

# The Parimutuel Market Maker

*A New Market Structure for Permissionless Prediction Markets*

Public Litepaper

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## Abstract

Permissionless prediction markets need a source of liquidity that does not depend on professional market makers or external subsidy. Currently, no existing market structure provides one. The Parimutuel Market Maker (PMM) is built to close this gap by evolving the parimutuel: a mechanism that bootstraps liquidity from the first dollar, but historically fails when late capital dilutes the payouts of earlier winning participants. The PMM accomplishes this by combining parimutuel settlement with mutually aware outcome price curves that adjust dynamically to the full pool state. Each position carries a deterministic, monotonically increasing minimum-return floor, set at entry and conditional on the position's outcome winning and being held to resolution. Payout floors rise with the volatility a position absorbs, turning exposure to opposing flow into counterparty-liquidity rewards. Participants who enter early or through a presale can pair directional conviction with a claim on the market activity that follows. Non-directional capital can earn yield through a risk-managed cashout service that supplies instant pre-resolution liquidity. Together, these properties let a permissionless prediction market open at the first dollar of liquidity and trade continuously, with no professional market makers and no external subsidies. To our knowledge, the PMM is the first parimutuel system that eliminates late-capital dilution rather than working around it.

## 1. Introduction

Prediction markets are forecasting instruments and financial venues simultaneously. A well-functioning prediction market produces prices that track probabilities, rewards participants in proportion to the quality of their forecasts, and remains tradable as new information arrives. Building such a market requires a market-making mechanism: a rule for pricing exposure to each outcome as the market evolves.

Permissionless prediction markets impose a harder constraint. When anyone can create a market, liquidity cannot depend on professional market makers, subsidized operators, or

discretionary incentives external to the market. If passive market participation is structurally unprofitable, the market can only survive through subsidy. Repeatable permissionless markets therefore require a mechanism where participants can bootstrap liquidity passively with a reasonable expectation of return, conditional on market growth, volatility, and participant flow.

Existing mechanisms each fail part of this requirement. AMMs provide permissionless liquidity but were designed for persistent tokens rather than expiring claims. CLOBs support active trading but require professional market makers before many markets can trade. The parimutuel comes closest: it functions from the first dollar of liquidity, requires no market maker, and settles peer-to-peer with no operator risk.

Pennock proposed a dynamic parimutuel market (DPM) to allow parimutuels to continuously price outcomes during events. The DPM borrows the parimutuel's ability to bootstrap liquidity but adds a dynamic entry and exit, creating a market that trades during an event. However, the DPM, as with the parimutuel, cannot support full-duration trading without diluting early conviction. Participants buy shares in outcomes, the pool accumulates value, and at resolution the pool is divided pro-rata among holders of the realized outcome. If late capital enters the correct outcome after the result becomes apparent, earlier correct participants see their share of returns reduced. Traditional parimutuels are therefore forced to either limit ongoing trading or accept significant odds dislocation as markets converge toward resolution.

The Parimutuel Market Maker (PMM) evolves the parimutuel foundation to suit the needs of permissionless prediction markets. It preserves peer-to-peer settlement and first-dollar liquidity while adding co-adaptive pricing, cross-outcome rebalancing, minimum-return floors, and a paired cashout service for pre-resolution exits. Section 2 explains how a PMM market works at a high level. Section 3 sets out the five requirements a permissionless prediction market imposes and shows how the PMM satisfies each. Section 4 presents simulation results.

The PMM's production curve family, parameter schedule, and rebalancing implementation are proprietary and are not disclosed; every property described in this paper is observable mechanism behavior.

## 2. How a PMM Market Works

At its base, a PMM market is parimutuel. Parimutuel markets are defined by an event, resolution criteria, and a finite set of two or more mutually exclusive outcomes. Participants buy shares in an outcome, forming a position that pays on resolution if the outcome is declared the winner, and the pool settles pro-rata among holders of the realized outcome. The PMM keeps this foundation and changes what happens between entry and settlement.

