; on 6 November its quoted bid and ask fell by similar amounts, as Polymarket's had over the summer, and within three months trading in these contracts grew about a hundredfold (Figure 7). Since both venues are priced against the same options, each offers a check on a change in the benchmark common to both: neither venue's premium fell at the other's date, although Kalshi's comparison in July rests on few quotes.

This was not a free lunch. On the days before the break for which I have Deribit's order book, the option spread that hedges a longshot tightly cost about 3.3 cents beyond its value, more than the 2.1 cents that a seller collected at Polymarket's bid, so on average the premium sat inside or at the edge of the band that hedging costs set (Section 3). Polymarket's prices also followed the options' implied volatility day by day. I interpret the facts with a model in which the market's few dealers price every payoff by a common rule, Black–Scholes at a volatility marked up above the options', inside that band. Inside the band nothing pins the markup down, so its level is a convention, which unravels once dealers who quote

from option prices enter. Like Nasdaq dealers' avoidance of odd-eighth quotes (Christie and Schultz, 1994), Polymarket's convention, if that is what it was, held for more than a year and ended within about two months. The model fits the premium's persistence and the form of its collapse, though not every detail, and bettors whose beliefs about volatility followed the options' at a fixed distance would leave the same marks. Within five weeks of the collapse's largest step, rewards for quoting on these contracts ended, the US Department of Justice and the CFTC were reported to have closed their investigations of Polymarket and Polymarket bought a licensed US exchange, and the number of contracts traded a week nearly doubled; the data cannot say which of these, if any, set off the collapse. On Kalshi, whose trades do not identify traders, the fall came after its spreads narrowed and as its trading grew, as the entry of dealers would bring, but the dealers themselves cannot be seen.

The comparison of payoff shapes is a test that can fail, and [Figure 2](#) sets out every market on which I can run it or measure the premium. On Polymarket's range events on nine US stocks, which resolve when the stocks' own options expire, a tail cost 0.72 cents more than an interior outcome of the same probability, a weaker version of the crypto result. On Kalshi's daily range events on EUR/USD and USD/JPY, which resolve at the hour at which currency options expire, takers paid 6.1 cents over the options' price for longshots, and there the same test points, less firmly, to the other form of the bias, a premium that depends on each bet's probability alone. Wherever options price the bet, longshots carried a premium at least for a time, but its form, who paid it and when it fell differed from market to market.

The paper adds three things to the work on the favorite-longshot bias (Sauer, 1998; Snowberg and Wolfers, 2010; Green et al., 2018): a benchmark of nearly identical payoffs priced in a deep market, a test of the bias's form that payoffs of different shapes make possible, and two episodes, on two venues priced against the same options, in which the bias fell sharply at different times. Recent work finds a favorite-longshot bias on Kalshi (Bürge et al., 2025) and on Polymarket (Cardozo and Rivero-Wildemaue, 2026), and gaps between Polymarket's Bitcoin contracts and option prices (Portnaya, 2026; Fabi et al., 2026). I add the comparison of shapes at the same probability, executed prices on both sides of the market on both venues, two more asset classes and the dated repricings of 2025. For readers of prediction-market probabilities (Wolfers and Zitzewitz, 2006; Gürkaynak and Wolfers, 2007; Diercks et al., 2026), the results suggest that a calibration error of about two cents in the tails can come from how a market is intermediated, can be measured without waiting for outcomes and can change within weeks.

2 Pricing a Bet with Options

2.1 The contracts and the data

Polymarket's contracts are tokens that pay one dollar if an event occurs. They trade on a limit order book, in which makers post resting orders and takers trade against them, and every fill is public, with the wallets of the taker and the makers, the side and the size. None of Polymarket's markets studied here charged trading fees until March 2026. Three kinds of contract on the price of Bitcoin and Ether have longshot sides. *Threshold contracts* ask whether the price will be above a strike at noon New York time on a date, on Binance's one-minute price. *Range events*, listed from February 2025, cut the price on a date into mutually exclusive outcomes, an open-ended tail at each end and interior ranges between, whose prices sum to about one; their tails pay what threshold contracts pay, and the threshold sample includes them. *Touch contracts* pay if the price touches a level within a month or a week. Resolution is mechanical, and none of Polymarket's 20,267 Bitcoin and Ether price markets in my records resolved other than at zero or one. Kalshi lists the same digital on both coins: every day a ladder of strikes that pay if the price, on CF Benchmarks' index, is above the strike at 5pm New York time, with Friday's ladder listed a week ahead

Where options price the bet, longshots carried a premium, at least for a time; its form, who paid it and when it fell varied by market

Longshot sides priced at 2–15% by the benchmark, in cents per \$1 over the benchmark's price: crypto and stocks more than a day before the close, currencies overnight. Football, the contrast, is priced against bookmakers about twenty minutes before kickoff.

○ received by sellers ● paid by buyers ◆ displayed price Polymarket Kalshi

Upper row of each market: the earlier period; lower row, lighter: the later one.

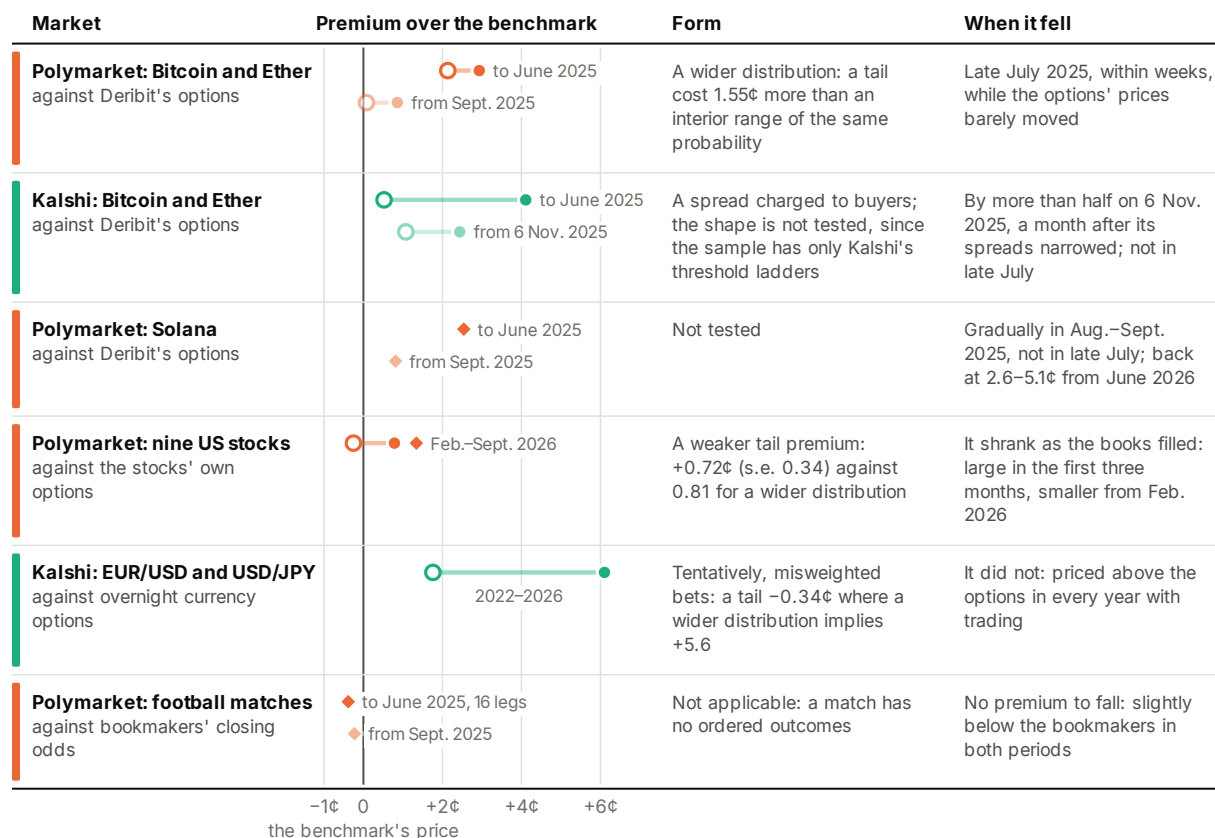


Figure 2. Every market tested

Notes: Calendar time except for the currency ranges, whose main construction is a variance clock (Section 9). Fills are weighted by shares or contracts, except the currencies', which count each fill once. Bitcoin and Ether: takers' fills of 2–15% legs more than a day before resolution (Section 6; for Kalshi, Section 7), before July 2025 and from September 2025 (Kalshi: from 6 November 2025). Solana: displayed prices, 52 contracts before and 1,251 after. Stocks: takers' fills within three hours of the 18:00 UTC snapshot, and displayed prices at it, February–September 2026. Currencies: takers' fills during the night, 2022–2026 without the sixteen months in which the books were nearly empty. Football: displayed prices about twenty minutes before kickoff against the average of bookmakers' closing odds with the margin removed by Shin's method (Shin, 1991; Football-Data.co.uk, 2026). Form: the comparison of a tail with an interior outcome of the same event, snapshot and probability bucket (Sections 4 and 9).

and the others about a day ahead, so that its prices more than a day before the close come from the Friday ladders. Its public trade history records each trade's price, size and taker side, but not the accounts, and takers pay a fee of $0.07P(1 - P)$ per contract at price P (KalshiEX LLC, 2022; Kalshi, 2026).

Every one of these payoffs is an option. A threshold contract is a digital option, an interior range is a spread of two digitals and a touch contract is a one-touch barrier option. Deribit lists European options on both coins with daily to quarterly expiries at 08:00 UTC. Table 1 lists the data. The main sample is every Bitcoin and Ether threshold contract on Polymarket from February 2024 to September 2026, observed every six hours, with the range events and touch contracts at the same times and every taker fill, and every Kalshi

Table 1. The data

Source	Period	Size	Used for
Polymarket, threshold contracts	Feb 2024 – Sep 2026	9,396 contracts at six-hourly snapshots; 238,608 contract-snapshots	The premium, its fall
Polymarket, range events and touch contracts	Ranges from Feb 2025, touch contracts from Jan 2024	The same snapshots; 43 complete range events, February–June 2025	The shape of the premium
Polymarket, trades	Feb 2024 – Sep 2026	7.03 million taker fills from 411,603 wallets; 10.0 million maker records	Both sides of the quote
Deribit options	2019 – Sep 2026	Every trade with the exchange's mark; order books on 32 days; volatility index (DVOL), hourly	The options' price; hedging costs
Options on the IBIT and ETHA funds	Nov 2024 – Sep 2026	Best bids and offers before the 18:00 UTC snapshot of each US trading day	A second option market
Kalshi	Mar 2024 – Sep 2026	73,958 Bitcoin and Ether markets, 7.6 million trades; currency ranges, 2022–2026	A second venue
Bloomberg	Mar 2024 – Oct 2026; FX fixings from 2010	CME and multi-venue Bitcoin volatility indices, risk appetite, ETF flows and attention; overnight FX smiles and fixings	Benchmarks and controls
Binance	2019 – Sep 2026	One-minute prices, the resolution source	Outcomes

ladder on both coins over the same months, with its quotes and trades. For comparison I use the options on the US spot Bitcoin and Ether exchange-traded funds (ETFs) and Bloomberg's series on CME's options, risk appetite, fund flows and attention.

2.2 From option prices to the price of a bet

Figure 3 follows one weekly range event through the four steps. At each six-hourly snapshot I fit an implied-volatility smile to each Deribit expiry from the option trades of the preceding hours (row 1). The second derivative of call prices in the strike gives the risk-neutral density of the coin's price at the contract's resolution time (Breedon and Litzenberger, 1978) (row 2). The options' price of each payoff, its state price, is the density's mass over the states in which it pays: a threshold contract or a tail is one digital, $q = -\partial C / \partial K$, and an interior range is the difference of two (row 3). Polymarket's strikes are converted from Binance's price to Deribit's index with the basis at the snapshot; Kalshi's index, like Deribit's, is in dollars and needs no conversion. The premium is the venue's price minus the options' price, in cents on a contract that pays one dollar (row 4). In this event, nearly seven days before resolution, Polymarket priced both tails above the options and the three central ranges below them, and its seven prices are best fit by the options' distribution made 13% wider.

Each contract is folded onto its longshot leg, the side that pays with probability $x = \min(q, 1 - q)$, and the main sample keeps legs with x between 2% and 15%. I compare three periods: *before the break*, February 2024 to June 2025; the *transition*, July and August 2025; and *after the break*, September 2025 to September 2026. I chose them after seeing the monthly series of Figure 1; Kalshi's own break is dated by a test in Section 7. Standard errors are clustered by day and by event (Cameron et al., 2011).

Polymarket's contracts resolve at noon in New York, Kalshi's at 5pm, and Deribit's options expire at 08:00 UTC, so the variance between expiries has to be interpolated. The text interpolates variance linearly in calendar time. A *variance clock*, which counts each hour by its share of a week's realized variance in Binance's five-minute returns (Andersen and Bollerslev, 1997), lowers the premium before the break by about 0.4 cents, leaves it unchanged after, and changes no conclusion; Figures 9 and B1, several figure

Pricing a bet with options: Polymarket priced both tails of this Bitcoin event above the options and the center below them

Polymarket's weekly event on Bitcoin's price at noon New York on 25 April 2025, nearly seven days ahead, and Deribit's options at the same moment (19 April 2025, 00:00 UTC).

