

Green

~~White Paper~~



PHARO

# PHARO

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# Introducing Pharo

## Introduction

Pharo is an Automated Coverage Market Maker (ACM), aka the world's first decentralized cover protocol, an evolution of the Automated Market Maker concept (AMM). In an AMM, Sellers are facilitated by Liquidity Providers who are rewarded for assuming the risk until a Buyer can be found. In an ACM, Cover Buyers (CBs) are facilitated by Liquidity Providers (LPs), who are also rewarded for assuming the risk of covering an event before it's expected to happen. Pharo can be thought of as an Event Risk Swap, where CBs pay stability premiums for their cover needs, and LPs accept that risk by collecting those premiums.

## The Pharo Algorithm & Marketplace

### Wisdom of Crowds

Pharo requires users to answer marketplace questions to establish their market position as a liquidity provider or cover buyer. For LPs, we ask:

1. **Liquidity amount:** Amount of cover to be paid in case the event is triggered.
2. **Estimated Event Rate:** User's estimate of when the event will be triggered.
3. **Maximum Acceptable Risk:** Premium collection rate to ensure breakeven before the event is triggered.

For CBs we ask:

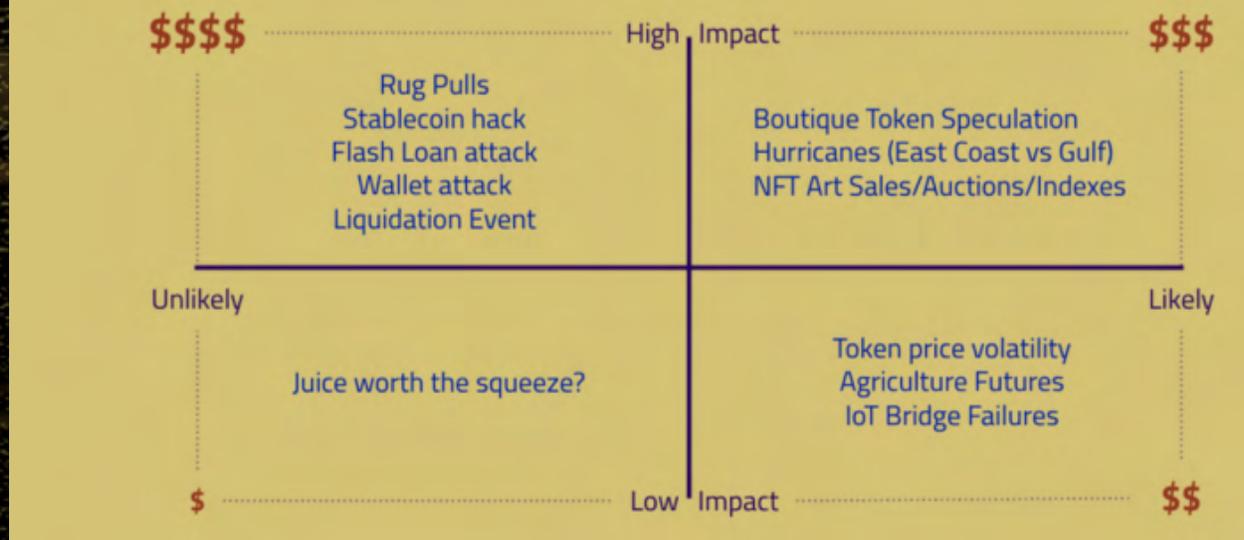
1. **Premium amount:** Premium provided for cover multiplier purchased.
2. **Estimated Event Rate:** User's estimate of when the event will be triggered.
3. **Minimum Cover Required:** After which point premiums will not be collected.

The answers to these questions are aggregated by the Anubis algorithm to create the market and from that market to calculate user quotes, rewards, risk, and APY.

This map provides some insight into the variation and types of markets that are possible with Pharo:

## Business of your Cover Market

Recognize any of these?