A PMM position differs from a parimutuel stake in two ways. First, its value has two components, directional exposure and counterparty-liquidity rewards. Liquidity here is counterparty capital in the parimutuel sense, the stake on opposing outcomes that funds the

winners, not the neutral two-sided depth of an AMM pool. The price a participant pays is therefore a composite of implied outcome probability and the liquidity-growth component assigned by the pool state. Second, every position carries a minimum-return floor, set at entry. Both properties come from how the PMM prices outcomes.

Pricing runs on a set of mutually aware outcome price curves. Each outcome has its own curve, and every curve is a function of the entire pool state rather than its own outcome's liquidity alone. When capital enters one outcome, the selected outcome moves along its curve and the prices of all other outcomes update in the same step. Two constraints hold through every update: the counterparty liquidity available to each outcome is determined by the liquidity held against all others, and total liquidity across the pool is preserved. The curve family and the schedule that governs it are proprietary; what matters for the rest of the paper is the behavior the constraints produce. Pool state is tracked per outcome and includes counterparty liquidity, share counts, deposited value, and accumulated counterparty-liquidity rewards.

The minimum-return floor follows from the same two constraints. A position's floor is recorded at entry from the pool state and its order of entry. From that point, each subsequent trade is priced so that it pays the cost of preserving every floor already outstanding. The floor is therefore intrinsic to the pricing rather than a guarantee layered on top of it. Because accrued rewards can raise a floor but never reduce it, a qualifying position's floor can only increase over its life.

### 3. What Permissionless Prediction Markets Need; How the PMM Delivers

A permissionless prediction market is a different design target than a centralized one. When anyone can create a market, the venue cannot rely on professional market makers or external subsidy to keep individual markets functioning; the mechanism itself has to do the work. Five requirements follow. A mechanism for permissionless prediction markets must support continuous trading, function at the first dollar of liquidity, settle peer-to-peer without subsidy, keep its entry-time prices meaningful at settlement, and make passive bootstrapping profitable. The rest of the section takes each requirement in turn, identifies the mechanisms that fail it, and shows how the PMM delivers.

#### Continuous Trading

*Prices must respond to information as it arrives, and participants must be able to both enter and exit positions throughout the market's lifetime.*

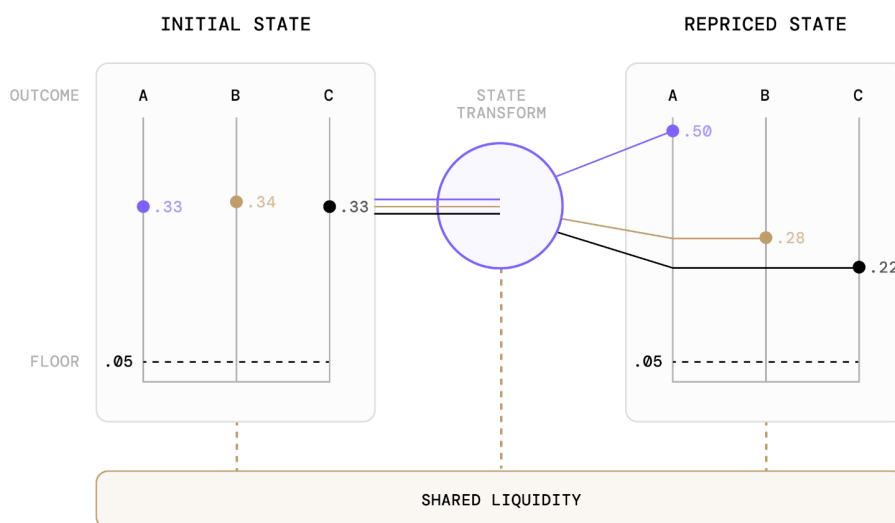
A traditional parimutuel fails this requirement. It offers no native way to exit a position, and to contain odds dislocation it typically stops accepting new entries before the event begins. The PMM provides continuous market interaction while preserving the floor obligations already outstanding. Because each outcome's price is a function of the full pool state, every trade reprices the whole market while preserving outstanding floor obligations.

Participants interact with a PMM market through three operations: buying a position, switching between outcomes, or exiting through the cashout service. A buy deposits value into a chosen outcome and issues the user shares. The PMM quotes the position from pool state and order of entry, assigns its minimum-return floor, and updates pricing conditions across all outcomes.

