

Betoken Whitepaper Draft

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Introduction

Betoken is a decentralized hedge fund built on the Ethereum blockchain that invests in ERC20 tokens. It automatically redistributes control over investment decisions to managers who make the most profitable investment proposals. This collected wisdom is compiled into good investment decisions, using a unique decision making system we call "Incentivized Meritocracy".

The core ideas behind Betoken's Incentivized Meritocracy are as follows:

- The control over decisions is tokenized.
- The control tokens are valuable.
- Good decisions are rewarded with control tokens proportional to both the quality and the quantity of their benefits.
- Bad decisions receive penalties in control tokens proportional to both how bad of a decision they were and how much damage they caused.

Betoken is for everyone: everyone can join, everyone can invest, everyone can make decisions for the fund and be rewarded for making good ones. And everyone can rise to the top if they have the merit.

Betoken is unstoppable: it is a completely decentralized application built on the censorship-resistant Ethereum blockchain.

Betoken is transparent: all statistics and decisions are publically available, and all fees and clauses are written in immutable open-source smart contracts.

1. The Betoken Model

1.1 Incentivized Meritocracy

An **Incentivized Meritocracy** is a system where

- The amount of control each actor has is proportional to their ability to make good decisions.
- Actors are financially incentivized to maximize their control (therefore their decision-making ability).

The above definition is not rigorous, since "control" and "ability to make good decisions" are not clearly defined, but it provides a general idea of how an Incentivized Meritocracy should behave. To sum it up in one sentence: the best people are in charge, and everyone wants to be in charge. The first point is the desired result, and the second point is the means of achieving it.

Having the people with the most merit in charge is clearly good for an organization as a whole. In a hedge fund like Betoken, having the people who are the best at making investments handle the fund's investments means that the ROI of the fund is going to be pretty good.

Incentivized Meritocracies have never been successfully implemented before, since it is near impossible to have a centralized actor that can judge everyone impartially. However, newly-invented smart-contract-enabled blockchains such as Ethereum allow us to construct **decentralized** actors that can uphold unbreakable rules, making implementing an actual Incentivized Meritocracy possible. Betoken is the first decentralized application that incorporates an implementation of Incentivized Meritocracy.

1.2 Betoken's Solution

There are four central ideas behind Betoken's solution to Incentivized Meritocracy:

1. Control is denoted using Kairo (KRO) — Betoken's custom ERC20 token — that must be staked when making investments for the fund, and the amount of the stake is proportional to the amount of investment.
2. The control token KRO is valuable, in that holders of the token can expect income proportional to the amount of KRO they hold.
3. Good investment decisions are rewarded with KRO proportional to both the quality (ROI) and the quantity (profit / prevented loss) of the investment decision.
4. Bad investment decisions receive penalties in KRO proportional to both how far below 0 the ROIs were and how much money they lost.

We provide below a description of how Betoken functions and details of Betoken's Incentivized Meritocracy.

The Betoken fund runs in investment cycles, and at the start of each cycle there is a period of time where investors can deposit & withdraw their funds.

After that, users can propose investments into ERC20 tokens by staking some Kairos — the name we use for control tokens. You can stake Kairo into proposals other users made, which has the same effect as creating the proposal yourself. You can also stake Kairo on the opposing side of a proposal to bet on its failure. It doesn't have any effect on the investments being made but is important to keeping the Incentivized Meritocracy functional. There is a restriction where you must stake no less than a certain proportion of your Kairo balance when staking.

After a certain time has passed, any changes to proposals and stakes are no longer allowed, and existing proposals are turned into actual investments using the equation

$$\blacksquare \text{ investmentAmount} = \text{totalFunds} \times \frac{\text{proposalStake}}{\text{totalProposalStakeInThisCycle}}$$

where *totalProposalStakeInThisCycle* is the sum of all Kairo staked in support of all investment proposals during the current cycle. The reason *totalKairoSupply* is not used as the denominator is that since it is unlikely that users would stake a large proportion of their Kairo, only a small fraction of the fund's assets would be invested every cycle, which will make the fund unprofitable.