### Eliminating Bad Actors

The users' market positions, the questions required for each user, ensure the Pharo algorithm will not mismatch positions in that market. Bad actors want to have their cake and eat it too. LPs want maximum premiums and no risk, CBs want minimum premiums for maximum cover. TL;DR: No one would want what they're selling.

To participate in the Pharo market, the protocol ensures "self consistency" by asking Cover Buyers (CB) what minimum cover they require, and asking Liquidity Providers (LP) what \*breakeven risk they'll accept. These values are compared against their stake and rate estimate to determine "self consistency", where CBs can't ask for more cover than their rate and fees allow, and LPs can't ask for less risk than their rate allows. In other words, Pharo looks at users' answers and asks the question, "Is this user's ask realistic compared to their rate estimate?", if the answer is "no" then they gotta go!

### Rebalancing

Now that all users are self consistent, is there market demand for their position? This acceptance criteria is built into the rate, stake, and minimum cover or maximum risk, required to enter the market. So a CB could say protons will decay before the event happens, but the acceptance criteria allows Pharo to recognize that no LP has agreed to accept such an extreme risk, and so the CB's offer would be rejected. Conversely, an LP could say the event is

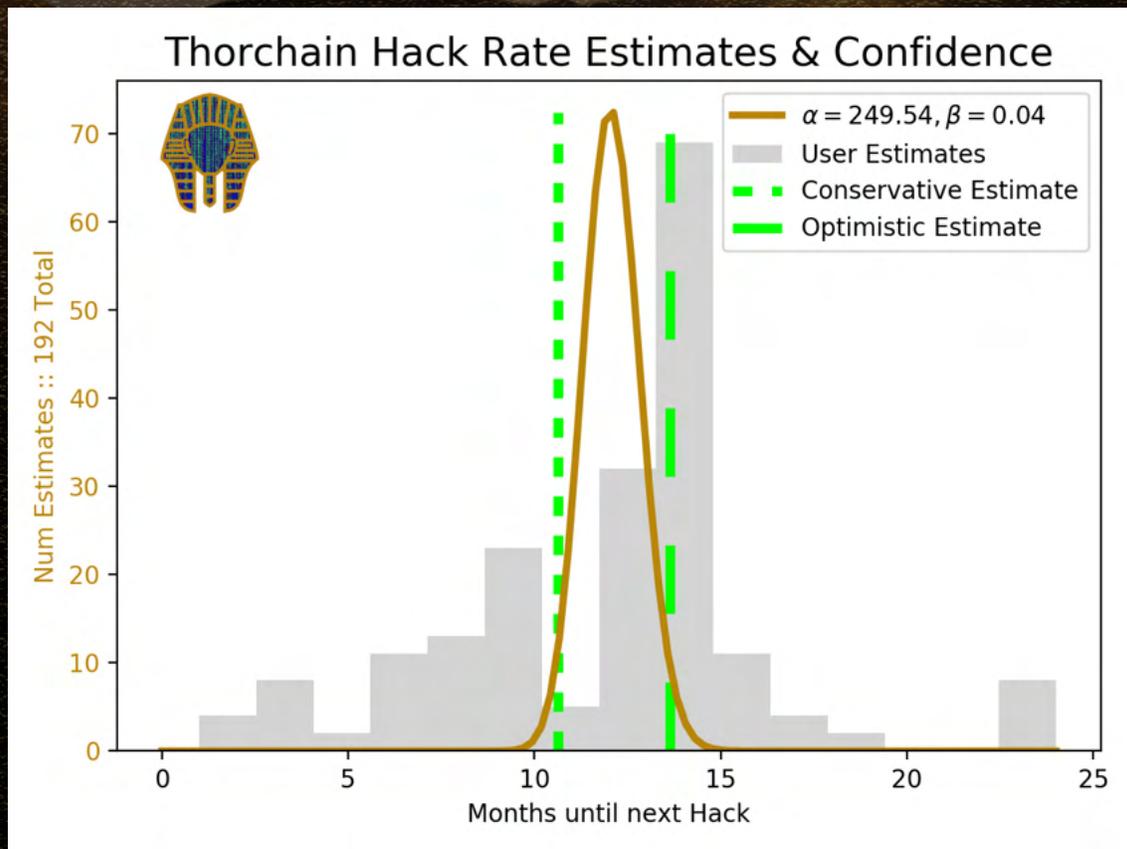
guaranteed to happen in an attempt to \*breakeven asap, but the acceptance criteria allows Pharo to recognize that no CB will accept THAT little cover, and so that LP's estimate would also be rejected. Everything between these extremes is matched based on FIFO principles, and whether their premiums or liquidity are fully utilized.

