Judge Research Tokenomics Overview

Nicholas Adams Judge, PhD

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1 Introduction

This document gives a simple overview of the token ecosystem design intended to support a fully permisionless version of the decentralized systematic fund Judge Research has been building.[1]

2 Legal Disclaimer

Any discussion of a token is hypothetical and conditional on regulators' approval. We recognize that a decentralized fund touches on multiple topics of appropriate concern to regulators and policymakers. We appreciate their concerns and prerogative. We will not airdrop a token, or make promises thereof, until such time it is unequivocally appropriate.

3 How It Works

This document is designed to be read in tandem with How it Works and How To Participate, which gives a better sense of how the whole ecosystem is designed. This document dives deeper into the theoretical token's role in that ecosystem.

4 High-Level Summary

4.1 Functions of a Token

A token with a staking system protects a permisionless decentralized system by rendering costs of attacking that system higher than the benefits of doing so.

Our theorized token ecosystem's incentive structure is designed to scale the system by rewarding participants for work on the system's most pressing needs. In particular, it is designed to *greatly* enhance early scaling, as those with first-mover advantages 'pick the low hanging fruit' and enjoy out-sized rents from their early feature and algorithm-engineering work.

[1] If you don't feel fully up to speed on our project, our explanatory Github repo has the most material, though the fastest way to get up to speed is this notion page.

Lastly, it is unusually straightforward to roughly estimate an optimal hard cap, because systematic strategies enjoy much greater success with eight or low nine-figure allocations due to lower slippage costs. A conservative baseline of success can therefore be characterized in terms of revenue coming into the system from the fund's systematic strategies, and we can work backwards to the right hard cap from that.

4.2 Incentive Structure

Funds and quantitative developers participate in our system by submitting features and algorithms they have engineered. Our AI assesses the utility of those contributions. Users will be rewarded by a function that multiplies that utility by the amount of the tokens they have staked, and the monthly profits obtained by the strategies that use those forecasts. Users of the system can, therefore, increase their rewards and deepen their involvement in the system by adding to their staked reserves.

LPs in the 'main fund' entity multiply the effect of SAFE round investors' capital, as the vast majority of the fund's '2+20' flow back into the ecosystem's token.

SAFE round investors own a portion of the main GP of the fund, and also enjoy allocation rights to the fund.

5 Goals

5.1 Goals of A Decentralized Systematic Fund

A decentralized systematic fund can succeed as a permissioned system without a token fairly easily: By gating the community, it is relatively hard to attack. While those gates would do little to slow down the system's early growth, they would prevent the full realization of our twin goals: The creation of a fund that,

1. Is capable of out-performing traditional systematic funds due to its feature space, which is of a quality and scale beyond that which can be produced by the standard fund organizational model.

2. Lowers the *minimal size* of a useful contribution to that space. This would pressure the industry's mean firm size at equilibrium down towards sizes less threatening to democratic governance and positive social outcomes.[2]

5.2 Goals of a Token Ecosystem

1. Security

2. Scaling and long-run function

3. Early scaling

[2]This goal can be read as a more precise formulation of crypto's general goals: Create systems so people can produce better outcomes by working together with less hierarchy.

5.3 Security

Standard security measures, along with Ethereum's design, are sufficient to protect our system against hacks. Our system's main vulnerability to attack comes in the form of a market-manipulative attack, in which users submit features that contribute to forecasts, wait until the live validation period has ended, and then front-run or otherwise exploit positions the decentralized fund takes.

It should be noted that this is an unrealistically elaborate form of attack. It requires the attacker to produce information materially helpful to forecasts. At that point, it would be easier to implement a simple systematic strategy than to attack our decentralized ecosystem. Nonetheless, without a staking system, and without rewards being paid out in a manner that aligns participants, it is feasibly a weakness in the system.

A more realistic danger is overfitting latent variables or 'spray and pray' contributions to the system. While the statistical filters needed to handle such bad or quasi-bad actors are reasonably straightforward, the system becomes vastly more efficient if a staking system and a compensation system of slightly-delayed payouts in a native token deepens the alignment of the decentralized system's interests and those of its participants.

Indeed, it would be unrealistic to imagine a system surviving quasi-bad actors' spam-like strategies without a staking system.

5.4 Scaling

Markets are systems that flatten the world's relevant information into a single dimension, 'price.' This emphasis on 'the world's' information is intentional: Markets, however inefficient, operate in, and react to, very high dimensional spaces. For tasks of market forecasting, this leaves the information-gathering task best suited to institutional structures as fluid and capable of scaling as markets themselves. In a quantitative context, 'information gathering' can be thought of as feature engineering.