If you have Kairo and didn't stake anything during the staking period, a certain proportion of your Kairo will be burnt. This measure is for preventing Kairo-hording, so that the fund's meritocratic nature is maintained.

After waiting for a certain time (ex. 30 days), the fund sells all tokens it invested in at the current market price. After the sell process is finished, the fund automatically determines how profitable each investment proposal was and redistributes Kairo based on the results. The amount of Kairos a user gets back for each proposal is $userStake \times (1 + ROIofProposal)$ if they supported it, and $userStake \times (1 - ROIofProposal)$ if they went against it, so if a proposal had a 20% ROI, everyone on the supporting side gets 20% more Kairos back, and everyone on the opposing side loses 20% of their stake.

At the end of every cycle, a certain proportion (20%) of total profits is set aside as commission and distributed among Kairo holders proportional to the amount they hold. A certain proportion of fund assets is also sent to Betoken's developers as a fee for using the platform.

1.3 Potential Problems

1.3.1 Cyclic Design

The reason that Betoken functions in rigid cycles rather than a more asynchronous manner is that it make the model much, much simpler. Asynchronicity will introduce many problems that we don't necessarily know good answers to, such as:

- How do we ensure that users can't just hold on to their Kairos without ever making investment decisions?
- How can we prevent users from canceling their stakes in a proposal that starts crashing right before its profitability is supposed to be evaluated?
- How do we evaluate the profitability of a proposal if anyone can stake in it at any moment before its evaluation?
- How do we handle investments if users can deposit and withdraw at any time?

Each of the problems mentioned above has more than one potential solutions, thus many design choices will have to be made, often without a way of providing good justification. Further more, introducing additional complexity to a smart contract based system is often a bad idea, since computations and storage are expensive, and bugs are often deadly.

Due to the above reasons, Betoken employs a cyclic design. However, the lack of asynchronicity introduces a number of problems.

1.3.1.1 Short Term Decisions

Suppose each cycle is 30 days long. If some user knows that token A's price will rise greatly on the 10th day of the current cycle and drop soon afterwards, there's no way for the fund to utilize this information and sell at the peak. If another user knows that token B's price will drop greatly on the 10th day of the current cycle and rise back soon afterwards, there's no way for the fund to buy the dip either. This means that the fund misses out on opportunities shorter-term than the specified cycles.

In a cyclic model, there exists a dilemma between utilizing short-term opportunities and having consistent gains. To be able to bank on short-term price changes, the length of cycles needs to be short; to be able to have consistent gains resistant to temporary price extremities, the length of cycles needs to be long so that erratic changes are evened out over time. We think that relatively long cycles are good, because investors should focus on the long-term potential that a token and its related technology has, rather than only on the price fluctuations.

//TODO: Add in more problems AND solutions :-) (Regarding the above problem, for e.g. user could choose between different categories of fund - Betoken long term (1y), Betoken short term(14d), betoken mid-term (30d), etc.)

1.4 Reasons Why Betoken's Model May Work

Since Betoken is something unprecedented, we do not have evidence that its model will work as intended. A formal proof of Betoken's plausibility also seems unlikely, since it's quite difficult to accurately model actors' behaviors. Therefore, we can only give here several possible reasons for which Betoken will work as intended.

1.4.1 Better Than Direct Investment

To be able to attract people with flair in investing, we must make participating in Betoken's investment process more lucrative than directly investing in the tokens oneself. Fortunately, it is easy to prove that the model satisfies this requirement (discounting the fluctuation of Kairo's price):

$$\blacksquare \text{ } ROI_{\text{Betoken}} = ROI_{\text{DirectInvestment}} + \frac{\text{commission}}{\text{investment.Amount}} \geq ROI_{\text{DirectInvestment}}$$

Therefore, investors are incentivized to join Betoken and make investment decisions. If Betoken does work successfully, this would be one of the main reasons.

1.4.2 Analogous to Markets

Betoken's Incentivized Meritocracy shares many similarities to markets of investable assets, such as the stock market and the cryptocurrency market. In fact, staking for a proposal is almost exactly the same as directly investing the token, except that the ROI is better. Therefore, we can estimate Betoken's success as a meritocracy by looking at how meritocratic the stock market and other markets currently are.