## Pharo Experiment Results

Pharo will be testing on the Mumbai testnet, collecting data proving the Anubis algorithm. The algorithm results will be made available in an updated Pharo GreenPaper, and on our blog: [Pharo.Medium.com](https://pharo.medium.com)

## Thorchain Experiment

We completed our Thorchain Discord Experiment in 2021Q3, which validated our “Wisdom of the Crowds” (please [see our first](#) and [our second blog](#) for more detail). We conducted this experiment using the Thorchain hack rate, which mimicked the functionality and automation for our production launch. The user data collected, and subsequent coverage policies generated by the Wisdom of the Crowds, mimic equivalent offerings by Nexus Mutual.



The chart above shows a gold gamma curve fit to the underlying Thorchain estimates in grey, flanked by a matrix green 95% confidence interval. The estimates are discretized by snapshot

estimates being limited to months between (1–18) 1 and 18 months. We have confidence in these estimates not only because of our extensive user filtering, but because the answers it yields support a Thorchain cover market that’s comparable to [existing Thorchain insurance markets like Nexus Mutual’s](#). Nexus Mutual is currently [offering limited Thorchain insurance](#) which their forum goes into depth on, and we believe Pharo can step outside these limitations and support current players like Nexus Mutual in creating a more robust market. With the current results, Pharo could support a \$0.11 premium per \$1.00 of cover; In other words, Pharo could cover \$100MM in Thorchain TVL for \$11MM per month. Pharo is also flexible. For Liquidity Providers this estimate assumes 95% confidence in the event occurring, but Pharo allows you to accept more risk by prioritizing a better offer with Cover Buyers. All users can buy or provide as much as they need, as long as the market has demand in the form of staked positions in the protocol.

Related Pharo Blogs:

1. <https://pharo.medium.com/wisdom-of-the-thorchain-crowd>
2. <https://pharo.medium.com/so-you-believe-thorchain-is-vulnerable-how-vulnerable>
3. <https://pharo.medium.com/knowledge-rewards>
4. <https://pharo.medium.com/the-wisdom-of-crowds-is-legitimate>

## Why Pharo?

Why invest time, money, energy in Pharo?

If you are reading this then you believe in DeFi despite the state of the market at the time of this writing (which in 2022Q1 is down substantially from 2021 highs). DeFi is the future, and like every time before will come roaring back from the lows with new highs, bringing in new investors, users and developers into the community. This is a very opportune time to be thinking about the future of DeFi and in particular what protocols and services will be the backbone of the next wave.

The functionality that Pharo provides will serve as the infrastructure for investors like yourself to become the fiscal backbone, and as a result experience substantial fiscal benefits.

