

Freeport

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Introduction

Freeport is a blockchain based prediction market built on Cardano. Freeport aims to be a decentralized system with mutually beneficial incentives that work for all participants (traders and market originators). It is also meant to be completely open and permissionless where anyone can create a market, and anyone can trade on any market. Market originators create the markets/pools for wagering and are trusted to resolve market outcomes. The prices of outcomes move in reaction to wagers made during the betting period, similar to how exchange rates move in an AMM Dex. The smart contracts that facilitate the value transfer are written in Plutus and deployed on the Cardano blockchain. Freeport contracts are an example of a headless Dapp. The parameterized nature of the contract allows for an infinite number of instances to be created, with each event/market representing a unique instance. Freeport's primary ambition is to harness the power of truly free and efficient markets to elicit the most accurate information possible for any given event and its outcomes.

Market Creation

Upon market creation, the market originator will specify a trading deadline, an expiration date, their initial stake (balance of Ada between option A and option B), and the fee. The trade deadline marks the valid time range for submitting a bet in a market. If the originator does not settle the market before the expiration date, bettors will be able to reclaim the Ada locked at the contract address equal to their original bet. The initial stake parameter is how the originator sets initial liquidity and price for the market. This is broken into `initialStakeA` and `initialStakeB`. The sum of the two represent the total Ada the originator will lock at the address to start. The proportion of each to the sum dictates the initial line or price of each outcome. The smart contract logic has guards in place to ensure an originator correctly initializes a market and will not allow trading until initial parameters are in place. A fee is specified to the contract which is to be taken out of the bettor's potential winnings and passed on to the originator at settlement. A fee is necessary to cushion the originator from potential loss and provide an incentive for them to maintain a good reputation within the betting community.

Wagering

Once a market is successfully created, wagering will be open until the trade deadline. When a wager is submitted, the bettor will receive an amount of outcome tokens that will act as a 'bet slip'. These tokens will be redeemable 1:1 for Lovelace (0.000001 Ada) if the market resolves to the outcome selected by the bettor, these outcome tokens will be worthless otherwise. Additionally, the bettor will receive pool tokens that will act as receipts to reclaim the wager in case of market expiration.

The potential win amount is a function of the current market price, the wager amount, and the market fee:

$$\text{Win Amount} = \left[\left(\frac{\text{Wager}}{\text{Pool A or B at contract} + \text{Wager}} \right) * (\text{Ada at contract} + \text{Wager}) \right] * (1 - \text{fee})$$

The current market price at any point is found by taking the proportion of Pool A or B tokens to the sum of Pool A and Pool B tokens (Total Ada Locked = Pool A locked + Pool B locked):

$$\text{Current Price A} = \left(\frac{\text{Pool A at contract}}{\text{Pool A at contract} + \text{Pool B at contract}} \right)$$

The new market price is dependent on the current liquidity and wager size:

$$\text{New Price A} = \left(\frac{\text{Pool A at contract} + \text{Wager}}{\text{Pool A at contract} + \text{Wager} + \text{Pool B at contract}} \right)$$

The difference between the new price and the current/instantaneous price is the resulting ‘slippage’ that occurs when making a bet. This is the same slippage that AMM Dex’s refer to. The higher the wager amount, the greater the slippage will be. This pricing mechanism comes with the implication that traders will move the line or exchange rate after each bet. This is a key feature in price discovery/information elicitation for prediction markets. The initial liquidity must be appropriately set in such a way so that a user can wager a reasonable amount without shifting the line too far away from their prediction.

Settlement

The market originator is trusted to settle the market honestly. This is done at any time prior to the expiration date in the form of a settlement transaction that tells the contract which option is correct and that the market is settled. If the originator settles the market incorrectly, *there will be no recourse for traders*. It is very important that traders be conscious of where/who they trade with. There are no do-overs and no one to step in during the event of a malicious settlement from a market originator. This is software meant for use by fully functioning adults who assume all risk for their trades and are responsible to properly vet the market they choose to trade within.

At settlement, the contract tallies the total liability to be paid to the winning outcome by calculating how many outcome tokens were released during the betting period. The contract then distributes winning outcome tokens equal to the difference of the total locked Ada and winning outcome liability to the originator. The originator can then claim these outcome tokens 1:1 for Lovelace. After settlement, bettors with winning outcome tokens must submit a redeem transaction to claim winnings. This transaction exchanges the outcome tokens for Ada locked in the contract.

Incentive Compatibility

Market settlement is entrusted to the market originator. The reputation-based system should create incentives for the originator to report the outcomes of the market event truthfully. Truthful settlement is necessary to maintain a reputation within the community of traders who will likely steer clear of originators with bad/unknown reputations for fear of a malicious actor who would report untruthfully for their own benefit. It is encouraged, but not necessary, that they dox themselves to establish some form of reputation and rapport within the community that will bolster trust from traders and ultimately drive more trading and liquidity. Traders will not have a ton of confidence trading on a market with a previously unknown originator who’s only known feature is their public key hash. It should be the goal of a market originator to have higher liquidity in their markets to ensure/produce more potential profit earned through fees. In this way, originators are incentivized to provide accurate, timely settlements to their events as well as provide clear descriptions of outcomes and grading.