To our knowledge, there is no evidence that they are not meritocratic: no one's heard of a dumb and inexperienced investor besting market growth, and smart people (like those at Renaissance Technologies) have achieved amazing ROIs (71.8% annual on average! [[source](#)]). Thus, we can expect that Betoken will also be meritocratic.

1.4.3 Friendly to Beginner Managers

Since the launch of our Testnet Alpha, some people have told us that they haven't had time before to do their due diligence researching and accumulating knowledge about the best crypto-assets, but want to get better at it. Betoken offers beginner managers a safe environment to grow, since they can first observe how veteran managers make investments and let the community handle the fund's money, before dipping their toes into making decisions for an already full-fledged hedge fund.

Compared to ICONOMI and Melon, where you have to bootstrap a new hedge fund completely on your own, Betoken is much more beginner-friendly. It's the difference between getting a job at a well-established company and starting your own company.

1.4.4 Automated Investment Process

When you want to buy or sell crypto-assets, you usually have to deal with exchange platforms. Betoken dramatically reduce the time users spend on the buying and selling process, since they are fully automated via our smart contracts. This feature gives users more time to conduct research for their future investments or to enjoy spending time with their friends and family.

//TODO: Add more reasons

2. Implementation Details

2.1 Kairo's Initial Distribution

As of writing, we have not decided on Kairo's initial distribution scheme. There are two options that we're considering:

1. Any user who deposits investment during the first investment cycle will receive Kairo proportional to the investment. Withdrawing investment will of course be disabled. This is the model currently implemented in the smart contracts.
2. We will have a traditional ICO for Kairo.

The reasons for choosing the first scheme are:

- It makes bootstrapping the Incentivized Meritocracy easier, since users aren't paying for the Kairo they get.
- It allows us to attract testers for the pre-release versions that will be released on Mainnet by making pre-release Kairo and after-release Kairo compatible, and providing a more favorable conversion rate for the test versions. For example, if you get 1 Kairo for every Ether you deposit in the final release, you can get 2 Kairo for every Ether you deposit in the test versions.

The reasons for choosing the second scheme are:

- It provides us with the funding that we need to make progress in the application and community development.
- People are more familiar with ICOs, so an ICO may have more traction.

2.2 Cycle Phases

Each cycle is divided into 5 phases:

- Deposit & Withdraw: When investors deposit and withdraw their funds.
- Investing: When users stake Kairo to make investment decisions for the fund.
 - Transition (Investing => Waiting): Stakes are taken from users who had Kairo and didn't stake anything, buy orders are made.
- Waiting: When everyone waits and let the token prices change.

- Transition (Waiting => Ended): Sell orders are made.
- Ended: When the invested tokens are sold and users wait for the sell orders to go through.
 - Transition (Ended => Finalized): Kairo is redistributed according to proposal results, commission, developer fee, and Oraclize fee are paid, and funds are returned to investors' balances.
- Finalized: A placeholder phase before the next cycle begins.

In a preliminary setup, the lengths of each phase are as follows:

- Deposit & Withdraw: 1 day
- Investing: 1 day
- Waiting: 27 days
- Ended: 1 day
- Finalized: no time

Totaling 30 days.

2.3 Token Trading

As of writing, Betoken uses EtherDelta, a decentralized ERC20 token exchange, to handle its token trading. When making orders, Betoken uses Oraclize to fetch the current market price of each token and set that as the price used in the corresponding order. However, since EtherDelta has been purchased by a dubious party and suffers a lack of credibility, KyberNetwork is selected as a potential replacement.

2.3.1 Oraclize

Oraclize is an oracle service that provides off-chain data to smart contracts. In Betoken, it is used in for fetching the current price of tokens, so that orders can be correctly made with appropriate prices. The inclusion to Oraclize poses two problems:

- Currently, CryptoCompare is used as the source of token prices, and a problem inherent to the usage of off-chain price feeds is that the feeds can go down/be manipulated. This brings a new attack surface into existence.
- Queries to Oraclize cost a small fee. In the current model, this is solved by setting aside the maximum possible fee from the fund's balance at the end of each cycle (the fees in the first cycle has to be paid manually).