A position switch moves a participant's exposure from one outcome to another without leaving the core pool. The switch preserves the expected value of a position, the product of the likelihood of the outcome and the sum of the user's principal, floor value and counterparty-liquidity rewards upon resolution if correct. The switched position receives a new minimum-return floor, computed against the preserved value and current pool state as if it were a new entry on the receiving outcome.

A cashout exits a position prior to resolution through the cashout LP vault. The vault offers a risk-adjusted quote at a discount to the position's current expected value. The discount is the cost of on-demand liquidity, not a slippage penalty against the pool; when a user cashes out, the cashout LP takes over the position and the user receives instant liquidity.

The distinction matters. A switch preserves value inside the PMM, making it the stronger option when a participant's conviction changes. A cashout provides immediate exit liquidity, but at a discount through a separate liquidity service. The cashout LP is naturally extensible to a RFQ-based system.



## Permissionless Cold-Start

*A new market must function at the first dollar of liquidity.*

The central limit order book fails this requirement. An empty order book has no price and no executable liquidity. Before trading can begin, a CLOB needs informed market makers willing to quote outcomes, and few professional market makers will support regional, domain-specific, sentiment-based, or esoteric markets. The PMM inherits cold-start from its parimutuel foundation: the pool itself is the counterparty, so the first deposit creates a functioning market, with no inventory to seed and no market maker required before trading begins.

Presale is an optional bootstrapping phase that accepts deposits before a market opens for continuous trading. Deposits clear at a constant price set at presale close, with oversubscription handled by proportional scale-down. A presale market therefore opens non-empty and immediately tradable. In exchange for bearing the earliest position risk, presale depositors receive the largest share of counterparty-liquidity rewards in the market. In the case of no presale, the market begins in a parimutuel bootstrapping state and transitions into continuous PMM trading once a configurable liquidity threshold is reached.

## Peer-to-Peer Economics Without Subsidy

*The mechanism must settle between participants without requiring neutral liquidity providers to absorb adversarial loss.*

Automated market makers and LMSR fail this requirement. Event contracts are expiring claims: one side of every market expires valueless, and an AMM pool rebalances into the losing side throughout the market's lifecycle, leaving its liquidity providers structurally short the correct outcome as information arrives. Fees can offset some of this loss, but raising fees pulls directly from trader returns on a fixed payout. LMSR avoids the pool but requires a subsidized operator, so every new market is a new subsidized position.

The PMM does not require a neutral liquidity provider to continuously rebalance into expiring outcome inventory. Counterparty liquidity remains inside the parimutuel participant pool. Positions hold directional exposure through resolution, and market activity is settled among participants rather than transferred to a separate LP class that must be paid to absorb informed flow.

At resolution, trading closes, unrealized outcome share counts go to zero, and settlement occurs. Each position in the realized outcome receives a payout determined by its pool share, accumulated counterparty-liquidity rewards, and any unallocated liquidity assigned by the settlement function. That payout satisfies or exceeds the position's minimum-return floor. The floor is not an additional payout component; it is the lower bound the realized payout must

satisfy. This floor-solvency property has been formally verified against the settlement logic, and the simulations in Section 4 test it across market conditions.

Auxiliary vaults are separate services with clearly priced risk. The cashout LP earns the spread on pre-resolution exit liquidity, but no party is paid to absorb adversarial loss on behalf of the core pool.

### **Entry-Time Price Integrity**

*The market's entry-time quotes must remain economically meaningful at settlement and cannot be degraded by subsequent trading activity.*

The traditional parimutuel fails this requirement most visibly. Entry-time odds are not representative of what a position may be worth at resolution: as the pool evolves, later flow changes the final realized odds, and positions in the correct outcome see their expected payout reduced.

The PMM avoids this failure through the minimum-return floor. Each new trade is priced so that it pays the cost of preserving every floor already outstanding. As a result, a position's entry-time quote defines a minimum settlement value that later flow cannot erode. The floor is deterministic and monotonically increasing: set at entry, and from there able only to rise.

The guarantee applies only to positions held to resolution in the realized outcome. A position held in an outcome that is not realized receives no payout, and cashout offers are separate secondary liquidity quotes that may fall below the position's resolution floor.