You can create this backbone and prepare to play a crucial role in the future of DeFi by doing one or more of:

<b>Mint a Pharo NFT:</b>	<a href="https://bit.ly/PharoNFTvideo">bit.ly/PharoNFTvideo</a>
<b>Participate in Testnet:</b>	<a href="https://bit.ly/PharoTestnet">bit.ly/PharoTestnet</a>
<b>Promote Pharo:</b>	<a href="https://bit.ly/PromotePharo">bit.ly/PromotePharo</a>
<b>Support Pharo Q&amp;A</b>	<a href="https://bit.ly/TeachPharo">bit.ly/TeachPharo</a>
<b>SAFT</b>	<a href="mailto:Sean@Pharo.Tech">Sean@Pharo.Tech</a>

As an early liquidity provider you get the benefit of being first in the system and thereby reaping the most rewards. You also get the benefit of collecting the earliest and over time the most service fee payouts from coverage buyers. Early liquidity providers drive confidence and earn rewards for that confidence.

You do not have to take a large position to be successful and ride the next wave - there is plenty of historical proof that support for a specific need, a common need, a universal need, grows into more general success. Consider the retail giant Nordstrom, which began from humble beginnings as a shoe store in Seattle riding the gold rush waves. Nordstrom's first market was shoes, expanding into boots to support the gold miners, and from there the nearly 100 plus years of success that we all know they have experienced. Small investments in targeted markets can facilitate substantial long term fiscal growth. Being first to act with conviction in times of uncertainty drives the future confidence in the system and yields large gains for those who act first.

All of this has a cascading positive impact on the DeFi ecosystem and helps facilitate the comeback and the promise of a stable future. The future of DeFi with Pharo is a future with confidence in the system backed by those in the system. Your conviction provides those with a lower risk tolerance the ability to hedge the positions they are more confident in. By allowing those less confident to increase their own conviction you give them back cognitive bandwidth. This increase in the cognitive bandwidth of all DeFi users, due to increased confidence, is something that the regular market cannot provide, but DeFi can and will do so with Pharo.

We are seeking partners to drive that cascading confidence and this is our call for partners. So come join us on this journey, buy some Pharo or an NFT - which earns you dividends by the way - and establish your place in the future of DeFi. If you'd like to participate in the DAO, which will have a treasury, can direct those resources, set Pharo priorities, and expand it's role over time, you'll need to stake your Pharo NFT and/or stake some PHRO for gPHRO for more voting power! Pharo will continue to build and release more markets and you will be uniquely positioned to continue to take advantage of this growth. As your confidence builds and you stake more, the confidence of other users in both Pharo and DeFi will rise. The future of finance is DeFi and we, with your help, will build the tools that guarantee stability in the future.

## Pharo Tokenomics

The \$PHRO tokenomics is designed to incentivize new markets and early adopters. The \$PHRO token is designed to incentivize the discovery of a market's event rate by rewarding users' event rate estimate performance. Each new market creates a constant buy-pressure as premiums must be paid in \$PHRO, and early market adopters earn \$PHRO by accurately predicting market events. To earn \$PHRO rewards from any market, a user must stake \$PHRO and give their event rate estimate for that market, whether they're a liquidity provider or cover buyer. This staking requirement creates a consistent deflation mechanism that can be actively managed by the Pharo DAO.

**Ticker:** PHRO 

**Chain:** Polygon, Optimism & Ethereum mainnet

**Contract Address: Kovan** 0xD0F30A471826AAf7970eB35d8409E88CB8BA5370

**Max Supply:** Unlimited

## Pharo Staking

At the outset there will be three initial uses of PHRO for holders, each of which will be an important component of the total PHRO tokenomics and function of Pharo as an insurance market. These are:

1. Staking PHRO in a specific Pharo market to:
  - a. collect premiums, and
  - b. collect rewards based on the accuracy of event rate predictions.
2. Locking PHRO in a specific Pharo market to:
  - a. Pay a premium for cover against catastrophic market events, and
  - b. Collect rewards based on accuracy of event rate predictions
3. Provide PHRO paired with USDC/MATIC/GFI to provide liquidity to the market for the purchase and sale of PHRO
4. Staking PHRO in the Reinsurance pool to collect premiums and rewards from that pool

## Market Inflation Kickstart

Each Pharo market begins with inflation, then transitions to deflation as the market stabilizes. We call this period the market's "Kickstart" period. A stable market is defined as a market whose event rate is "predictable". Predictable means the event occurs within known statistical uncertainty. A market event rate's statistics are calculated from the market's users who submit their event rate estimates when they lock their \$PHRO in the market.