A secondary but still-important difference between our decentralized system and simpler, largely-failed attempts to forecast crowdsourcing is the (long-run) freedom of participants to specify their own dependent variables. As new assets come on the market, or new asset classes interact in new ways, the forecasting task grows in complexity exponentially.

Complexity grows even further when one expands the task from forecasting at one or two timeframes - e.g. one hour forecasts, or daily forecasts - to many. In our research, combining forecasts - and their concomitant error terms - across timeframes is exceptionally powerful. This makes sense for a number of statistical reasons, but makes things harder computationally.

In short, the reason so many quant funds exist in the first place is that the informational complexity of global markets overwhelms basic institution-building. The point of *this* project is to build next-generation institutions, where decentralized incentive systems scale in a manner that markets will still always outstrip - but less so than the pre-DeFi institutional models that currently

dominate international markets.

Thus, creating an incentive system that *measures and rewards* contributions with zero human overhead is necessary to take advantage of the still-new capacity to organize people at a global scale.

5.5 Early Scaling

Token ecosystems are almost-notoriously good at early scaling. This system is related to information aggregation. Early participation is inordinately attractive because the cost of 'low hanging fruit' is low, and those that 'claim that ground' keep it for as long as their information is being supplied with regularity.

As an example, consider the first user to send in the differenced logged prices of BTC. It is a reasonable to assume that variable will be useful for a large number of algorithms and assets, even after much harder-to-produce variables are added. Further, that user is incentivized to 'protect' their valuable claim by submitting related variables that might eventually be chosen by our genetic algorithm.

With reasonable parameters, the incentive system can be designed to *overwhelm* those considering joining as early-adopters. As the system finds successful strategies and demonstrates early victories, and credibility is achieved, the rush to claim the most valuable information should continue at scale.

In short - and to greatly oversimplify - the system is designed to be the first opportunity for quant funds and individual quant devs to 'ape into' a system built exclusively for their expertise.

5.6 A Note of Caution

The above set of goals are straightforward. Execution is of course more challenging than theorizing. A portion of the seed round's funds are devoted to hiring quant devs that, along with the cofounders, will be actively contributing to the ecosystem. While we already have an early list of funds that would like to participate, prior to the ecosystem coming together as a decentralizsed entity, a team of experienced PhDs and quant devs will be driving the growth of the ecosystem.

This is simply the quant dev equivalent of what is now a tried-and-true method of scaling token ecosystems: A core team sets up the basic infrastructure and builds on top of that infrastructure while encouraging others to join, stepping back piecemeal from governance roles the ecosystem matures.

6 How to Meet these Goals

6.1 Components of Ecosystem & User Reward Structure

Summary of the Below: *Users are rewarded monthly by a function that relates the amount their contributions improved forecasts, the amount they staked,*

and the amount of money the systematic strategies to which they contributed earned.

While token ecosystems are of course complex things, this one's incentive structure is relatively simple.

User U^i contributes p features $X^i_{1...p}$ and k algorithms $F^i_{1...k}$, forming a set of $p+k$ contributions $G^i = \{F^i, X^i\}$ with $p+k$ elements, or, in the language of genetic algorithms (GA), genes.

U^i stakes K^i, K. Rewards are paid out to this staking vault which is locked for some parameterized amount of time K^i_t, during which time the algorithm can decide to remove or add additional tokens.

Prior to entering the GA, genes are screened to see if they match genes already submitted or possess other statistically undesirable traits. If so, they are thrown out.

Details of the GA are intentionally obfuscated, to protect the IP of the fund. What is pertinent here is that the genes that survive long enough through testing, validation and live data implementation then enter systematic strategies, $A_{1...m}$, A for 'animals.' Each a_m is at times live, with c_m amount of capital behind it over the course of one month, that results in profit r_m.

Each gene's contribution to each a_m is assessed as a weighted portion of several success metrics - e.g. forecast onsidedness, correlation. That 'help' value is assigned by a function $h_{1...g} = f(a^{1...g}_m)$

User U^i's monthly reward - in ETH in the permissioned system, and in a native token when the ecosystem is allowed to move to a permissioned system via an airdrop - is thus defined by a function whose parameters will be specified at a later date,

$$R(U^i) = f(\Sigma^m_1(r_i) * \Sigma^m_1(h^i)) \tag{1}$$

For the time being, (1) is left intentionally vague, as the design of the ecosystem is extremely complex. After alpha testing, we will publish a more precisely specified user reward function.