2.3.2 EtherDelta

EtherDelta is a decentralized token exchange that uses a traditional model, where users can make and take limit orders. Its overarching advantage is that it is currently the largest decentralized exchange with the most volume and trading pairs. However, apart from its declining credibility, its inclusion in Betoken introduces a host of other problems:

- It's always possible that orders made by Betoken won't be picked up by takers.
 - Maybe the token's price changed significantly after making the order.
 - Maybe the price obtained from CryptoCompare was faulty or quite different from the price in EtherDelta.
 - Or maybe it's because the market is very sensitive to even small differences in order prices and it's inherently difficult to consistently pinpoint the appropriate price window.

This introduces a great deal of uncertainty to Betoken's normal operation, which is extremely undesirable.

- There's always a delay between making an order and the order being fulfilled, and after Betoken becomes a major market player it is possible for malicious actors to use this delay to their own benefit. For example, if the price of a token usually sees a small spike after Betoken invests in it, someone can easily frontrun Betoken's order and profit on the spike, since Betoken is completely transparent.

Therefore, we hope to transition to using KyberNetwork as soon as it becomes a viable option.

2.3.3 KyberNetwork

KyberNetwork is "an on-chain protocol which allows instant exchange and conversion of digital assets (e.g. crypto tokens) and cryptocurrencies (e.g. Ether, Bitcoin, ZCash) with high liquidity."[\[source\]](#) It is a far superior option than EtherDelta, since it allows for instant token exchange which makes it able to avoid the problems mentioned in 2.3.2. Its inclusion would also eliminate the need for the "Ended" cycle phase, since we don't have to wait for orders to go through anymore, making the cycles more concise. Oraclize would also not be needed, since KyberNetwork provides its own on-chain price feed. Therefore, the inclusion of KyberNetwork will minimize the number of moving parts in Betoken's operation and significantly reduce Betoken's attack surface, reducing Betoken's running and maintenance costs and increasing its security.

However, KyberNetwork is still an in-progress product, unlike EtherDelta which has been online for a long time, so it's still unclear whether we'd want to use KyberNetwork in our final release. Furthermore, it's likely that the types of tokens that KyberNetwork supports won't be able to match EtherDelta for quite some time, so using KyberNetwork would limit the types of tokens that Betoken can invest in.

We will decide on this matter based on how much progress KyberNetwork will make before we roll out Betoken's Mainnet Alpha.

2.4 Rules In The Fund

Partly to ensure scalability and partly to prevent spamming attacks, there are certain rules in the fund's smart contract, which will be listed below. Note: most of the exact numbers used are only placeholders, and will likely be different in future releases.

- Each member can **create** at most 2 investment proposals during each cycle. (No restrictions on staking in proposals.)
- At most 20 investment proposals can be created in each cycle.
- Each proposal can invest in only one token, and two proposals cannot invest in the same token.
- When staking into a proposal, the size of the stake must be no less than 25% of one's Kairo balance.
- If a user has Kairo and didn't stake anything in the current cycle, 25% of their Kairo balance will be burnt.
- A user cannot stake into both sides of the same proposal.
- If the number of supporters of a proposal reaches zero, the proposal will be removed from the list. No similar rule for the number of opposers.

2.5 Smart Contract Maintenance

2.5.1 Upgrading Contracts

To upgrade the **BetokenFund** smart contract, the following steps will be taken:

1. The old contract is paused before the Waiting phase of the current cycle, and all users withdraws their investments.
2. The new contract is deployed.
3. The list of participants is read from the old contract and transferred to the new contract.
4. The addresses of subcontracts (**OracleHandler**, **ControlToken**) are sent to the new contract.
5. The owner of the subcontracts is set to the new contract.
6. The upgrade is now complete.

The script to do this can be found in Betoken's GitHub repository.

To upgrade subcontracts other than **ControlToken**, simply set the relevant address variable in **BetokenFund** to be the address of the new contract.

The **ControlToken** contract is not expected to be upgraded, since it is just a simple ERC20 token with minor additions.

2.5.2 Handling Emergencies

The **BetokenFund** contract inherits the **Pausable** contract from OpenZeppelin, so that it is possible to pause the normal operation of the fund when an emergency occurs, such as an attack or a market black swan event. When paused, an emergency withdraw function will be able to be called by users to withdraw all funds.