### **Profitable Passive Bootstrapping**

*The mechanism must give early, non-quoting capital a reasonable expectation of profit.*

All alternative systems fail this requirement. In a permissionless market, passive bootstrapping capital cannot be expected to actively quote prices like a professional market maker. It must have a reason to enter before the market is mature and remain exposed while the outcome is uncertain. The PMM provides this through counterparty-liquidity rewards assigned to early positions and presale participants.

A position that enters early and remains exposed through subsequent market activity accrues additional value as capital enters opposing outcomes. This capital increases the counterparty value available to existing positions. Volatility is a proxy for useful counterparty liquidity: a position that stays in the pool while the market moves against it is serving as the counterparty for later traders. As opposing flow grows, the PMM captures that increase through rewards that raise the position's minimum-return floor.

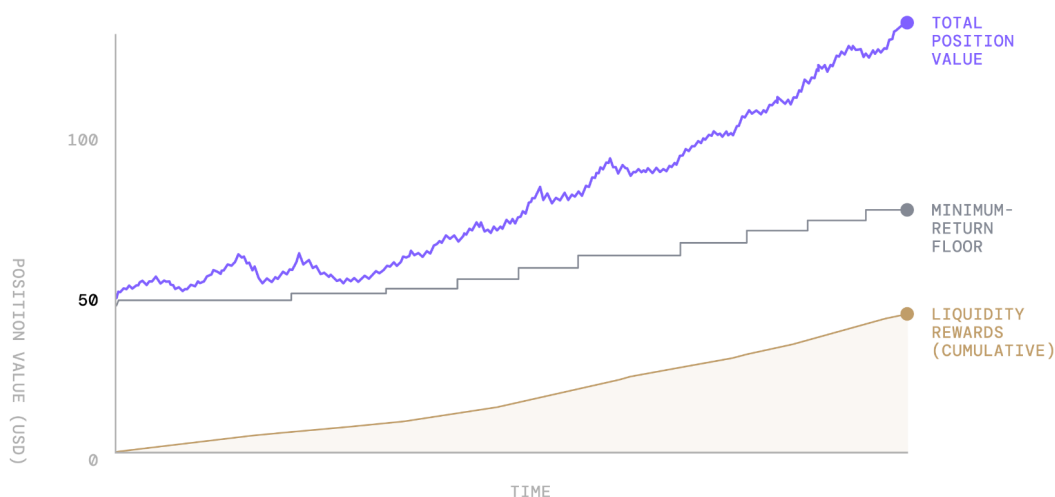
This explains the simulation results in Section 4. Markets with little probability movement produce returns closer to the initial floor. Markets with more movement generate more

counterparty-liquidity rewards, because positions repeatedly absorb volatility and retain the rewards generated by that exposure. Short-duration Bitcoin markets exhibit enough volatility for presale positions to produce positive average returns in simulation. Not all event types will be volatile enough to produce positive expected returns in every setup, but markets with sufficient opposing flow can still produce outsized returns.

Two kinds of capital can participate. Opinionated capital enters early or through presale, pairing directional risk with the largest share of counterparty-liquidity rewards. Capital seeking risk-managed, non-directional exposure deposits into the cashout LP vault, which earns the spread on pre-resolution exits plus the resolution value of winning shares it holds at settlement.

## Value of a \$50 position in a 50/50 market

HELD TO RESOLUTION IN THE REALIZED OUTCOME



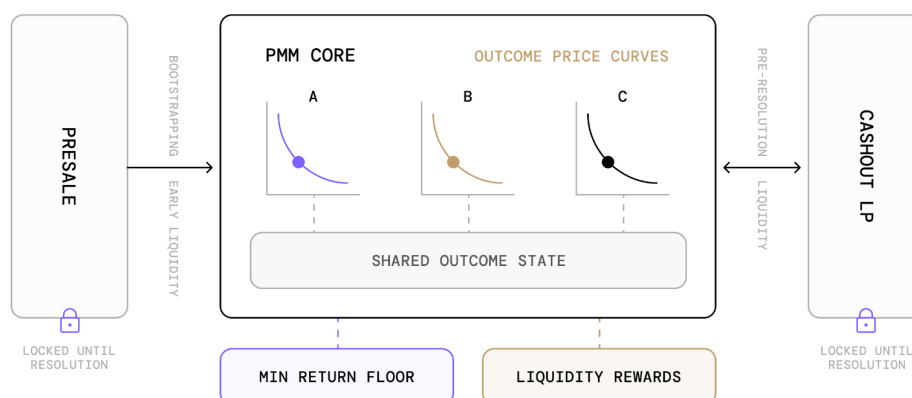
## Where Each Mechanism Stands

The matrix below places the PMM against alternative mechanisms.