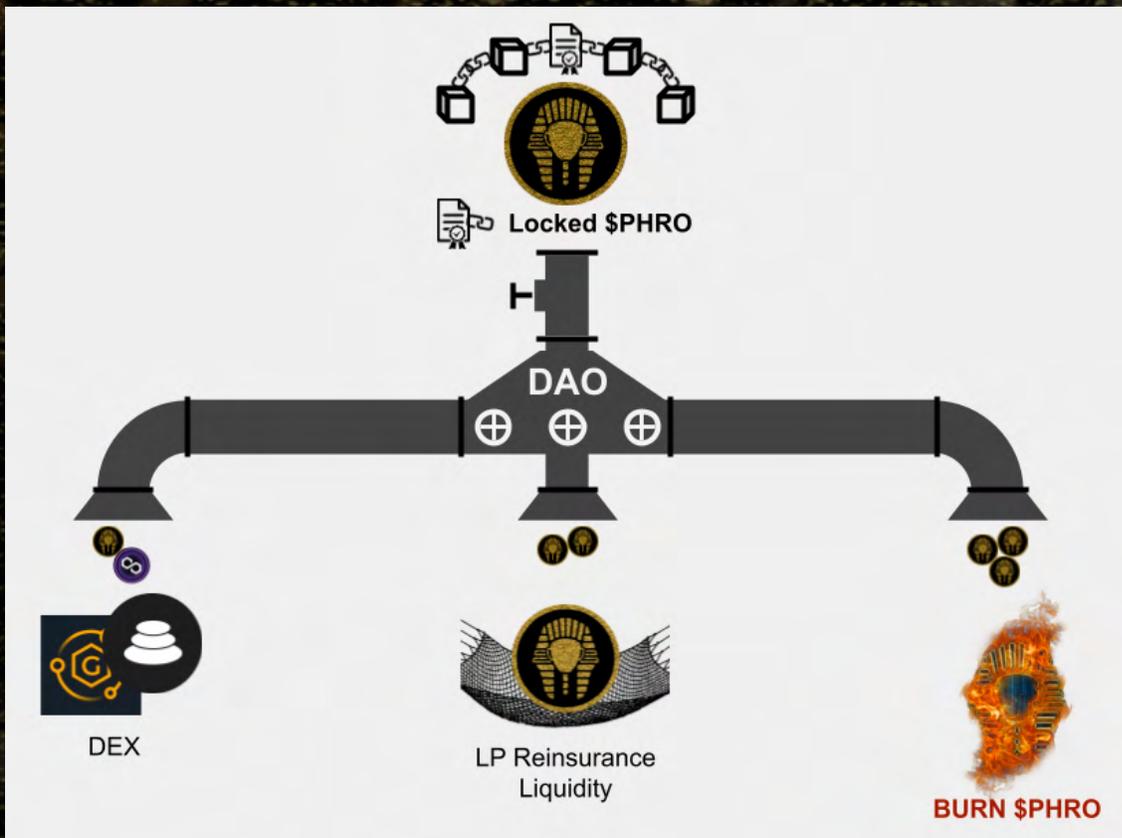
## Rewards Distribution

\$PHRO locked can also be redistributed as rewards until stability is reached, reducing the minting of new \$PHRO and thereby reducing the \$PHRO inflation rate. \$PHRO rewards decrease when the underlying data, user and event, matches Pharo's estimated Probability Distribution Function (PDF) according to its [p-value](#). When a Pharo market stabilizes, the rewards are minimal as the p-value indicates little value in new estimates. The p-value therefore limits the inflationary rewards period, the time and number of estimates required to characterize the event rate and reliably predict market events.