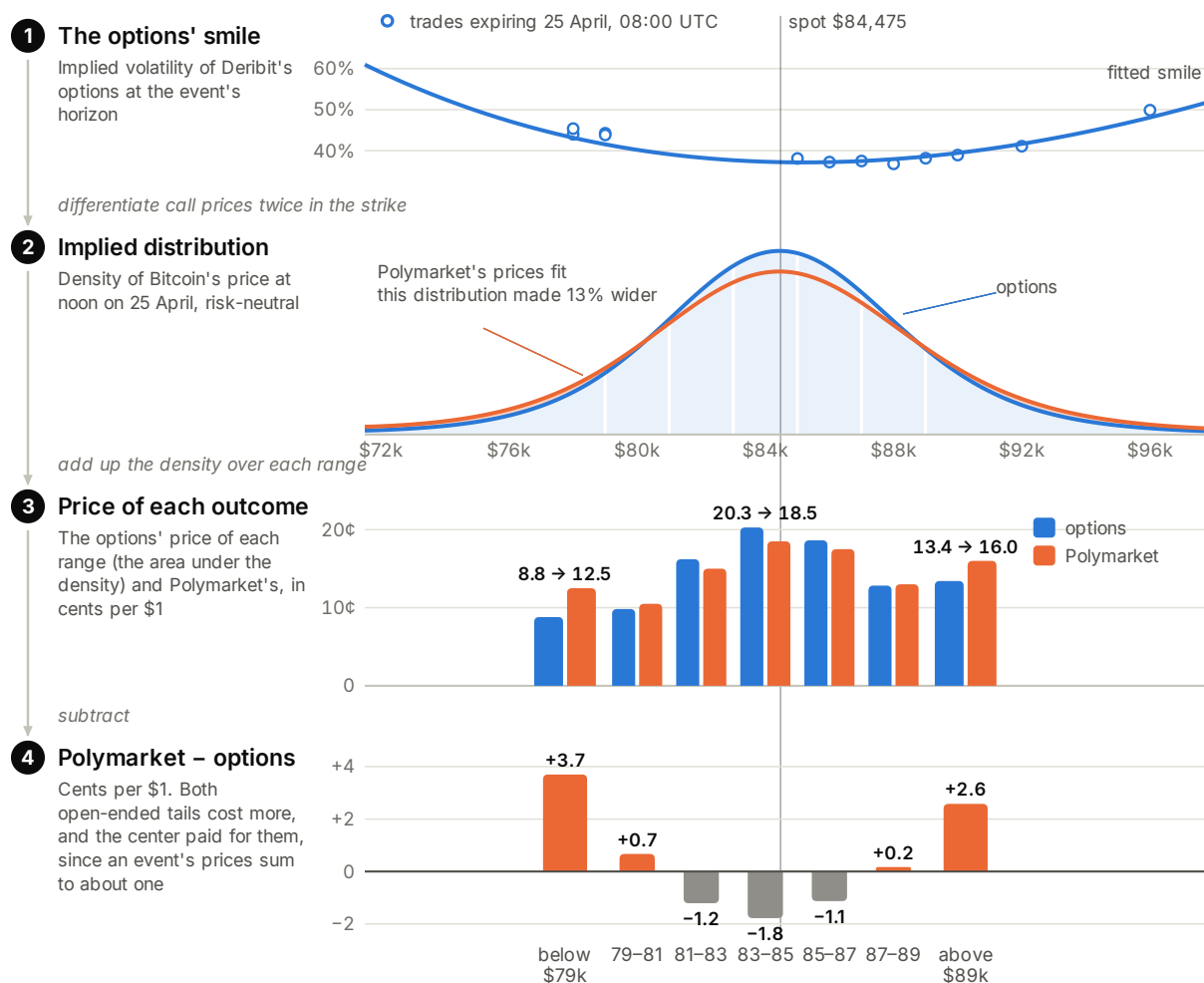


Figure 3. From option prices to the price of a bet

Notes: Polymarket's weekly range event on Bitcoin's price at noon New York on 25 April 2025, at the 00:00 UTC snapshot of 19 April. Row 1: implied volatilities of trades in Deribit's options expiring on 25 April and the smile fitted to them. Row 2: the risk-neutral density at the event's resolution time, from the second derivative of call prices in the strike, and the density whose prices best fit Polymarket's seven prices, with a volatility 12.6% above the options'. Row 3: each outcome's price, the density's mass over the range. Row 4: Polymarket's price minus the options'. Rows 3 and 4 are in cents per \$1.

notes and the appendix give its values. Within the final day the two interpolations differ by more and both fail a test against outcomes, so every result uses observations more than a day (25 hours) before resolution.

The two payoffs are nearly, not exactly, the same. They differ in the price index, in the hour, in settlement (a dollar stablecoin on Polymarket, dollars on Kalshi, the coin on Deribit) and in the risk that the platform fails or resolves a market wrongly. Section 4 shows that compensation for a risk of this kind, which depends on a contract's probability alone, cannot produce the shape of the premium.

3 Longshots a Quarter Above the Options

Until June 2025 Polymarket priced its 2–15% longshot legs 2.24 cents above the options' price ($t = 16.5$), or 28% of it (23% on the variance clock). From September 2025 the premium was 0.21 cents, about 3% (Figure 1A). Relative to the options' price it had the classic shape of the favorite–longshot bias: 60% on legs priced at 2–5%, 32% at 5–10%, 18% at 10–15% and 2% near even odds. In the language of option pricing, Black–Scholes reproduces Polymarket's prices at a volatility about 11% above the one that reproduces the options' prices before the break, and 1% above it after. The premium was spread across contracts, 90% of which were priced above the options on average, and it was larger in 2024 (2.76 cents) than in the first half of 2025 (2.06). The estimate before the break rests on 183 contracts, and each month before March 2025 on four to eight.

How much does this depend on the benchmark? The level of the premium is uncertain by about a cent, and its fall by less: across eight constructions of the options' price, the premium before the break ranges from 1.6 to 2.6 cents and its fall from 1.6 to 2.4 (Appendix B). The options on the spot Bitcoin and Ether funds, a second option market with its own traders, put the premium at 1.5 to 2.0 cents before the break and about zero after it. CME's Bitcoin options priced Bitcoin about 3% more volatile than Deribit's, before and after alike, which would lower the volatility markup by about three percentage points without changing its fall. The option market's own outcomes give a direct check. Digitals priced from the same kind of surface paid off about as often as their prices said: on 2–15% legs in the months before the break, 0.39 percentage points more often (standard error 0.66). Had Polymarket's prices been the true probabilities, the digitals would have paid off about two percentage points more often. The outcomes reject that when upside and downside legs are pooled ($t = 2.8$), though not for upside legs alone, and the 95% interval reaches about 1.7.

A premium of two cents on a payoff that the option market prices is not by itself an arbitrage. The trade would sell the longshot on Polymarket and buy the vertical spread that approximately replicates it on Deribit, which expires eight or nine hours before the contract resolves. On the days before the break for which I have Deribit's order book, a spread 2% of the strike wide cost a median 3.3 cents beyond its value, and spreads 5% and 10% wide 1.5 and 0.9 cents (Figure 8A in Section 8). Selling at Polymarket's bid with the tight hedge would have lost 0.5 to 1.7 cents, depending on the fee tier and the interpolation. A loose hedge would have gained 0.1 to 1.4 cents in expectation, but at real risk: the coin ends inside a spread 5% wide about one time in six. On average the premium lay inside or at the edge of the band that hedging costs set, although 30% of sell volume before the break was in contracts whose bid exceeded the options' price by more than the cost of a tight hedge. Section 8 asks why it stayed there and why it left.

4 Mostly a Wider Distribution, Not Misweighted Bets

The favorite–longshot bias can take two forms, which a single bet cannot tell apart but an event cut into several payoffs can. If prices overweight the probability of each unlikely bet, the premium depends only on a payoff's probability. If prices come from a distribution of the underlying that is too wide, the premium also depends on where the payoff sits in that distribution.

4.1 Three pricing rules

Consider three one-parameter rules that map the options' prices of an event's outcomes into prices. Under a *wider distribution*, or volatility markup, every outcome is priced as Black–Scholes would price it at $1 + \theta$

times the volatility that reproduces its options' price. A digital with options' price y is priced at

$$R_\theta(y) = N\left(\frac{N^{-1}(y)}{1 + \theta}\right), \quad (1)$$

and an interior range between strikes $K_1 < K_2$ at $R_\theta(y_1) - R_\theta(y_2)$. A rule of *misweighted bets* prices each outcome by a function of its own probability, as the probability weighting of prospect theory (Tversky and Kahneman, 1992; Prelec, 1998) does when it is applied bet by bet. To respect adding up within an event I use $p_i = q_i^\gamma / \sum_k q_k^\gamma$, which overweights unlikely outcomes when $\gamma < 1$. A *reweighted distribution*, as in rank-dependent utility, applies Prelec's function $W(y) = \exp(-(-\ln y)^\alpha)$ instead to the probability that the underlying ends above each strike, so that an interior range is priced at $W(y_1) - W(y_2)$.

The markup moves probability from the center of the distribution to both tails (Figure 4A). Within a complete event the open-ended outcomes carry the premium and the central outcomes pay for it. A tail and an interior range of the same probability are therefore priced differently: the tail gains the probability moved into it, while the interior range gains probability at its outer edge and loses it at its inner edge. Misweighted bets price two outcomes of the same probability alike, wherever they sit. Proposition 1 makes this precise, and Appendix D sketches its proof.

Proposition 1 (The geometry of a markup). *Let $\theta > 0$. (i) An open-ended outcome with options' price $x < 1/2$ is priced above it, and its premium relative to x falls from infinity to zero as x rises from zero to one half. (ii) An interior outcome on one side of the median carries a smaller premium than an open-ended outcome with the same options' price, and an interior outcome that contains the median carries a negative premium. (iii) The premia of a complete event's outcomes sum to zero. (iv) Under any rule that prices outcome i of an event at $f(q_i) / \sum_k f(q_k)$, two outcomes of the same event with the same options' price carry the same premium.*

Part (i) is the favorite–longshot profile, which both forms share. Parts (ii) and (iv) separate them, and part (iii) says that within a complete event the center pays for the tails. A reweighted distribution, like the markup, moves probability to both tails, and the test below does not separate it from the markup.

4.2 Tails against interior outcomes of the same event

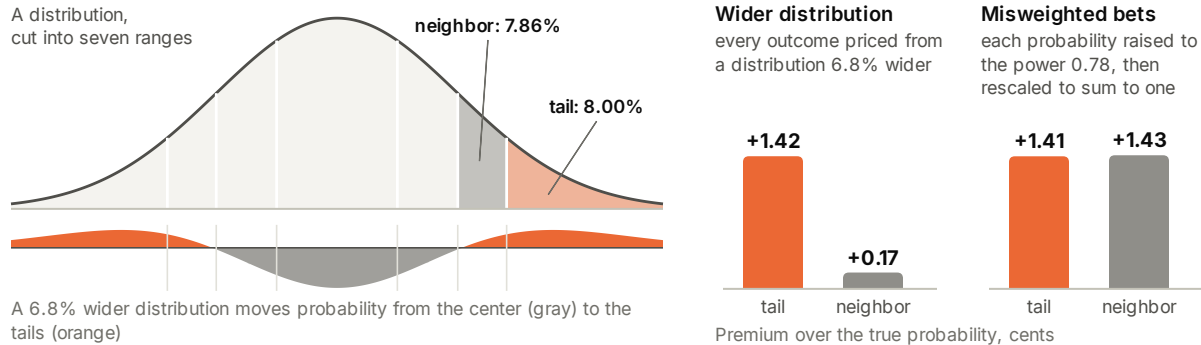
I use every outcome of the weekly range events at the snapshots at which both tails and every interior outcome are observed, from February to June 2025, 43 events at 830 event-snapshots (Figure 4B). The open-ended tails carried 1.5 to 2.0 cents on 2–15% legs. Interior outcomes of the same events, with the same options' prices, carried 0.2 to 0.7 cents, and the likeliest interior outcomes, at 35–50%, were priced 2.45 cents below the options.

The cleanest version of the test compares a tail and an interior outcome of the same event, snapshot and probability bucket, with a fixed effect for each such group, or cell (Figure 4C). An open-ended tail was priced 1.55 cents (standard error 0.22) above an interior outcome of the same cell, and 1.23 cents (0.22) on the variance clock. The markup fitted to every outcome of the events, 6.8% (standard error 0.4 percentage points), implies 1.75 cents, the reweighted distribution ($\alpha = 0.935$) implies 1.54, and misweighted bets ($\gamma = 0.951$) imply -0.02 . All three parameters are fitted to the same outcomes, so the agreement of the first two rules with the data is partly built in. What matters is that misweighted bets, fitted to the same prices, miss the difference entirely. The difference is positive in 37 of the 43 events, has a wild cluster bootstrap p -value of 0.0003 with weeks as clusters, is 1.45 cents (0.36) on executed prices rather than displayed ones, and is 1.0 to 1.2 cents against the prices of the ETF options. The distribution is not the whole story, however. Fitted to the tails alone the markup is 8.0%, and to the interior outcomes alone 5.5%, so a small premium that depends on probability alone is present too.