One thing to note about the emergency withdraw function is that if the fund is paused when the fund is invested in tokens, things would get more complicated, since the tokens have to be sold before users can withdraw, and the amount they can withdraw would likely be different from the amount at the start of the cycle.

2.5.3 Contract Administrator

The **BetokenFund** contract inherits the **Ownable** contract from OpenZeppelin, and the owner is given administrator rights. Calling the emergency functions, pausing and unpausing, calling the functions related to upgrading, and changing the fund's fee rates all require administrator rights. Initially, the owner is set to be an account owned by the Betoken team, so that Betoken may be smoothly bootstrapped; after Betoken has enough community support, it is possible to set up a DAO (Decentralized Autonomous Organization) contract as the owner of Betoken, so that Betoken is completely decentralized.

2.6 Governance

As we mentioned in 2.5.3, the control over Betoken's smart contracts will initially be held by our team, until the Betoken community is large enough to sustain itself, after which a DAO will be set up as the contracts' owner. We are still considering different options for how the DAO will operate, and will list them out below.

2.6.1 Votes

There are two options for what to use as votes in the DAO: one's Kairo balance and one's Ether deposit balance. Both of them are viable, since the interests of Kairo holders and investors of the fund are all aligned with the interests of the entire fund. However, the two choices do have subtle differences.

Reasons to choose Kairo

- Using Kairo as votes would add additional value to Kairo tokens, benefiting the Incentivized Meritocracy.
- Kairo holders are likely more involved in the fund's operations than investors, which means they would know better about what's best for the fund.

Reasons to choose Ether deposit balance

- It makes sense to distribute power based on the stake one has in the fund. If someone has invested a lot in Betoken, they would expect to have a big say in administrative decisions.
- More secure to attacks. Even though extremely unlikely, it is possible for an attacker to spread FUD (Fear, Uncertainty, Doubt) so well that the price of Kairo drops significantly, buy in tons of Kairo, and take over the fund. The same is more difficult to accomplish with Ether: if you cause a lot of people to withdraw everything from the fund, and then deposit a ton of Ether yourself, you would actually reassure investors that it's still safe and well to invest in Betoken, counteracting your attack.

There is a third option where both Kairo and Ether are used as votes, which seems more reasonable than using either one individually, since both investors and managers will be represented in administrative decisions. This is the option we're considering to use.

2.6.2 Implementation

We intend to use an established framework like Aragon to implement the DAO.

3. Market Analysis

3.1 *Competitors*

Betoken faces two types of competition: competition for investors, and competition for managers. We will discuss them below.

3.1.1 Competition for Investors

Since Betoken invests solely in cryptocurrencies, our customer base is different from that of traditional hedge funds that invests in stocks and bonds. Specifically, our customer base will mainly consist of open-minded accredited investors and individual cryptocurrency investors. There are two types of competitors for this customer base:

- Traditional hedge funds that have included cryptocurrencies as a new investment option.
- (Partly-)Decentralized cryptocurrency hedge fund platforms, such as ICONOMI and Melon. ICONOMI and Melon are both platforms where users can build their own traditional-style hedge funds that invest in cryptocurrencies. They do appeal to the same customer base as Betoken, but the fund managers on their platforms each keep their own information and investment strategies, whereas Betoken is able to combine the skills and resources of its managers for the good of the fund.

To investors, only two metrics have significance: risk and ROI.

- Betoken is definitely going to be riskier than traditional hedge funds. Compared to other decentralized hedge funds, Betoken's risk is on the same order of magnitude.
- Betoken's ROI mostly depends on the effectiveness of its Incentivized Meritocracy, which we cannot estimate at this point.

Therefore, the intensity of competition that Betoken will face largely depends on its ROI.

- If it is significantly better than anything else, then great. None of the competitors mentioned above will be relevant. Copycats may emerge, but network effect and first mover advantage will keep Betoken at the top.
- If it is on the same level as the aforementioned competitors, then Betoken will go head to head with ICONOMI and Melon, both of which will already have been launched for a long time when Betoken launches. Competition will be fierce, but Betoken will hold its place as the only crowdsourced cryptocurrency hedge fund.