## Market Deflationary Mechanism

Deflation happens naturally as \$PHRO is required to participate on either side of each Pharo market, putting constant buy pressure on \$PHRO as new premiums and new liquidity must be paid using \$PHRO. \$PHRO locked in a market could be:

1. Added to the reinsurance liquidity pool (reserve pool)
2. Added to DEX liquidity pools
3. Burned



### Reinsurance

Events happen, payouts will be made, but in the long run liquidity providers will earn money if they re-stake and stay in the game. To support this, Pharo collects 5% of \$PHRO collected into a reinsurance pool, which liquidity providers can pay an additional premium to access; The 5% is managed by the Pharo DAO. This reinsurance pool makes it easy to stay in a market, maintaining liquidity in that market, and thereby supporting the deflationary process.

### DEX or Burn

The Pharo DAO can choose (based on votes) to invest or burn \$PHRO locked in any given market. When investing, minimum liquidity in any or all pools will be maintained by selling the

locked \$PHRO. The Pharo DAO can burn the locked \$PHRO to avoid creating sell pressure and lowering the token value too much.

## Limits of Inflation and Deflation

### Maximum Market Inflation aka Kickstarter Inflation

Inflation of \$PHRO occurs by design in an unstable market, this is how users are incentivized to participate early: when event rates are unknown and uncertainty is highest. An inflation period is shortest lived if users' estimates have a p-value of 0 (zero), and perfectly predict the arrival time, aka Pharo cycles, of the next event, which can occur with as little as 33 user estimates; A Pharo cycle being the unit of measure defined by that market's event rate discovery question. Let's calculate the collective rewards.

The area under the curve of a normal distribution cut-off at the 95th percentile is 0.95. If we set the standard deviation to:  $\sigma = \frac{1}{\sqrt{2\pi}}$ , then the pdf height is 1. The 95th percentile of a normal distribution with 1dof lies at 3.841 standard deviations. For the market users to create a normal distribution, their stakes would have to match the pdf perfectly for a p-value of 0 to occur, which is then scaled by the TVL of the market, making the user value at x:

$$V(x) = \frac{TVL}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2} \frac{x^2}{\sigma^2}}$$

And making the reward multiplier at x:

$$M(x) = 1 + \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2} \frac{x^2}{\sigma^2}}$$

Since  $\sigma = \frac{1}{\sqrt{2\pi}}$  and we are looking for  $R(x) = V(x) * M(x)$ , we can simplify these equations and combine:

$$R(x) = TVL * \left[ e^{-\frac{1}{2} \frac{x^2}{\sigma^2}} + \left( e^{-\frac{1}{2} \frac{x^2}{\sigma^2}} * e^{-\frac{1}{2} \frac{x^2}{\sigma^2}} \right) \right] = TVL * \left( e^{-\pi x^2} + e^{-2\pi x^2} \right)$$

The total reward R is the integral of  $R(x)$  over  $x$ :

$$\int_{-3.841}^{3.841} R(x) dx = \frac{TVL}{\sqrt{2}} \left[ erf(3.841 * \sqrt{2}\sqrt{\pi}) + \sqrt{2} * erf(3.841 * \sqrt{\pi}) \right] = 1.7071067811 * TVL$$

If those first 33 people combine for a  $TVL = \$10K$ , the minimum rewards are:

$$R_{Total} = \$17,071.067811$$

This value,  $R_{Total} = 1.7071067811 * TVL$ , represents a minimum inflation rate of 7.071% for any given market.

## Maximum Perpetual Inflation

TL;DR

Chaotic markets → Consistent Inflation → Inflation / Cycle < Kickstart Inflation → Deflation / Cycle >=< Inflation / Cycle → Deflation is DAO controlled.