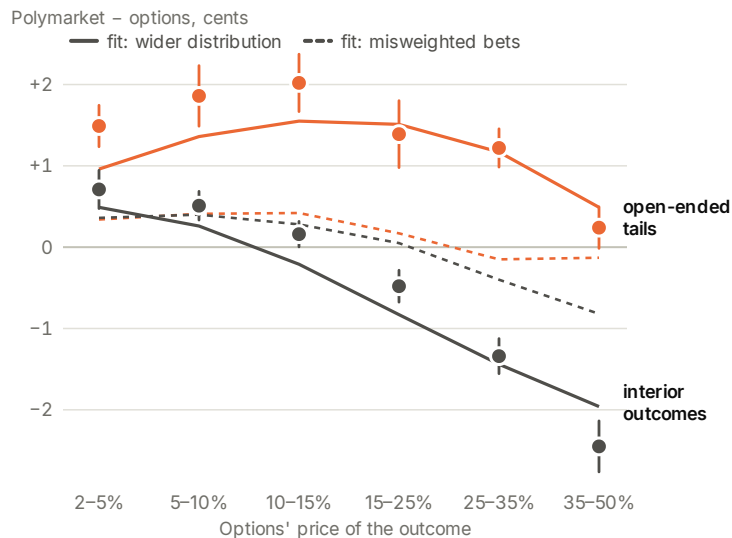
The premium depended on where an outcome sat in the distribution, not only on how likely it was

Open-ended tails were priced above interior outcomes of the same probability in the same event: the signature of a distribution that is too wide. A rule that misweights each bet's probability cannot produce it.

A The idea: two outcomes with the same probability, in different places



B The data: Polymarket's range events, February–June 2025

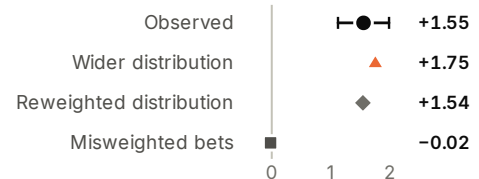


C The test

+1.55¢

more for an open-ended tail than for an interior outcome of the same event, snapshot and probability bucket (s.e. 0.22); positive in 37 of 43 events

Implied by each rule, fitted to all outcomes



After the break the difference was -0.28¢ (s.e. 0.04).

Figure 4. The geometry test

Notes: Panel A is an illustration on a normal distribution cut into seven ranges, with a tail and its neighbor of nearly equal probability. The wider distribution uses the markup fitted to the range events (6.8%); the power 0.78 for misweighted bets is chosen so that both rules give the tail about the same premium. Panel B: complete weekly range events on Bitcoin and Ether, February to June 2025 (43 events at 830 event-snapshots), calendar time, ± 2 standard errors clustered by event and day; the lines are two of the rules, each fitted to every outcome. Panel C: the coefficient on a tail indicator in a regression with a fixed effect for each event, snapshot and probability bucket (1,414 observations), and the same regression on each rule's fitted prices; on the variance clock the observed difference is 1.23 cents (0.22).

The same pattern appears, more weakly, in a second asset class. From November 2025 Polymarket listed weekly range events on nine large US stocks, which resolve at the close at which the stocks' own options expire, so those options price every outcome without interpolation. In 57 events a tail cost 0.72 cents (0.34) more than an interior outcome of the same cell, against 0.81 implied by the fitted markup, with a wild bootstrap p -value of 0.07.

4.3 What the shape rules out, and what it does not

The shape rules out, as the main source of the premium, any rule that prices a bet by its own probability. That includes the weighting of each bet's probability, the leading account of the bias at the racetrack (Snowberg and Wolfers, 2010), and compensation for the risk that a market is voided or resolved wrongly, which also depends on probability alone. It would take a 4% to 6% chance that a market is resolved at one half to fit the premium, and none of the 20,267 markets was. Heavy demand for the tails does not explain it either: takers bought only 49% of the 2–15% range-tail shares that traded. Most taker volume came from wallets that also post quotes, so this share mixes dealers' inventory trades with bettors' demand.

What the shape identifies is a difference between the distribution in Polymarket's prices and the one in the options' prices: Polymarket priced these contracts as if Bitcoin and Ether were 7% to 13% more volatile than the options said. A benchmark too narrow by the same amount would produce the same shape. But it would also make prices after the break look marked up, and after the break the same construction gives a markup of only 0.8%. The options' own outcomes also argue against a benchmark that is too narrow: over 2019–2026, open-ended digitals paid off only 0.31 percentage points (0.37) more often than interior ranges with the same price. An error that changed with the volatility regime cannot be excluded. A wider distribution in Polymarket's prices could come from bettors who believe the coins more volatile than the options do, from weights that bettors apply to the distribution (Polkovnichenko and Zhao, 2013; Baele et al., 2019), or from the pricing rule of the market's intermediaries. How prices moved with the options narrows these accounts (Section 6).

5 A Collapse Within Weeks

The premium fell in 2025, and most of the fall came within a few weeks (Figure 1A and Figure 9). The weekly mean premium was 1.6 to 2.4 cents in the first three weeks of June 2025, 1.1 to 1.4 cents in every week from 23 June to 21 July, and then 0.7 and 0.1 cents in the two weeks from 28 July. Every month from April 2024 to June 2025 has a mean premium of at least 0.85 cents, and every month from September 2025 at most 0.60. Bai–Perron models with two or more breaks put the last break on 27 or 28 July 2025 (Bai and Perron, 1998).¹ A single shift, dated by the search, has a sup-Wald statistic of 143 against a 1% critical value of 12.2 that allows for the search (Andrews, 1993), and is dated 29 June. The data cannot tell a discrete step from a transition lasting a few weeks to a few months, but they suggest two parts: the price at which takers sold longshots broke at the end of June, and the price at which they bought broke on 28 July.

The payoffs repriced as a narrower distribution implies (Figure 5A). Because a range event's prices sum to one, a fall in its tails has to be offset somewhere in its interior. Between the periods the tails fell by 1.5 to 2.2 cents on 2–15% legs. The unlikely interior outcomes moved by half a cent or less, and the likeliest rose by 0.7, 1.2 and 1.9 cents at 15–25%, 25–35% and 35–50%, close to the 0.7, 1.3 and 1.7 that moving the markup from its pre-break to its post-break value implies. Across the twelve cells, the markup's implied changes miss the observed ones by 0.31 cents (root mean squared error) and those of misweighted bets by 0.94, although the markup understates the fall of the tails by 0.6 to 0.8 cents on 2–15% legs. The markup fell by about 90%, from 11.4% to 1.0% on threshold contracts (with range tails), from 6.8% to 0.8% across the outcomes of range events and from 5.3% to about zero on touch contracts (Figure 5B). Within the same cell, the difference between a tail and an interior outcome went from 1.55 cents to –0.28 (0.04).

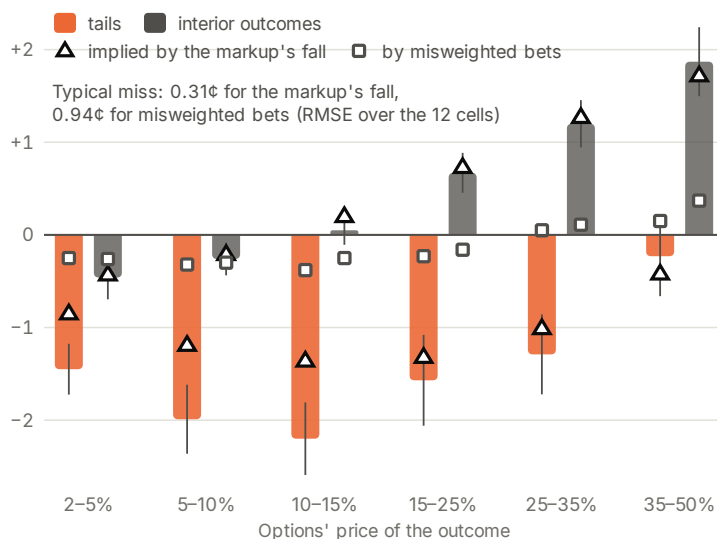
None of the other measured changes of the summer of 2025 accounts for the fall (Appendix C). In the eight weeks either side of 28 July, Polymarket's price of the same legs fell by 1.76 cents while their options'

¹Windows around the break are centered on 28 July 2025 for Polymarket's prices and Kalshi's quotes and on 27 July for some measures from fills; the break tests put the last break on one date or the other, depending on the series.

When the premium collapsed, the tails fell and the likeliest outcomes rose, as a narrower distribution predicts

Change in Polymarket's price minus the options' price of the same outcome between February–June 2025 and September 2025–September 2026, complete range events (cents); and the volatility markup implied by Polymarket's prices.

A Change at the break, by the outcome's probability



B The markup fell about 90%

Volatility implied by Polymarket's prices, % above the options'

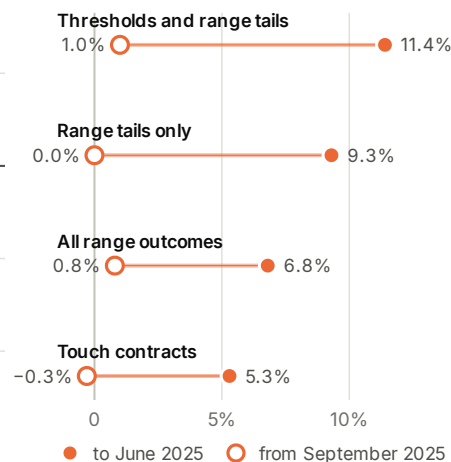


Figure 5. How the payoffs repriced

Notes: Panel A: change in the mean premium of the complete range events between February–June 2025 and September 2025–September 2026, by the options' price of the leg, with ± 2 standard errors; triangles and squares are the changes that each rule implies when its parameter moves from its fitted value before the break to its value after. Panel B: the markup θ of Equation (1) fitted to 2–15% legs of each product, and to every outcome of the range events.

price fell by 0.14 (Figure 1D). The mix of contracts changed, but between the two periods, with fixed effects for the mix, the premium fell by 1.75 cents, and within range tails, whose design did not change, by 1.53. Bettors kept trading, and the number of contracts traded barely changed in the five weeks around 28 July. Measures of risk appetite, crypto volatility, flows into the spot ETFs and attention to crypto do not account for the fall either: in weekly regressions that control for the market's size, the weeks from 28 July carry a premium 0.74 cents lower, and 1.10 cents lower with all these measures added, although the attention measures alone shrink the gap to 0.56.

6 Both Sides of the Quote

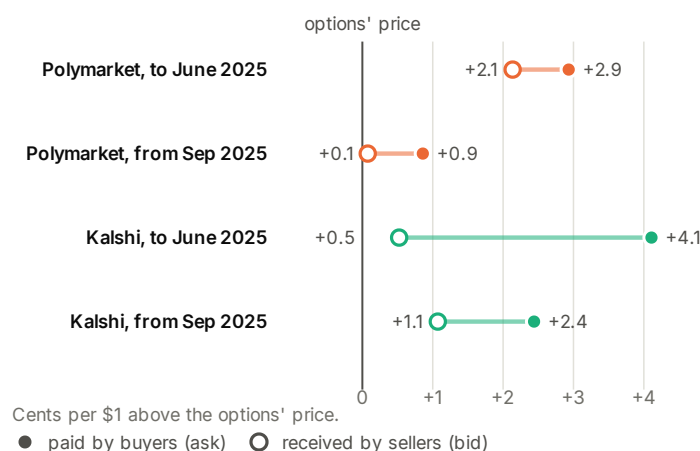
The public fills show both sides of the market (Figure 6A). Before the break, takers who sold a longshot, hitting a resting bid, received 2.14 cents more than its options' price, and takers who bought, lifting a resting ask, paid 2.93 cents more; 75% of the shares that takers sold were sold above the options' price. After the break the bid was at the options' price (+0.08) and the ask 0.86 cents above it. The distance between buys and sells of the same contract in the same hour, the closest measure of the spread that fills allow, changed little, from 0.75 cents to 0.66, while the midpoint of the same pairs fell from 2.73 to 0.56 cents above the options' price. The whole quote moved down by about two cents.

With both quotes above the options' price, the level of the premium was a transfer from takers who bought longshots to takers who sold them, and the makers kept the spread. Valued at the options' price, takers who bought longshots before the break lost \$537,000 and takers who sold them gained \$419,000.

Polymarket's whole quote sat above the options' price and moved with the options' volatility

Takers' fills of longshots that the options priced at 2–15%, more than a day before resolution, in calendar time. On Kalshi, which lists the same digital, buyers paid the premium before July 2025 and sellers received about the options' price, in its quotes and in its trades weighted by contracts.