| Mechanism  | Continuous Trading | Cold-Start    | No Subsidy Needed | Entry-Time Price Integrity | Profitable Passive Bootstrapping |
|------------|--------------------|---------------|-------------------|----------------------------|----------------------------------|
| Parimutuel | No                 | Yes           | Yes               | No                         | No                               |
| AMM        | Yes                | Yes           | No (LPs bleed)    | Yes                        | No                               |
| CLOB       | Yes                | No (needs MM) | Yes               | Yes                        | No                               |
| <b>PMM</b> | <b>Yes</b>         | <b>Yes</b>    | <b>Yes</b>        | <b>Yes</b>                 | <b>Yes</b>                       |

## The System at a Glance

A full Melee market pairs the core PMM with an optional presale and a cashout LP vault. Traders interact with the PMM as presale participants or general market participants and receive resolution payouts as described above, with presale participants receiving the larger share of counterparty-liquidity rewards. Cashout LPs receive yield through the spread accumulated from providing the cashout service, plus the resolution value of any unsold winning shares at market resolution. Market creators receive a portion of the platform fees collected on all market activity. Each role is compensated by the market's own activity rather than by external subsidy.

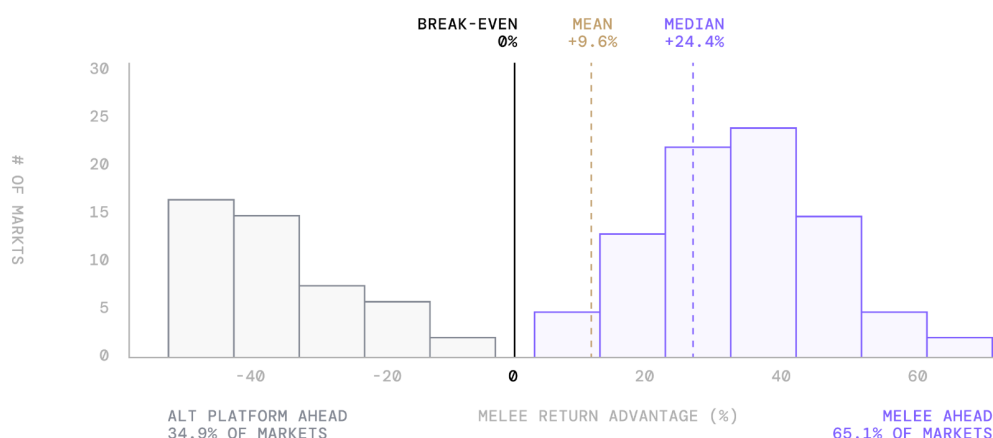


## 4. Market Simulations

We simulate 126 15-minute Bitcoin markets to test two of the mechanism's central claims: that the minimum-return floor holds at settlement, and that passive participation in sufficiently volatile markets is profitable on average. Across every simulated market, each qualifying winning position settled at or above the minimum-return floor quoted at entry. The two distributions below report returns across the same set of markets. Trades are only assumed to occur if the odds on Melee can be profitably arbitrated net of fees against markets for the same event on other platforms.