3.1.2 Competition for Managers

There are several competitors in this area:

- ICONOMI and Melon are platforms that allow managers to create their own hedge funds with customizable rules. There are reasons that may convince a manager to join either side, so there's no clear winner here.
- Numerai is a hedge fund that uses an interesting auction system that lets data scientists compete to provide the best algorithms for predicting stock prices. The top rated algorithms will be used to make investment decisions for the hedge fund. [\[source\]](#) Numerai's model is inferior to Betoken's almost in every respect, because
 - In Betoken, the commission managers get is proportional to the size of the fund's assets, while the same is not necessarily true in Numerai.
 - The bets data scientists make in Numerai have binary results: either you lose all of your staked tokens or you lose none. In contrast, proposals in Betoken have much more granular results. This makes Betoken appeal better to risk-averse managers.
 - Numerai's model rewards algorithms that fit past data best, rather than algorithms that will perform well in real investment decisions, so there's a gap between the model's optimization goal and the actual goal. Betoken's model, on the other hand, rewards managers that **actually make the best decisions/most profit**.
 - There is a steep learning curve for joining Numerai as a manager, while all you have to do to start making decisions for Betoken is getting some Kairo.
- Quantopian and Quantiacs are crowdsourced hedge funds using similar but slightly better models compared to Numerai:
 - Users enter their algorithms in trading competitions, and the best algorithms are used for actual investing.
 - There's no staking or betting involved; anyone can enter competitions at no cost.
 - Algorithms don't have to use machine learning, so managers don't have to be data scientists.
 - The algorithms come in the form of trading bots, so they're far more connected to actual trading than Numerai's machine learning algorithms.
 - Developers of winning algorithms actually get a cut of all profits generated by their algorithms.

Since one manager can make decisions for as many hedge funds/platforms they like, competition for managers probably won't be as fierce as that for investors. However, we believe that Betoken will be the prime choice for the vast majority of managers. We list out below the pros and cons of joining Betoken from the perspective of managers.

Pros for choosing Betoken:

- Low barrier of entry. No need to learn a specific language, API, or type of algorithm, or even anything about programming; all you need to do is get some Kairo and start making decisions.

- Higher returns. The ROI for making decisions in Betoken is even higher than that of directly investing into the tokens, and the commission you get is proportional to the fund's assets. No middleman taking away a large portion of your profits for no good reason.

Cons for choosing Betoken:

- The parameters used in the fund, such as commission rates, cannot be changed by the will of a single manager, so if a manager wants full freedom in selecting such parameters alternatives like ICONOMI and Melon would be better.

3.2 Demand for Decentralized Cryptocurrency Hedge Funds

3.2.1 Demand from Investors

One of Betoken's competitors, ICONOMI, has seen rapid growth in user count and book value. Quoting ICONOMI's [Q4 2017 Financial Report](#):

Our user base increased more than 50% in the last quarter, and **in January we added more than 10,000 new users**. Our book value increased to \$327 million USD, which is 173% more than in Q3. But even more important than book value is the revenue the platform is generating. **DAA's have generated over \$200,000 in revenue in one quarter**, an increase of more than four times over Q3.

From this evidence, it is clear that the demand for decentralized cryptocurrency hedge funds is real and fast growing.

If we look at cryptocurrency hedge funds in general, the numbers are even more promising: according to Morgan Stanley, investors have put over **\$2 billion USD** into hedge funds specialized in cryptocurrency investments in 2017, and 2018 will likely be bigger. [\[source\]](#) The high demand for cryptocurrency hedge funds is truly undeniable.

3.2.2 Demand from Managers

There is evidence that quants and data scientists are interested in participating in hedge funds.

- According to Quantopian's [website](#), over 700,000 algorithms have been submitted to their platform throughout its lifetime.
- According to a Wired [article](#), over 7,500 data scientists joined Numerai's competitions in 2016.
- The market cap for the ICONOMI token, which will be used for creating hedge funds on ICONOMI's platform [\[source\]](#), is currently over \$156 million USD. (Coinmarketcap, Feb 8 2018)