A Bid and ask over the options' price



B Pass-through of the options' volatility

Share of a day's change in the options' price, from a move of their implied volatility at a fixed spot price, that reached Polymarket

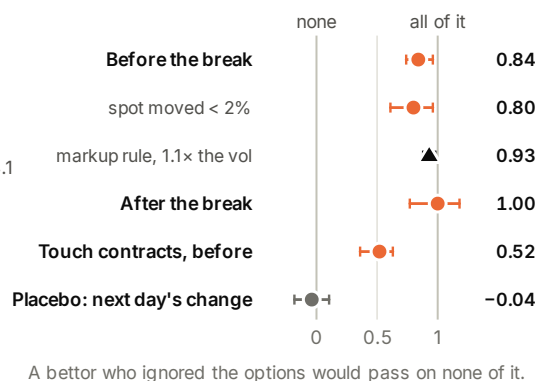


Figure 6. Both sides of the quote

Notes: Panel A: mean premium of takers' fills of 2–15% legs more than a day before resolution, each fill priced against the options at the nearest snapshot, carried to the fill's time with the spot price and the decay of variance, weighted by shares (Polymarket) or contracts (Kalshi). Two thirds of Kalshi's contracts before July 2025 traded in November 2024; counting each trade once puts its bid at +2.6 and its ask at +7.0 (Section 7). Panel B: the ratio of the effect on Polymarket's price to the effect on the options' price of the part of a day's change in the options' price that comes from the change in Deribit's volatility index at a fixed spot, with 95% intervals from a bootstrap over calendar weeks; the triangle is the ratio that the markup rule implies. The placebo is the coefficient on the next day's change in the volatility index relative to that on the same day's (−0.07 against 1.78).

Takers as a whole lost \$118,000, roughly the spread on the shares traded. Most of this passed between wallets that also post quotes, which account for 85% of the buyers' loss and 97% of the sellers' gain. A few makers supplied most of the liquidity: in May and June 2025 the five largest makers of longshot legs supplied 58% of makers' longshot sales in the average week. At the break the largest makers moved together. Of the fourteen largest makers in the summer of 2025, all seven that sold in both the week of 21 July and the week of 28 July sold lower relative to the options' price in the second week, by 1.29 cents on average, and all eight that bought in both weeks bought lower, by 1.61. Moves this unanimous recur in 5 of 24 week-to-week comparisons, but this one did not reverse.

Polymarket's prices also moved with the options' implied volatility (Figure 6B). A bettor who forms beliefs from the coin's price moves prices when the spot moves, whereas a dealer who quotes from option prices also moves them when the options' implied volatility moves and the spot does not. I split the change in the options' price of a contract between two snapshots into parts due to time, the spot, the change in Deribit's volatility index and the change in realized volatility, and regress the changes in both prices on these parts. Before the break 0.84 of the volatility part passed into Polymarket's prices within a day (95% interval 0.74 to 0.96), close to the 0.93 that the markup rule predicts, and after the break 1.00. Before the break it is 0.80 when the spot moved less than 2%, and the next day's change in implied volatility, a placebo, has no detectable effect. On touch contracts about half passed through, before and after the break alike (0.52 and 0.55). Realized volatility did not move Polymarket's prices detectably more than it moved the options'. Whoever set Polymarket's prices followed the options closely.

The same Bitcoin and Ether bets on two venues: both priced longshots above the options, and each venue's premium fell at a time of its own

Monthly means for longshot sides the options priced at 2–15%, more than a day before the close, against the same Deribit state prices, calendar time. Polymarket: displayed prices. Kalshi: quotes at most five cents wide.

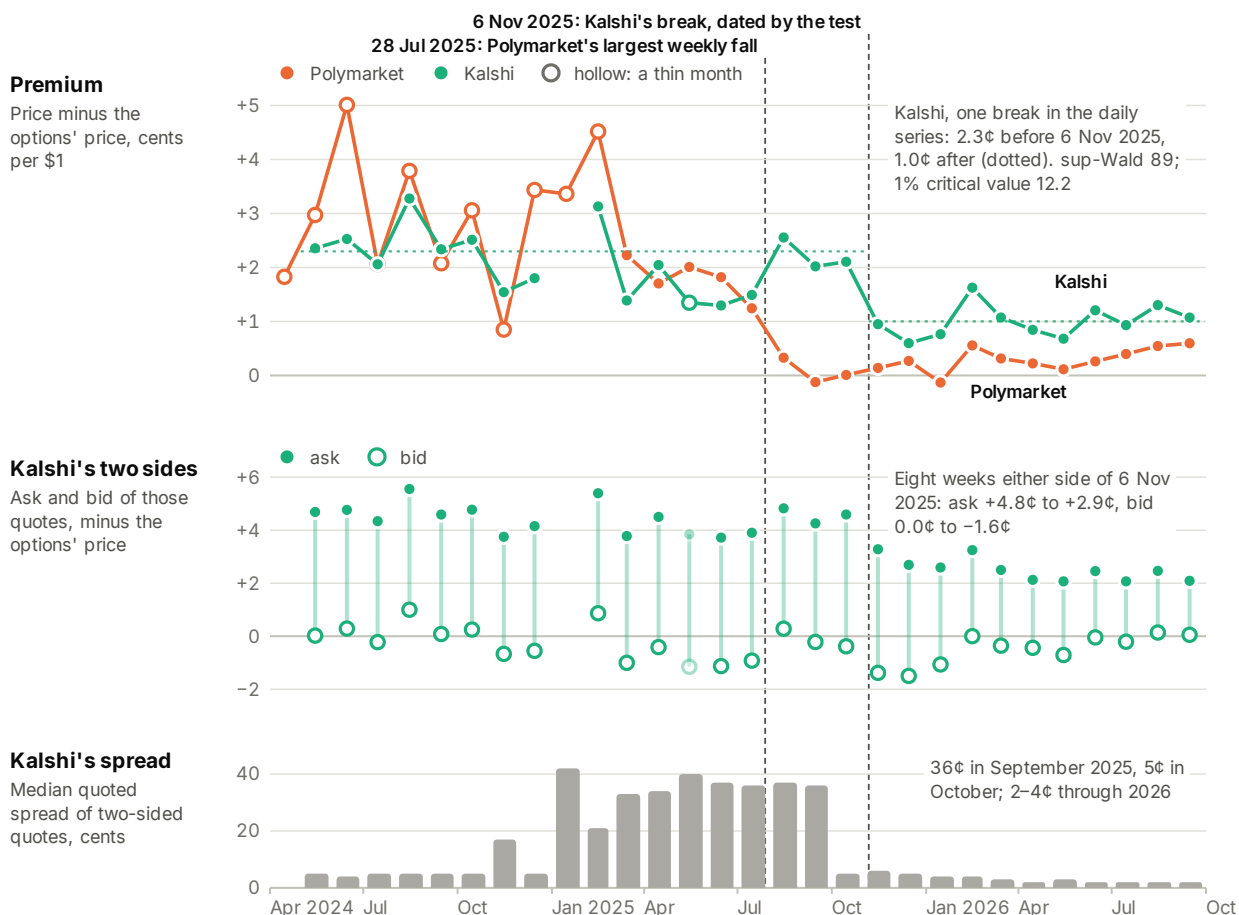


Figure 7. The same bet on two venues

Notes: Bitcoin and Ether legs that the options priced at 2–15%, more than a day before the close, calendar time. Polymarket: the monthly mean premium of displayed prices of Figure 1A, in cents; hollow, the months before March 2025, on four to eight contracts each. Kalshi: quotes at most five cents wide in the hourly candle that ends at each six-hourly snapshot; hollow or light, the months with fewer than 50 such quotes (January 2025, with four, is left out); the dotted lines are Kalshi's mean premium either side of the single break in its daily series. Middle: the mean ask and bid of those quotes. Bottom: the median spread of every two-sided Kalshi quote on these legs.

7 The Same Bet on Two Venues

Kalshi's ladders pay what Polymarket's threshold contracts pay, five hours later in the day, and the same Deribit options price them. More than a day before the close Kalshi's quotes come from the Friday ladders, almost all on Bitcoin until December 2025, and until late 2025 they were sparse: from January to September 2025 the median quoted spread on 2–15% legs was 21 to 42 cents, and fewer than one observation in eight carried a quote at most five cents wide. I call such quotes tight and measure Kalshi's premium on them, from the hourly candle that ends at each six-hourly snapshot, as the midpoint minus the options' price, and on its trades, each priced against the options as Polymarket's fills are (Appendix A).

Before July 2025 the two venues charged about the same premium in different ways (Figure 7). The midpoint of Kalshi's tight quotes stood 2.19 cents above the options' price, against 2.24 for Polymarket's

displayed prices, but the quotes were 4.6 cents wide on average, against a gap of about 0.8 cents between Polymarket's average buy and sell prices. Kalshi's bid sat at about the options' price, -0.11 cents (0.12), and its ask 4.49 cents (0.12) above it. Its trades agree when weighted by contracts: takers who sold longshots received 0.52 cents (0.68) more than the options' price and those who bought paid 4.11 cents more, on 2,916 trades, or -0.03 and 4.81 cents net of Kalshi's taker fee. Two thirds of those contracts changed hands in November 2024, however, and counted one by one the trades put sellers 2.6 cents and buyers 7.0 cents above the options' price, so they say less than the quotes do. On Polymarket the whole quote stood above the options' price; on Kalshi the premium was a wide spread charged to buyers.

Kalshi did not reprice at the end of July 2025. In the eight weeks either side of 28 July its tight-quote premium rose by 1.35 cents, on 35 days of quotes from 15 weekly Bitcoin ladders, too few for a reliable standard error (Conley and Taber, 2011), while Polymarket's daily premium fell by 1.41. Kalshi's fall came three months later. In the daily mean premium of its tight quotes, a single shift dated by the search falls on 6 November 2025, from 2.30 cents to 1.00, with a sup-Wald statistic of 89 against a 1% critical value of 12.2 (Andrews, 1993); the 95% interval for the date runs from 22 September to 18 November (Bai, 1997), and a block bootstrap's from 20 August to 19 November. Bai-Perron estimation selects this break and no other (Bai and Perron, 1998; Liu et al., 1997), and a logistic transition fits best as a step on 5 November, although a transition lasting months cannot be excluded. The date is the same on the variance clock (1.52 to 0.51 cents) and on Bitcoin alone, and between 6 and 11 November with weekly means, with ten or more tight quotes a day, and within quotes two to four days, or more than four days, before the close.² The ask has its own single break on the same date, 2.1 cents down, and in the eight weeks either side Kalshi's ask went from 4.8 to 2.9 cents above the options' price and its bid from 0.0 to -1.6 : the whole tight quote moved down, at about the same width, as Polymarket's had over the summer. Over the same weeks Polymarket's premium against the same options rose by 0.24 cents, so a change in the benchmark common to both venues did not produce Kalshi's fall, as Kalshi's rise at the end of July suggests that it did not produce Polymarket's.

The narrowing of Kalshi's spreads came first. The median quoted spread on these legs was 36 cents in September 2025, 5 in October and 2–4 in 2026; the daily median fell to 5 cents on weekdays in the week of 6 October, and to 6 cents at weekends from 8 November. From 1 October, a date I took from the monthly spreads, to 5 November, the median spread was 14 cents below its level in the eight weeks before, while the premium of the tight quotes was unchanged (-0.1 cents). Quotes at most five cents wide went from about a tenth of the observations before October to about half in the eight weeks after 6 November and more than three quarters in every month of 2026, and the contracts traded on these legs more than a day ahead rose from about 11,000 a month in September and October 2025 to 116,000 in November and more than a million a month from January 2026. The trades moved less than the quotes. On the 130 trades of the eight weeks before 6 November and the 2,314 of the eight weeks after, buyers paid 4.7 and 2.3 cents above the options' price and sellers received 0.6 in both, so in the trades only the buyers' price fell; from 6 November to September 2026, buyers paid 2.44 cents (0.16) and sellers received 1.07 (0.13). Fills are where takers chose to trade, and need not match the average tight quote, whose bid then sat below the options' price.

The two venues differed in the form of the premium and in when it fell, but on both the fall came with a change in quoting, and on both the bid and the ask fell by similar amounts, on Polymarket the bid about a month before the ask and on Kalshi in its quotes but not its trades. On Polymarket the largest makers lowered their prices together and new makers appeared (Sections 6 and 8); on Kalshi the spreads

²Within the final day before the close, which the main text leaves out (Section 2), Kalshi's premium in hourly candles on the variance clock shows no comparable break: the strongest candidate, in March 2026, has a p -value of 0.055.