### Winning-outcome **return advantage** in Bitcoin 15M markets

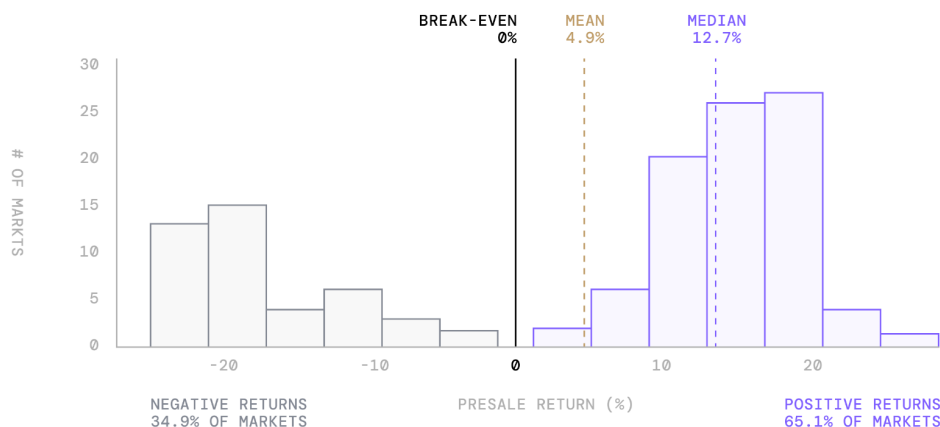
DISTRIBUTION OF MELEE RETURN ADVANTAGE VS A STATIC WINNING-SIDE BET ON ANOTHER PLATFORM ACROSS 126 MARKETS



The first distribution compares the return on a winning PMM position to a static bet on the same winning outcome held on another platform. The PMM position returns more in 65.1% of markets, by an average of 9.6% and a median of 24.4%, because a position held to resolution also accrues counterparty-liquidity rewards as it absorbs opposing flow, value a static winning bet does not capture. The advantage ranges from -48.9% to +67.2%, and in roughly a third of markets the static bet returns more.

## Presale **profitability** in Bitcoin 15M markets

DISTRIBUTION OF PASSIVE PRESALE RETURNS ACROSS 126 SIMULATED MARKETS



The second distribution reports the return a passive presale position realizes across the 126 markets. The presale position holds equal amounts of the correct and incorrect outcome at the beginning of market, limiting its downside to the initial minimum return of one outcome minus the cost of both. Presale returns are positive in 65.1% of markets, averaging 4.9% with a median of 12.7%. Returns scale with how much the market moves: markets with little probability movement settle near the initial floor, while markets with more movement accrue more counterparty-liquidity rewards. The distribution also carries real downside. Roughly a third of markets return negative, the range runs from -22.7% to +28.1%, and a presale position whose outcome does not win can lose its stake. The positive average reflects passive participation as a risk-bearing strategy, not a guaranteed return.

**Note:** Across simulated markets, every qualifying winning position settled at or above the minimum-return floor quoted at entry.

## 5. Limitations

**Instant exit is a separate service.** Exit prior to resolution depends on the cashout LP and may be discounted. Cashout availability depends on vault depth.

**Reward concentration without a presale.** For markets that do not use the presale mechanism, the earliest entrants receive the entire share of counterparty-liquidity rewards rather than a presale split. The concentration is a design choice available to market creators and

reflects the volume-weighted structure of the reward schedule rather than a flaw in the floor property. Passive returns depend on market growth, volatility, flow composition, and parameters.

## 6. Conclusion

Permissionless prediction markets need a mechanism that no existing market structure provides. The parimutuel bootstraps liquidity and settles peer-to-peer but cannot trade continuously or protect early conviction. The AMM and LMSR trade continuously but require a neutral party to absorb loss. The CLOB does both but cannot open a market without professional market makers. Each succeeds in its native setting and fails when applied to permissionlessly created event contracts. The PMM is built for the setting itself: continuous trading on expiring claims, price discovery from the first dollar of liquidity, peer-to-peer settlement, entry-time price integrity, and profitable passive participation, all at once.

To accomplish this, the PMM links its entry-time prices to its settlement-time obligations. Mutually aware outcome price curves adjust dynamically to the full pool state, and minimum floors are guaranteed at the time of entry. With that guarantee, early participants and passive capital can underwrite their exposure with confidence, unlocking liquidity from both neutral and opinionated capital while limiting adverse selection.

For traders, this means a position whose floor is set at purchase and whose upside grows as the market itself grows. For passive capital, it means yield from prediction markets, a category previously closed to capital that does not actively manage positions. For the prediction-market category, it means markets can exist where they could not before: regional, domain-specific, sentiment-based, and esoteric markets that no professional market maker could underwrite.

## References

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- Adams, H. (2018). Uniswap Whitepaper.
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