Table 2. The legal and market timeline

Date	Event	Source
3 Jan 2022	The CFTC fines Polymarket \$1.4 million for offering unregistered event contracts and orders it to wind down noncompliant markets; on 24 January Polymarket blocks trading by US users	CFTC (2022); The Block (2022)
13 Nov 2024	FBI agents seize the chief executive's phone and electronics; he is not arrested	The Block (2024)
Feb 2025	Weekly range events on Bitcoin are listed (on Ether from April 2025)	This paper's data
23 Jun–21 Jul 2025	Rewards for quoting end on the daily and weekly crypto listings	This paper's data
15 Jul 2025	The Department of Justice and the CFTC close their investigations, as reported	The Block (2025)
21–22 Jul 2025	Polymarket buys QCEX, a CFTC-licensed exchange, for \$112 million	CDC Gaming Reports (2025)
28 Jul 2025	The premium's largest weekly fall ; new maker wallets first fill on 28 July and 1 August, some probably continuing wallets that had just stopped	This paper
Aug–Sep 2025	Ladders of strikes on most days replace single strikes listed one to three days a week	This paper's data
3 Sep 2025	CFTC staff no-action letter to QCEX's exchange and clearinghouse	CFTC (2025)
Oct–Nov 2025	On Kalshi, the median quoted spread on crypto longshots narrows from 36 cents to 5; the premium of its tight quotes falls on 6 November, the date a break test finds	This paper
Nov–Dec 2025	An amended order of designation; Polymarket's US app opens to selected users on 3 December	Bitcoin Magazine (2025)
Feb–Mar 2026	A smaller premium returns from early February; reward settings reappear on listings from 10 February, and taker fees with rebates for makers begin in March	This paper's data; Polymarket (2026)

had narrowed a month earlier, and trading grew a hundredfold. Kalshi's trades carry no account identifiers, so whether new dealers arrived there cannot be seen.

8 Why It Lasted, and Why It Ended

8.1 A pricing convention inside a hedging band

I interpret these facts with a model of a pricing convention, set out in [Appendix E](#). The market's dealers, the few makers who supply most of its quotes, price every payoff by a common rule, the markup of [Equation \(1\)](#), and quote a bid and an ask half a spread c either side of it; call them *rule dealers*. Bettors trade for reasons that price differences of a few cents do not overturn, such as a taste for lottery-like payoffs (Barberis and Huang, 2008). Outsiders who know the options' price can trade against the quotes or post their own, but only at a cost κ of carrying a hedged position until resolution, which covers the hedge's transaction costs, the risk it leaves, the capital it ties up and, on Polymarket, the cost of operating on a venue closed to US residents. Any markup that keeps every quote within κ of the options' price survives, and inside that band nothing pins it down. With balanced buying and selling, bettors' flows and the dealers' profits do not depend on the markup, arbitrage binds only at the edges of the band, and a dealer who quotes another markup is left with a one-sided position that it can carry only at the outsiders' cost ([Proposition 2](#)). The level of the markup is then a convention, and the premium it creates is a transfer between buyers and sellers, as in the fills.

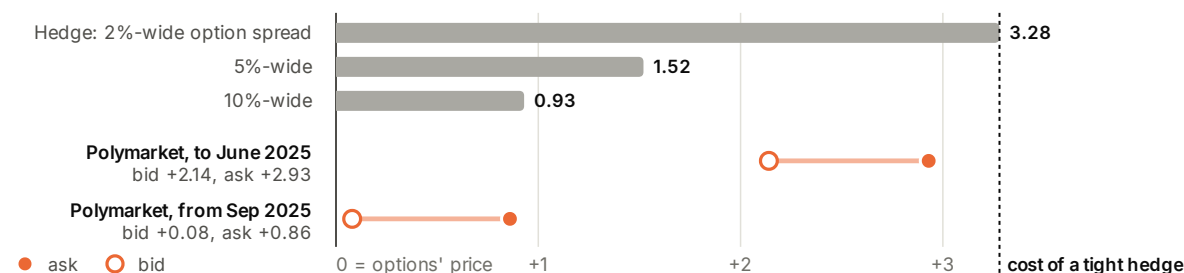
The convention unravels when dealers who quote from option prices enter at a cost no higher than the incumbents' ([Proposition 3](#)). On an open-ended outcome they offer the cheaper ask and receive every buy order, while the rule dealers keep receiving the sell orders. The tails that the rule dealers accumulate push their markup down, until every contract's quotes are centered on the options' price and the spread is the entrants' ([Figure 8B](#)). When the entrants' costs are close to the incumbents', such a switch moves the bid and the ask by about the same amount, leaves the spread nearly unchanged, lowers the prices of tails

A model of why it lasted and why it ended: a pricing convention inside a band set by the cost of hedging

Dealers who price every payoff by one rule can hold any markup that outsiders cannot profitably trade against. Dealers who quote from option prices end it.

A Selling the premium and hedging it tightly with options did not pay

Cents per \$1 beyond the options' price; Deribit's quoted spreads at standard fees, calendar time



A seller at the pre-break bid who hedged with the 2%-wide spread lost 1.14¢; looser hedges gained 0.61–1.20¢ in expectation but left real risk. The band holds at the average fill if hedging costs at least 2.93¢, about the cost of a tight hedge.

B How dealers who quote from options unravel it (stylized, with the observed quotes)

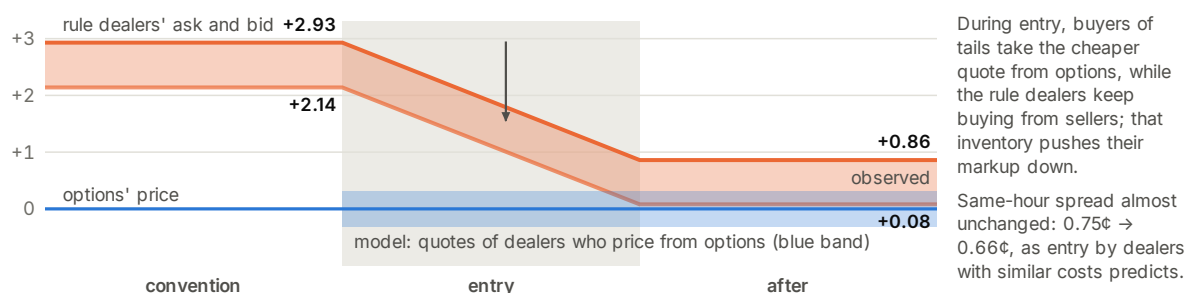


Figure 8. The hedging band and the end of the convention

Notes: Panel A: median cost, beyond its value, of buying the Deribit vertical spread that replicates a 2–15% digital at the quoted asks and bids with standard fees, on the first-of-month days with order books before the break, in cents per \$1 of digital payoff; Polymarket's quotes are takers' fills. Panel B is stylized: the path of the quotes over the three phases is drawn, not estimated, and only the quotes at either end are observed; after the break the observed ask sits above the symmetric quotes that the model's entrants would post.

and raises those of central outcomes, which is what the fills and the range events show. The band is wide enough to have held the old markup. It holds at the average fill before the break if κ is at least the ask's distance from the options' price, 2.93 cents, about the cost of a tight hedge (Figure 8A). Had an entrant absorbed takers' purchases and carried that position at a cost no greater than the incumbents' half-spread, it would have earned about \$13,000 a week in the eight weeks before 27 July 2025. Until mid-2025, then, either no dealer with costs that low was active on Polymarket, or the fixed cost of operating there, legal risk included, exceeded those rents. On Kalshi the same arithmetic involves a wider spread. Its tight quotes before July 2025 had a midpoint 2.2 cents above the options' price, like Polymarket's prices, but were 4.6 cents wide, so its ask stood 4.5 cents above the options' price. The band holds there only if outsiders' cost is at least that much, more than a tight hedge of Polymarket's contracts costs; a hedge of Kalshi's contracts, which resolve 13 or 14 hours after the options expire rather than 8 or 9, is looser and so costlier. Its fall on 6 November 2025 moved the quoted bid and ask down together, at about the same width, as a switch to dealers with costs close to the incumbents' would, but the premium fell by about half, not to zero.

What triggered it? Three candidates in the five weeks before the largest weekly drop; the data cannot rank them

Weekly, from the week of 26 May to the week of 29 September 2025. Weeks start on Monday.

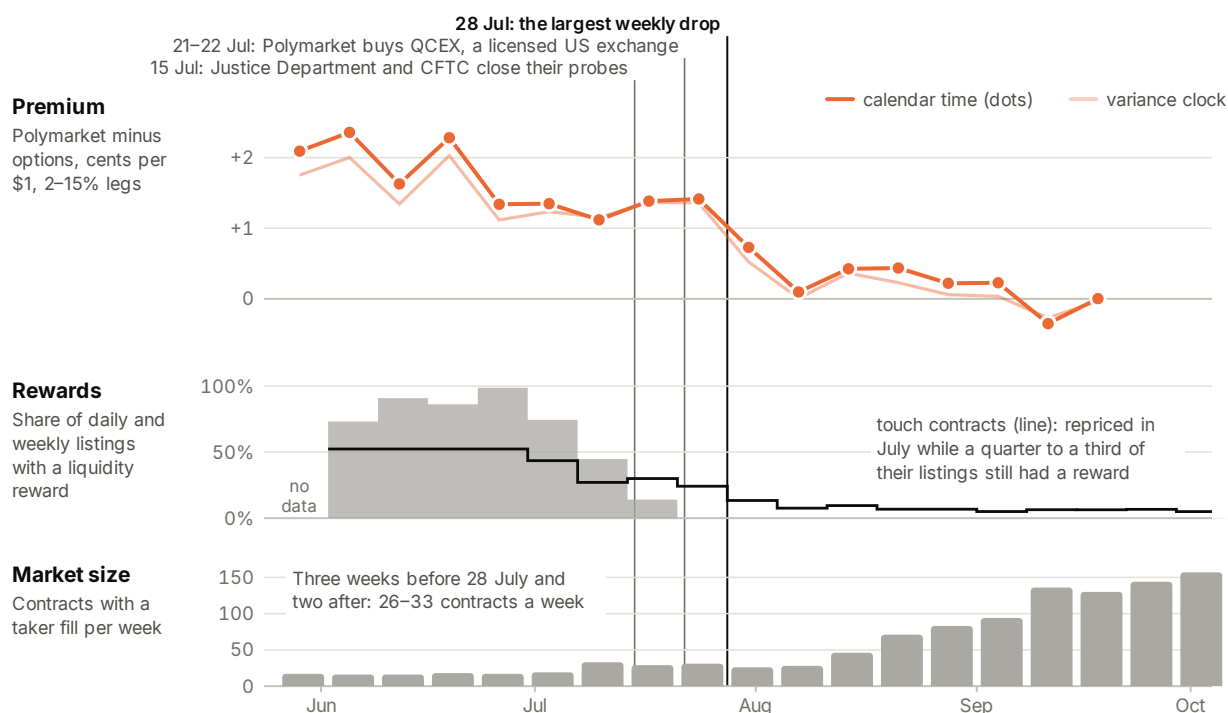


Figure 9. The weeks around the break

Notes: Top: the weekly mean premium of 2-15% legs of threshold contracts more than a day before resolution, in both interpolations. Middle: the share of open daily and weekly threshold, range-tail and interior listings that carried a reward rate (area) and the same share for touch contracts (line); the week of 26 May has no reward records. Bottom: contracts with a taker fill on a 2-15% leg more than a day before resolution.

Three of the model's predictions fail, two of them by small amounts. The markup was lower on interior outcomes than on tails, the bid fell a month before the ask, and after the break a tail sat 0.28 cents below an interior outcome of the same cell instead of at the same price. The leading alternative to the model is bettors whose beliefs about volatility stayed a fixed multiple above the options' and converged to them in the summer of 2025. They would leave the same marks, and the data do not exclude them, although they would have had to follow the options' implied volatility day by day as closely as a dealer who quotes from it.

8.2 What triggered the collapse?

Three candidates fall within five weeks of the collapse's largest step (Figure 9 and Table 2), and the data cannot rank them: the end of liquidity rewards, the legal news and the market's growth. The first is the end of liquidity rewards. Polymarket pays makers for resting orders near a market's midpoint, whatever the midpoint's relation to the options' price, which could have helped hold dealers at the prevailing level. The share of daily and weekly listings that carried a reward fell from nearly all in the week of 23 June 2025 to none in the week of 21 July. But touch contracts repriced in July while a quarter to a third of their listings still carried a reward, and the pool was small, \$16,350 in the first half of 2025, or 7.5% of makers' net profit.

The second is the legal news. Polymarket settled with the CFTC over unregistered event contracts in January 2022 (Commodity Futures Trading Commission, 2022) and from then on did not serve users in the United States, and in November 2024 FBI agents seized its chief executive's phone and electronics (The Block, 2024). The closing of the investigations by the Department of Justice and the CFTC was reported on 15 July 2025 (The Block, 2025) and Polymarket's acquisition of QCEX, a CFTC-licensed exchange, on 21–22 July (CDC Gaming Reports, 2025), two weeks and one week before the largest step. Both lowered the legal risk that a professional, option-hedged dealer would bear on the platform, which in the model enters both the fixed cost of entry and κ . Yet the news was venue-wide, and Polymarket's Solana contracts, whose hedges cost more than twice as much, did not reprice at the end of July. The third candidate is the market's growth: contracts traded a week rose from 7–9 in April 2025 and 16–19 in June to 26–33 in July, which raises the rents that pay for entry. New maker wallets first filled on 28 July and 1 August, although some probably continue wallets that had just stopped, and once those links are counted entrants account for 25% to 42% of the fall in makers' sell price. The candidates are not exclusive.

9 Other Markets, and a Test That Can Say No

Figure 2 collects every market in which an outside price benchmarks a prediction market's longshots. Polymarket's Solana contracts carried a premium of 2.54 cents (0.29) before July 2025, on 52 contracts, but did not reprice at the end of July: their weekly premium was 1.37, 1.42 and 1.67 cents in the weeks of 14, 21 and 28 July, and it fell gradually, to 0.3–0.6 cents in early September, before returning to 2.6–5.1 cents from June 2026. Polymarket's contracts on nine large US stocks, listed from November 2025 and priced against the stocks' own options, which expire at the same close, carried a large premium in their first three months, when the books were thin, and a smaller one from February 2026: displayed prices stood 1.34 cents (0.20) above the options' price, sellers received about the options' price (–0.25 cents, 0.38) and buyers paid 0.79 cents (0.76) more, 2.10 (0.46) counting each fill once. Football is the contrast. Against bookmakers' closing odds with the margin removed by Shin's method, which allows for the bookmakers' own longshot bias (Shin, 1991), Polymarket priced 2–15% outcomes about twenty minutes before kickoff 0.23 cents (0.03) below the bookmakers after the break, on 1,165 legs, and 0.38 (0.17) below them on the 16 legs before it. Polymarket's other categories have no outside price, and tests against their outcomes, with standard errors of one to three cents, cannot measure a premium of this size.

A test that always found a wider distribution would say little. Kalshi lists, every weekday, a range event on EUR/USD and one on USD/JPY that resolves at 10am New York, the cut at which currency options expire, so an overnight option quoted at the previous evening's close prices every outcome. I take the options' prices from Bloomberg's overnight smiles and spread the night's variance over its hours with a variance clock; on a night with a scheduled data release, the clock uses that release's own variance. Outcomes do not reject this benchmark: legs priced at 2–15% paid off 0.26 percentage points (0.29) more often than their options' price for EUR/USD and 0.14 (0.18) more often for USD/JPY.

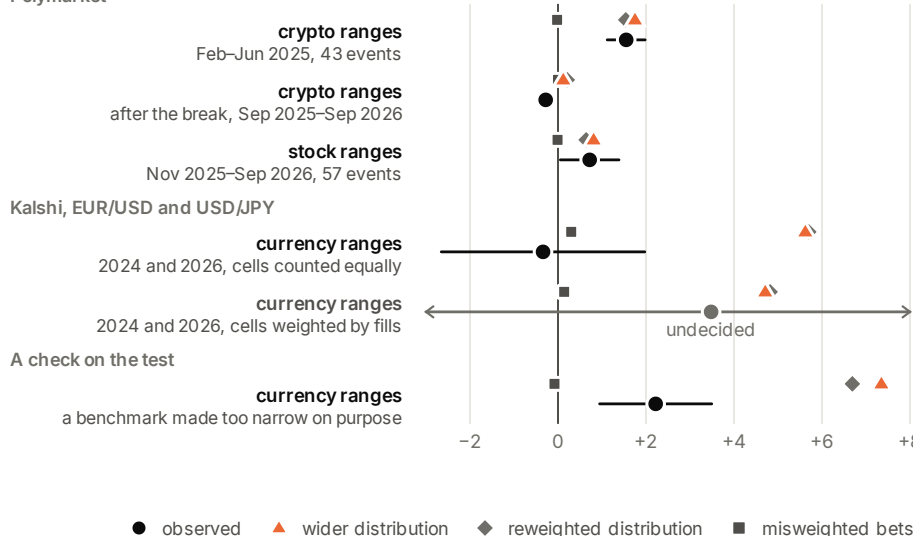
Against this benchmark Kalshi's currency longshots carried a large premium (Figure 10B). In 1,015 events from August 2022 to October 2026, leaving out the sixteen months from September 2024 to December 2025 in which the overnight books were nearly empty, takers who bought a longshot paid 6.10 cents (0.58) above the options' price and takers who sold one received 1.76 (0.22) above it. Where the comparison of shapes can tell the rules apart, it points the other way from Polymarket's, though less firmly (Figure 10A). Pooled over all the years, a tail carried 0.42 cents (0.60) more than an interior range, and the rules fitted to these cells' own fills predict differences between 0.03 and 0.99, too close to tell apart, because in 2022 and 2023, which supply most of the cells, the markup that fits the fills is small, between –5% and +4%; those

The test does not always find a wider distribution: on Kalshi's currency markets it points, tentatively, the other way

Tail minus interior outcome of the same event, snapshot and probability bucket (for Kalshi, the same night and taker side), in cents, with 95% intervals, and what each pricing rule fitted to the same prices implies.

A Observed difference against each rule

Polymarket



B Kalshi's currency longshots

+6.10¢

over the options' price, paid by buyers of longshots priced at 2–15%

+1.76¢

received by sellers

+0.26 / +0.14

how often these longshots paid off, minus the options' price at the close, in percentage points (EUR/USD, USD/JPY): the benchmark passes

Overnight events that resolve at 10am New York, the cut at which FX options expire.

Figure 10. The test on other markets

Notes: Panel A: the coefficient on a tail indicator with a fixed effect for each event, snapshot (for Kalshi, night and taker side) and probability bucket, with 95% intervals; the markers above each row are the differences that the three rules imply when fitted to the same prices. Kalshi's rows pool EUR/USD and USD/JPY; the first two use 2024 and 2026, and the check, which interpolates in calendar time and so leaves too little variance at the fills' times, pools every year. Panel B: Kalshi's fills of 2–15% legs during the night, against Bloomberg's overnight smiles at the New York close.

years say little about the positive markup at issue. In 2024 and 2026 (a split I chose after seeing this), the markup that fits the fills is large, 29.5%, so the rules disagree. Across 212 cells in 109 events, the markup implies that a tail costs 5.62 cents more than an interior range of the same probability, and misweighted bets imply 0.30; the observed difference is -0.34 cents (standard error 1.18). Allowing for the error in the fitted markup, the observed difference less the one the markup implies has a 95% interval from -12.7 to -1.3 cents. Weighting the cells by their fills instead of counting them equally leaves the comparison undecided. And when the benchmark is made too narrow on purpose, the test moves toward a wider distribution, as it should.

The difference between tails and interior outcomes on Polymarket is therefore not a mechanical property of the comparison. On Kalshi's currency ranges the premium looks like the one at the racetrack, a premium on each bet's probability, whereas on Polymarket's crypto contracts before the break it sat in the tails of the whole distribution.

10 What It Means, and What It Does Not

For traders, where an option market spans a prediction-market payoff, the gap between the two can be measured in real time. On Polymarket's crypto contracts before mid-2025 it was not an arbitrage: the tight hedge cost about 3.3 cents beyond its value against a premium of 2.1 cents at the bid. The profitable trade

belonged to a dealer able to carry a one-sided position more cheaply than outsiders could, worth about \$13,000 a week to an entrant, or to an outsider willing to bear the risk of a loose hedge.

For anyone who reads prediction-market prices as probabilities, the paper offers a check that needs no outcomes. Where an outside market prices the same payoffs, the tails can be compared with it. On the crypto contracts of both venues the gap was about two cents per dollar until mid-2025, and it fell sharply, on Polymarket within weeks in the summer of 2025 and on Kalshi in early November. A calibration error of that size can come from how a market is intermediated, not only from its bettors, it can differ between venues that list the same bet, and it can change quickly.

For the favorite–longshot bias, payoffs of different shapes on one underlying show whether a market misprices each bet’s probability or the whole distribution, a question that bets on single events leave open. Polymarket’s crypto ranges and Kalshi’s currency ranges appear to give different answers. The test needs events whose open-ended and bounded outcomes are all quoted, and an outside market that prices them, as the stocks’ own options do for Polymarket’s range events on them.

The evidence has limits. Each repricing is a single episode. Polymarket’s sample before the break is small, 183 threshold contracts over 17 months and 43 complete range events, and Kalshi’s quotes more than a day ahead were sparse until late 2025 and its trades do not identify traders. The breaks and the periods were dated from the data, the options’ price is a model-based interpolation, the model’s band rests on a cost that cannot be observed, and the trigger is not identified. A smaller premium returned from early February 2026, shortly before Polymarket’s reward settings changed and a month before it introduced taker fees with rebates for makers. The markup was about 3% in February and again in September 2026, and in August and September an open-ended tail was again priced above an interior outcome of the same cell, by 0.82 and 1.62 cents, on eight and eleven events. The convention account predicts that a markup, a positive difference between tails and interior outcomes and a bid above the options’ price return together, and data from after the Polymarket sample, which ends in September 2026, can test that prediction ([Appendix F](#)).

Until mid-2025 the two largest prediction markets priced their crypto longshots well above the options, Polymarket as if the coins were more volatile than the options said. Then Polymarket lost most of that premium and Kalshi more than half of it, each at a time of its own and as quoting on that venue changed.

References

- Andersen TG, Bollerslev T (1997) Intraday periodicity and volatility persistence in financial markets. *J. Empirical Finance* 4(2–3): 115–158.
- Andrews DWK (1993) Tests for parameter instability and structural change with unknown change point. *Econometrica* 61(4): 821–856.
- Baele L, Driessen J, Ebert S, Londono JM, Spalt OG (2019) Cumulative prospect theory, option returns, and the variance premium. *Rev. Financial Stud.* 32(9):3667–3723.
- Bai J (1997) Estimation of a change point in multiple regression models. *Rev. Econom. Statist.* 79(4):551–563.
- Bai J, Perron P (1998) Estimating and testing linear models with multiple structural changes. *Econometrica* 66(1):47–78.
- Barberis N, Huang M (2008) Stocks as lotteries: The implications of probability weighting for security prices. *Amer. Econom. Rev.* 98(5):2066–2100.
- Bitcoin Magazine (2025) Polymarket rolls out US app today to select users. Bitcoin Magazine, 3 December 2025.
- Breeden DT, Litzenberger RH (1978) Prices of state-contingent claims implicit in option prices. *J. Bus.* 51(4):621–651.
- Bürge C, Deng W, Whelan K (2025) Makers and takers: The economics of the Kalshi prediction market. Working Paper WP25/19, UCD Centre for Economic Research. Also CEPR Discussion Paper 20631.
- Cameron AC, Gelbach JB, Miller DL (2011) Robust inference with multiway clustering. *J. Bus. Econom. Statist.* 29(2):238–249.
- Cardozo M, Rivero-Wildemaue JI (2026) The favorite–longshot bias in prediction markets: Evidence from Polymarket. arXiv:2609.12878.
- CDC Gaming Reports (2025) Polymarket acquires QCEX for \$112 million in U.S. market re-entry bid. CDC Gaming Reports, 22 July 2025.

- Christie WG, Schultz PH (1994) Why do NASDAQ market makers avoid odd-eighth quotes? *J. Finance* 49(5):1813–1840.
- Commodity Futures Trading Commission (2022) CFTC orders event-based binary options markets operator to pay \$1.4 million penalty. Press release 8478-22, 3 January 2022.
- Commodity Futures Trading Commission (2025) CFTC staff issues no-action letter regarding event contracts. Press release 9113-25, 3 September 2025 (CFTC Staff Letter No. 25-28 to QCX LLC and QC Clearing LLC).
- Conley TG, Taber CR (2011) Inference with “difference in differences” with a small number of policy changes. *Rev. Econom. Statist.* 93(1):113–125.
- DeFi Rate (2026) Kalshi posts \$13B record volume in March, extends lead over Polymarket. DeFi Rate, 6 April 2026.
- Diercks AM, Katz JD, Wright JH (2026) Kalshi and the rise of macro markets. NBER Working Paper 34702, National Bureau of Economic Research.
- Driscoll JC, Kraay AC (1998) Consistent covariance matrix estimation with spatially dependent panel data. *Rev. Econom. Statist.* 80(4):549–560.
- Fabi M, Marfè R, Ruffo VM, Schönleber L (2026) Are decentralized prediction markets efficient? Evidence from Bitcoin options. Talk, DeFi Workshop, Financial Cryptography 2026.
- Football-Data.co.uk (2026) Football results, statistics and soccer betting odds data. <https://www.football-data.co.uk>, accessed 11 October 2026.
- Gandhi A, Serrano-Padial R (2015) Does belief heterogeneity explain asset prices: The case of the longshot bias. *Rev. Econom. Stud.* 82(1):156–186.
- Gatheral J, Jacquier A (2014) Arbitrage-free SVI volatility surfaces. *Quant. Finance* 14(1):59–71.
- Green EA, Lee H, Rothschild DM (2018) The favorite-longshot Midas. Working paper, University of Pennsylvania.
- Griffith RM (1949) Odds adjustments by American horse-race bettors. *Amer. J. Psych.* 62(2):290–294.
- Gürkaynak RS, Wolfers J (2007) Macroeconomic derivatives: An initial analysis of market-based macro forecasts, uncertainty, and risk. Frankel JA, Pissarides CA, eds. *NBER International Seminar on Macroeconomics 2005* (MIT Press), 11–64.
- Kalshi (2026) Fee schedule. Last updated and effective 7 July 2026, <https://kalshi.com/docs/kalshi-fee-schedule.pdf>; fee type and multiplier of each series (GET /series) and the record of fee changes (GET /series/fee_changes) from Kalshi’s public API, accessed 11 October 2026.
- KalshiEX LLC (2022) Amendment to the exchange’s fee schedule. Rule self-certification to the CFTC under Regulation 40.6(a), 9 September 2022, effective 22 September 2022, with the exhibit “Trading Fees”, <https://www.cftc.gov/filings/orgrules/rule091222kexdc001.pdf> and <https://www.cftc.gov/filings/orgrules/rule091222kexdc003.pdf>.
- Levitt SD (2004) Why are gambling markets organised so differently from financial markets? *Econom. J.* 114(495):223–246.
- Liu J, Wu S, Zidek JV (1997) On segmented multivariate regression. *Statist. Sinica* 7(2):497–525.
- MacKinnon JG, Webb MD (2017) Wild bootstrap inference for wildly different cluster sizes. *J. Appl. Econometrics* 32(2):233–254.
- Ottaviani M, Sørensen PN (2008) The favorite-longshot bias: An overview of the main explanations. Hausch DB, Ziemba WT, eds. *Handbook of Sports and Lottery Markets* (North-Holland), 83–101.
- Polkovnichenko V, Zhao F (2013) Probability weighting functions implied in options prices. *J. Financial Econom.* 107(3):580–609.
- Polymarket (2026) Changelog. Polymarket documentation, <https://docs.polymarket.com/changelog>, accessed 11 October 2026.
- Portnaya V (2026) Do prediction markets match option prices? Bitcoin threshold evidence from Binance and Polymarket. arXiv:2606.19517.
- Prelec D (1998) The probability weighting function. *Econometrica* 66(3):497–527.
- Sauer RD (1998) The economics of wagering markets. *J. Econom. Lit.* 36(4):2021–2064.
- Shin HS (1991) Optimal betting odds against insider traders. *Econom. J.* 101(408):1179–1185.
- Snowberg E, Wolfers J (2010) Explaining the favorite–long shot bias: Is it risk-love or misperceptions? *J. Political Econom.* 118(4):723–746.
- Thaler RH, Ziemba WT (1988) Anomalies: Parimutuel betting markets: Racetracks and lotteries. *J. Econom. Perspect.* 2(2):161–174.
- The Block (2022) Following CFTC settlement, prediction platform Polymarket geoblocks trades in the US. The Block, 24 January 2022.
- The Block (2024) FBI seizes Polymarket CEO’s phone and electronics: Report. The Block, 13 November 2024.
- The Block (2025) US Justice Department and CFTC close probes into Polymarket: Bloomberg. The Block, 15 July 2025.
- Tversky A, Kahneman D (1992) Advances in prospect theory: Cumulative representation of uncertainty. *J. Risk Uncertainty* 5(4):297–323.
- Wolfers J, Zitzewitz E (2006) Interpreting prediction market prices as probabilities. NBER Working Paper 12200, National Bureau of Economic Research.

Appendix A The Options' Price

The surface. At each snapshot (00:00, 06:00, 12:00 and 18:00 UTC) I take Deribit's option trades of the preceding hours, invert each trade's mark price at that trade's forward, and fit a smile in standardized moneyness to each expiry. The digital $q = -\partial C / \partial K$ follows from the smile, and every payoff is priced from the digitals at its strikes on the same surface. Polymarket's displayed price is the midpoint of the best bid and ask, or the last trade when the spread exceeds ten cents. The main sample keeps contracts more than 24 hours old and displayed prices after a contract's first fill, since the displayed price of an empty book is often exactly 0.50.

Fills. Every taker fill of a 2–15% leg more than 25 hours before resolution, in a contract listed more than a day earlier, gets the options' price of the nearest snapshot, carried to the fill's time with the spot price and the decay of variance. A taker who sells the longshot hits a resting bid, and one who buys lifts a resting ask; the order book itself is not observed. None of the fills is a self-trade, and dropping round trips, in which a wallet buys and sells the same leg within five minutes in similar sizes, moves the bid and the ask by less than 0.01 cents.

Kalshi. Kalshi's state prices come from the same surfaces at the same snapshots, at each ladder's strike and 5pm close. Its quote at a snapshot is the closing bid and ask of the hourly candle that ends then; the exchange returns no candle for some hours, which are left out rather than read as empty books. A quote is tight when it is two-sided (a bid of at least one cent and an ask of at most 99) and at most five cents wide, and each observation is folded onto its longshot leg as on Polymarket. Kalshi's trades, with the taker's side, are priced against the options as Polymarket's fills are, under the same rule (contracts listed more than a day earlier, fills more than 25 hours before the close, the options' price of the nearest snapshot carried to the trade), and weighted by contracts. The break tests use the daily mean premium of the tight quotes on days with at least three, from April 2024, with the Newey–West variance, trimming and simulated critical values used for Polymarket.

Inference. Standard errors are clustered by UTC day and by event (Cameron et al., 2011). With standard errors clustered by month, or those of Driscoll and Kraay (1998), which allow for errors in the options' price that persist across days, the t -statistics of the premium before the break are 11.4 and 11.7 in calendar time. With 30 monthly clusters of very different sizes, the wild cluster bootstrap p -value of the fall is at most 0.0003 (MacKinnon and Webb, 2017).

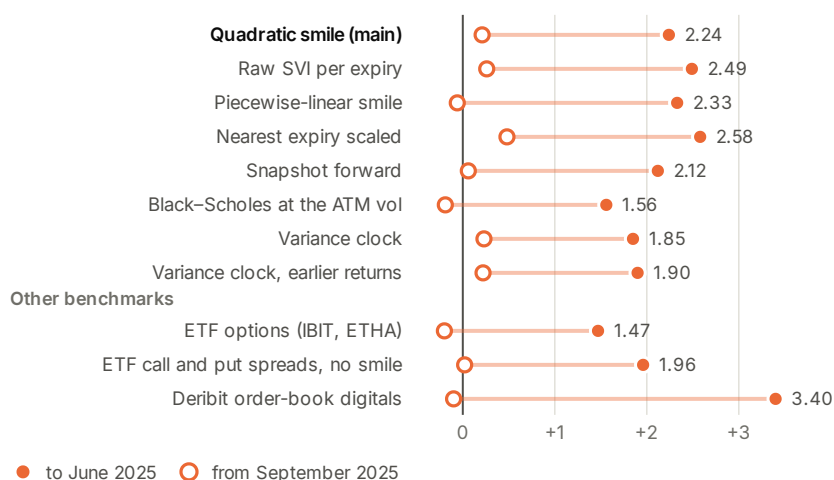
Appendix B The Benchmark

Figure B1 collects the evidence on the options' price. The eight constructions differ in the smile (a quadratic in standardized moneyness, raw SVI (Gatheral and Jacquier, 2014), a piecewise-linear smile, Black–Scholes at the at-the-money volatility), in the forward, in the expiry used and in the interpolation, and the fall ranges from 1.6 to 2.4 cents across them. On the 94 legs that resolve four hours before an expiry of the ETF options, the premium before the break was 1.47 cents against the ETF options and 2.22 against Deribit, and after it -0.20 and 0.43 (1.60 and 1.66 before the break on the variance clock). Deribit's order book gives a benchmark free of a fitted smile on 32 days, against which Polymarket stood 3.4 cents higher before the break, on only 27 legs, and 0.1 cents lower after, on 1,141. The option market's own outcomes test the benchmark against the hypothesis that Polymarket's prices were the true probabilities; for upside legs alone, which paid off 1.21 percentage points (1.38) more often than their options' price before the break, that hypothesis is not rejected.

The benchmark moves the premium's level by about a cent, but under every model-based benchmark the premium fell by 1.6 to 2.4 cents

Premium of 2–15% legs more than 25 hours before resolution, in cents per \$1, before the break (to June 2025) and after it (from September 2025).

A Eight constructions of the options' price, and other benchmarks



B Against CME's options

CME's Bitcoin options priced Bitcoin 2.9% more volatile than Deribit's, before and after alike. Volatility implied by Polymarket's threshold prices, % above:

against Deribit: 11.4% → 1.0%

against CME (restated): 8.3% → -1.9%

C The options' own record

How much more often 2–15% digitals paid off than the options' price said, in the months before the break, in percentage points, with a 95% interval:

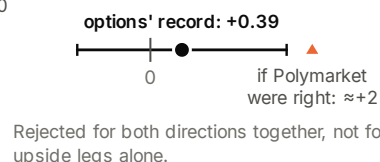


Figure B1. The premium against other benchmarks

Notes: Panel A: the premium of 2–15% legs of threshold contracts more than a day before resolution under each construction of the options' price, with the legs selected on the main construction, and against three other benchmarks: the ETF options on the legs that resolve four hours before one of their expiries (94 before the break, 1,661 after), and Deribit's order-book digitals on 27 legs before the break and 1,141 after. Panel B: CF Benchmarks' index of CME's Bitcoin options against Deribit's DVOL, and the markup restated against a benchmark uniformly that much more volatile. Panel C: synthetic digitals from the same kind of surface, one to seven days ahead, against Binance's outcomes.

Appendix C What Else Changed in the Summer of 2025

Figure C1 collects the evidence on the other changes of the summer of 2025. In the eight weeks either side of 28 July, Polymarket's price of the same legs fell by 1.76 cents while their options' price fell by 0.14 (0.23 on the variance clock). The mix of contracts changed, as single strikes listed one to three days a week gave way, from mid-August 2025, to ladders of strikes on most days. But between the two periods, with fixed effects for bucket, direction, asset, horizon and weekday of resolution, the premium fell by 1.75 cents (2.03 without them), and within range tails, whose design did not change, by 1.53. Bettors kept trading. In the eight weeks either side of 28 July takers' weekly purchases of longshots were 1.15 times their earlier level and their sales 0.92 times, neither change significant, although the intervals are wide. The market grew, and over the whole sample its growth and the break are hard to tell apart, but in the three weeks before 28 July and the two after it the number of contracts traded barely changed, 26 to 33 a week, while the premium fell from 1.1–1.4 cents to 0.1–0.7.

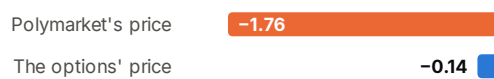
Measures of risk appetite, crypto volatility, flows into the spot ETFs and attention to crypto do not account for the fall either (Figure C1C). Controlling for the market's size, the weekly premium is 0.74 cents lower from 28 July than before. Adding every measure except IBIT option volume widens the gap to 1.10 cents. On the weeks from November 2024, when IBIT option data begin, adding all of them widens it from 0.68 to 1.19. Before the break the premium was higher in weeks of a low VIX and loose financial conditions,

Options, bettors, contract mix and risk appetite do not explain the fall

Panels A and B compare the eight weeks either side of 28 July 2025, except where marked; panel C uses weekly data from March 2024 to September 2026. Cents per \$1 unless stated.

A The options' price did not move; Polymarket's did

Same legs, eight weeks either side of 28 July



Premium, whole periods before and after



Calendar time (the options' price on the variance clock: -0.23). Whole periods: to June 2025 against from September 2025, with fixed effects for bucket, direction, asset, horizon and weekday of resolution.

B Bettors kept buying and selling



Weekly volume of longshot shares, after against before, with 95% intervals. Contracts traded a week were ×2.9 as many in the eight weeks after as in the eight before, but barely changed in the five weeks around 28 July.

C Controls for risk appetite, crypto volatility, ETF flows and attention: with all of them, the fall is larger

Weeks from 28 July 2025 against the weeks before, regressing the weekly premium on the market's size and the controls. Newey–West 95% intervals

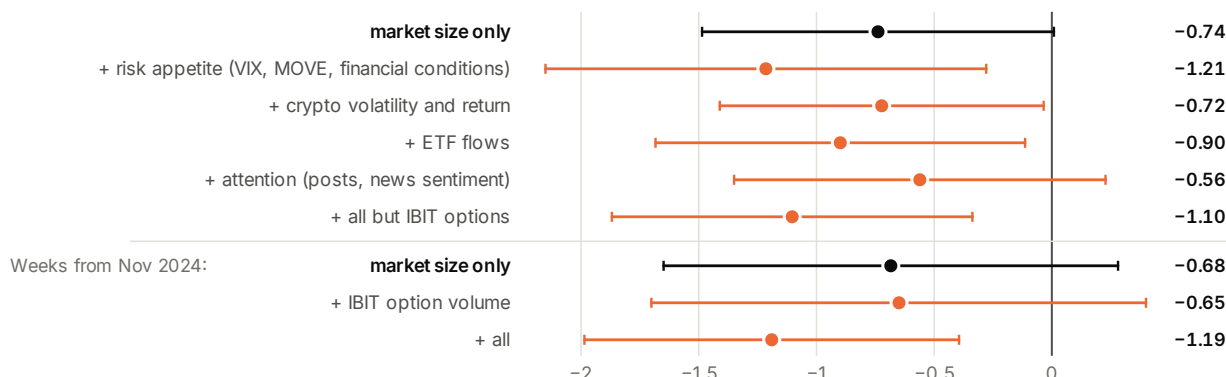


Figure C1. What did not change

Notes: Panel A: the change in the mean price of the same 2–15% legs, within cells of moneyness and horizon, from the eight weeks before 28 July 2025 to the eight weeks after; the lower rows give the change in the premium between the whole periods before and after the break, with fixed effects. Panel B: takers' weekly purchases and sales of longshot shares. Panel C: the coefficient on an indicator for the weeks from 28 July 2025 in regressions of the weekly mean premium on the log number of contracts traded and Bloomberg's measures, with Newey–West 95% intervals.

so the summer's turn toward risk-taking would, if anything, have raised it. The attention measures alone shrink the fall to 0.56 cents.

Appendix D The Geometry Test in Full

Table D1 reports the test behind Figures 4 and 5. Panel A gives the observed premium of the complete range events by the options' price of the leg, with each rule's fit; panel B the comparison of a tail with an interior outcome of the same event, snapshot and bucket; and panel C the change at the break against the change that each rule implies. The fit of the markup and of the reweighted distribution is close, and that of misweighted bets poor, in every panel.

Proof of Proposition 1 (sketch). Write $k = 1 + \theta > 1$, $z = N^{-1}(y)$, n for the standard normal density and $g(y) = R_\theta(y) - y = N(z/k) - N(z)$ for the premium of a digital. (i) For $y < 1/2$, $z < 0$, so $z/k > z$ and

Table D1. The premium by payoff shape within complete range events

Options' price of the leg	Open-ended tails				Interior outcomes			
	Observed	Wider distr.	Rewtd. distr.	Misw. bets	Observed	Wider distr.	Rewtd. distr.	Misw. bets
<i>A. February–June 2025: observed premium and each rule's fit, calendar time</i>								
2–5%	+1.49 (0.13)	+0.96	+0.88	+0.34	+0.71 (0.12)	+0.49	+0.46	+0.36
5–10%	+1.86 (0.19)	+1.36	+1.25	+0.41	+0.51 (0.09)	+0.26	+0.27	+0.40
10–15%	+2.02 (0.18)	+1.55	+1.46	+0.42	+0.16 (0.08)	–0.21	–0.17	+0.28
15–25%	+1.39 (0.21)	+1.51	+1.33	+0.17	–0.48 (0.10)	–0.83	–0.75	+0.05
25–35%	+1.22 (0.12)	+1.17	+1.06	–0.15	–1.34 (0.11)	–1.44	–1.26	–0.40
35–50%	+0.24 (0.13)	+0.49	+0.28	–0.13	–2.45 (0.16)	–1.96	–1.81	–0.82
Fit (RMSE)		0.36	0.41	1.24		0.31	0.28	0.55
<i>B. Tail minus interior outcome of the same event, snapshot and bucket</i>								
Calendar time	+1.55 (0.22)	+1.75	+1.54	–0.02				
Variance clock	+1.23 (0.22)	+1.28	+1.13	–0.01				
After the break, calendar time	–0.28 (0.04)	+0.12	+0.21	0.00				
Fitted parameter (s.e.)		θ 6.8% (0.4)	α 0.935 (0.004)	γ 0.951 (0.007)				
<i>C. Change at the break, after minus before, and the change each rule implies</i>								
2–5%	–1.45 (0.14)	–0.85	–0.70	–0.25	–0.46 (0.12)	–0.43	–0.36	–0.26
5–10%	–1.99 (0.19)	–1.19	–0.98	–0.32	–0.26 (0.09)	–0.21	–0.19	–0.30
10–15%	–2.20 (0.20)	–1.36	–1.14	–0.38	+0.05 (0.08)	+0.20	+0.15	–0.25
15–25%	–1.57 (0.25)	–1.32	–0.99	–0.23	+0.67 (0.11)	+0.73	+0.59	–0.16
25–35%	–1.29 (0.22)	–1.01	–0.76	+0.05	+1.20 (0.13)	+1.27	+0.97	+0.11
35–50%	–0.23 (0.22)	–0.42	–0.14	+0.15	+1.87 (0.19)	+1.72	+1.40	+0.37
Fit of the changes (RMSE)		0.31	0.42	0.94				

Notes: Every outcome of the weekly Bitcoin and Ether range events at the snapshots at which both tails and every interior outcome are observed, listed more than 24 hours earlier and more than 25 hours from resolution (43 events and 830 event-snapshots before the break). Premia are folded onto the leg whose options' price is below one half, in cents per \$1, with standard errors clustered by event and day. Each rule is fitted to every outcome of the period: the wider distribution prices a digital at $R_\theta(y)$ of Equation (1); the reweighted distribution at Prelec's $W(y)$; misweighted bets price outcome i at $q_i^* / \sum_k q_k^*$. RMSE: root mean squared error across buckets, weighted by observations. Panel B: 1,414 observations in calendar time and 1,437 on the clock. Panel C: the change implied by moving each rule's parameter from its fitted value before the break to its value after.

$g(y) > 0$. The ratio $g(y)/y = N(z/k)/N(z) - 1$ falls as y rises, because the derivative of $\log\{N(z/k)/N(z)\}$ in z is $\rho(z/k)/k - \rho(z) < 0$ with $\rho = n/N$ decreasing; it is zero at $y = 1/2$ and tends to infinity as $z \rightarrow -\infty$, since $N(z/k)/N(z) \sim k \exp\{z^2(1 - k^{-2})/2\}$. (ii) $g'(y) = k^{-1} \exp\{z^2(1 - k^{-2})/2\} - 1$ falls as $|z|$ falls, so g is strictly concave on $(0, 1/2]$ and, since $g(1 - y) = -g(y)$, strictly convex on $[1/2, 1)$. An interior outcome above the median, between strikes whose digitals have options' prices $y_1 > y_2$ with $y_1 \leq 1/2$, has options' price $x = y_1 - y_2$ and premium $g(y_1) - g(y_2)$. A strictly concave function with $g(0) = 0$ is strictly subadditive, so $g(y_2 + x) < g(y_2) + g(x)$: the interior outcome's premium is below $g(x)$, the premium of a tail with the same options' price. Below the median the same argument applies to $1 - y$, and an outcome that contains the median, with $y_1 \geq 1/2 \geq y_2$, has premium $-g(1 - y_1) - g(y_2) < 0$. (iii) The marked-up prices of a complete event's outcomes telescope to one, as the options' prices do, so the premia sum to zero. (iv) is immediate. $\square$

Appendix E The Model in Brief

Contracts $j = 1, \dots, J$ pay one dollar if the path of the underlying lies in a set A_j . The options' price of contract j 's longshot leg is $x_j \in (0, 1/2]$, taken as given from a deep option market. A rule with markup θ prices contract j at $m_j(\theta)$, computed from Equation (1), with premium $\delta_j(\theta) = m_j(\theta) - x_j$. In each period and for each contract, a bettor who buys arrives with probability λ_B and one who sells with probability λ_S , and each takes one unit at the best quote.

Table E1. The model against the evidence

	Evidence	Assessment
<i>Assumptions</i>		
Bettors' flows do not respond to the markup	Takers' buying $\times 1.15$ and selling $\times 0.92$ around 28 July 2025; the elasticity of buying is bounded only to $[-4.2, +2.3]$	Not rejected; weak
Outsiders carry a one-sided position at a cost κ	The band holds at the average fill if $\kappa \geq 2.9\text{¢}$ (2.4¢ on the clock), about the cost of a tight hedge	A parametrization
<i>Predictions</i>		
At equal probability, the premium depends on the payoff's shape	Tail minus interior $+1.55\text{¢}$ (0.22); markup 1.75, reweighted distribution 1.54, misweighted bets -0.02 ; stocks $+0.72$ (0.34)	Consistent; so is the reweighted distribution
Central outcomes are priced below their options' price	-0.48¢ , -1.34¢ and -2.45¢ at 15–25%, 25–35% and 35–50%	Consistent
One markup prices every payoff of an event	8.0% on tails and 5.5% on interior outcomes of the same events (s.e. of the difference 0.5 percentage points)	Rejected; small
With balanced flows the level is a transfer among takers	Takers bought 48% of the longshot shares in the fills before the break; buyers lost \$537,000 and sellers gained \$419,000	Consistent
Bid and ask move together; the spread changes little	Both fell by about 2.1¢ between the periods, the bid a month earlier; same-hour spread 0.75¢ before, 0.66¢ after; on Kalshi at 6 November 2025 the quoted ask fell by 1.9¢ and the quoted bid by 1.6¢, but in its trades only the ask fell	Fails in part
Payoffs reprice as the markup's fall implies	Root mean squared error 0.31, against 0.42 and 0.94 for the two weightings; the tails' fall understated by 0.6–0.8¢	Consistent
After the switch the premium does not depend on shape	Tail minus interior -0.28¢ (0.04)	Rejected; small
Each venue's premium falls after its own quoting changes	Kalshi's premium rose by 1.4¢ around 28 July 2025 (15 weekly Bitcoin ladders) and fell from 2.3¢ to 1.0¢ on 6 November 2025, a month after its median spread narrowed from 36¢ to 5¢, while trading grew tenfold that month and a hundredfold within three months	Consistent in part; it fell by half, and Kalshi's dealers are unobserved
A convention survives where informed quoting is costly	Solana, hedges 2.6–2.8 times as costly: no fall at the end of July, a gradual fall, a return in 2026 above the pre-break level; data seen before the model was written	Survival consistent; one asset

Assumption 1 (Inelastic bettors). Bettors trade at the posted quotes whenever the quotes lie inside the band of [Assumption 2](#).

Assumption 2 (Constrained outsiders). Outsiders who know the options' price can trade against the quotes or post their own, and offset the position in options, at a cost κ per unit of net position held to resolution. They trade on every contract whose bid b_j or ask a_j lies more than κ from x_j .

Rule dealers quote $b_j = m_j(\theta_t) - c/2$ and $a_j = m_j(\theta_t) + c/2$ on every contract and lower the markup when they accumulate payoffs that gain from volatility, $\theta_{t+1} = \theta_t - \varphi \Delta I_t$ with $\varphi > 0$, where ΔI_t is their net purchase of such payoffs. *Informed dealers* quote from option prices, with a round-trip cost s , after paying a sunk cost F to operate. Two or more informed dealers compete their quotes down to $x_j \mp s/2$.

Proposition 2 (A band of conventions). *Let only rule dealers quote, with balanced flows $\lambda_B = \lambda_S = \lambda$, and let Θ be the largest interval containing zero on which $|\delta_j(\theta)| \leq \kappa - c/2$ for every j . For every θ_t in the interior of Θ :* (i) *outsiders neither trade against the quotes nor post their own, and bettors' flows do not depend on θ_t ; (ii) the rule dealers' expected revenue per contract and period, at the options' price, is λc , whatever θ_t ; (iii) the markup has zero drift; and (iv) no rule dealer gains by quoting another markup on any contract, since the one-sided position that a deviation builds gains at most $|\delta_j| + c/2$ per unit, which does not exceed its carrying cost κ .*

Proposition 3 (Informed quoting unravels the convention). *Consider contracts that are open-ended or contain the median, quoted by rule dealers at a markup $\theta_0 > 0$ in the interior of Θ with balanced flows, and let informed dealers enter with a round-trip cost s . If $s \leq c$: (i) on every contract with $|\delta_j(\theta_0)| > (c-s)/2$, informed quotes beat the rule dealers' on one side only: on an open-ended outcome the informed dealers receive every buy order and the rule dealers every sell order; (ii) the rule dealers' inventory then changes in the direction that lowers the markup; (iii) with two or more informed dealers and $s < c$, every premium falls to zero, whatever the payoff's shape, and the spread becomes s . (iv) If $s > c$, a convention with a smaller markup survives. Entry pays if the rents in (i) during the transition exceed F .*

A change of the markup moves the bid and the ask of a contract by the same amount, and a switch to informed quotes moves the midpoint by $-\delta_j(\theta_0)$ and the spread from c to s ; when s is close to c the two cannot be told apart. A fall in κ , for instance in the legal cost of operating on the venue, would also lower the markup, to the edge of a narrower band. [Table E1](#) sets the model's assumptions and predictions against the evidence.

Appendix F A Test on Later Data

The convention account makes a prediction that data not yet seen can check. If the premium returns, it should return as a convention: a markup on open-ended payoffs, a tail priced above an interior outcome of the same probability in the same event, and a bid above the options' price, together. A premium that depends on each bet's probability alone, or a premium charged only to buyers as on Kalshi before July 2025, would be a different mark. For each month after the Polymarket sample ends in September 2026, the test computes, with the definitions used here, the markup fitted to 2–15% legs of threshold contracts, the difference between tails and interior outcomes within the same event, snapshot and bucket, and the mean premium of takers' sells. With about eight to eleven complete range events a month, against the 43 behind the result before the break, the comparison of shapes needs several months of data; the markup and the fills accumulate faster.