Rabbit Hole

### Chaotic Markets

Some markets will have crowds that fundamentally disagree about the true event rate, either because of an unfalsifiable assumption, or because the event distribution is multimodal or chaotic. These disagreements will result in irregular event rate estimates, estimates that collectively do not match Pharo's assumption of a gamma distribution, likely resulting in p-values anywhere between 0.5 and 1 depending.

### Consistent Inflation

Usually after the "kickstart" inflation period, incentives go to zero once users have discovered the market event rate, however in our chaotic market the rewards will never go to zero, there is no good simplification or analytical characterization of the users' estimates, and the market will consistently inflate \$PHRO with each observed event.

### Inflation / Cycle < Kickstart Inflation

This inflation rate will be less than the kickstart minimum rate as, 1) the p-value cuts rewards in half due to an imperfect statistical characterization, and 2) users' estimates must be statistically further from observed events than a 'perfect' kickstart period. Whether this inflation is 7% or 0.1%, there is consistent inflation as \$PHRO is awarded to users that correctly estimate the event rate, it just may be that the object whose events we're observing doesn't have a regular pattern, and may even be chaotic in nature.

### Deflation / Cycle >=< Inflation / Cycle

Each market's potential deflation rate per cycle is greater than the kickstart inflation rate as rewards are designed to be capped at 100% of \$PHRO staked in each cycle.

### Deflation is DAO controlled

The Pharo DAO has three deflationary actions that can be managed manually via the Pharo DAO multisig wallet, or automatically via the Pharo DAO smart contract. The real question is how can the Pharo DAO ensure long term stability of the \$PHRO token price as markets are added and as market TCL changes.

Pharo uses its own internal definition of time, which we call a cycle and is based on that market's question for gathering event rate estimates and determining the wisdom of the crowd.

Let's say we have a market collecting \$10K in premiums each cycle, paid in \$PHRO. Let's also say one (1) \$PHRO = one (1) \$USDC, then a DEX with \$1MM in \$PHRO / \$USDC paired liquidity has equal amounts \$PHRO and \$USDC, 500K / 500K respectively. We can calculate the deflation rate for each cycle using the change in the DEX's liquidity ratio, in our case purchasing \$10K in \$PHRO changes the \$USDC / \$PHRO ratio from 500K / 500K to 500K / 490K, which is a 2% \$PHRO price increase due to buy pressure. If we instead use \$100K in premiums, we'll see a 25% price increase each cycle. As liquidity pools are created and/or increase their TVL, Pharo will track the average deflation rate across all markets and determine how to best control the price of \$PHRO by adjusting the rates PHRO is either:

1. Added as liquidity to DEX pools,
2. Added to Reinsurance pools,
3. Burned

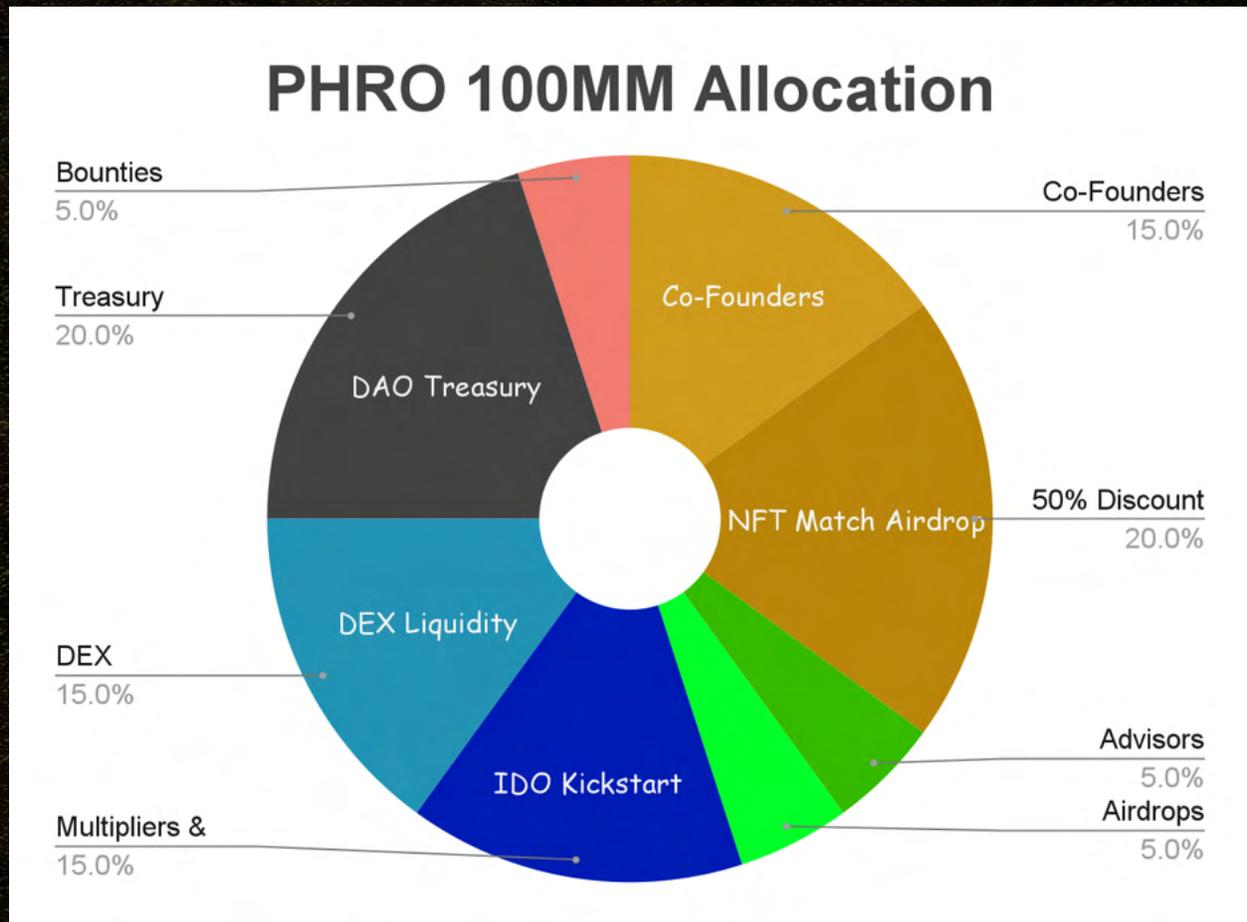
In the event there isn't enough PHRO locked in markets for the DEX or Reinsurance, the Pharo DAO can choose to mint new PHRO for these specific purposes.

The average of these various rates are maintained at any positive inflation or negative deflation rate the DAO chooses for whatever reason. With such precise control over the price of \$PHRO, each new market both stabilizes the overall rates while allowing each market to behave organically.

## IDO & TGE

Pharo plans to mint 100,000,000.00 (aka 1e8 or one-hundred million) \$PHRO with a starting price of \$0.05. The [Pharo IDO tokenomics](#) are designed to build a team for Pharo mainnet launch. This funding will allow us to hire a team of full time developers.

## PHRO IDO Allocation



Each slice of this pie is designed to ensure Pharo can hire a team to properly launch our first market, whether it's SHIB or something else the DAO chooses.

**Team:** Sean Moore Gonzalez & Jason Romero will have been building Pharo for roughly one year as of April 2022. We need to prove to our families this was a good idea 😊😊

**NFT Match Airdrop:** We're fulfilling our 50% token discount for Pharo NFT holders by matching their PHRO held two (2) weeks after TGE, vested over one (1) month.

**Advisors:** We have a great team of advisors that have supported us from the beginning, time for us to support them. They continue to support us and will support you as the protocol goes live.

**Airdrops:** We've run a number of airdrop campaigns, including our Thorchain test, time to pay the bill and prepare for future drops.

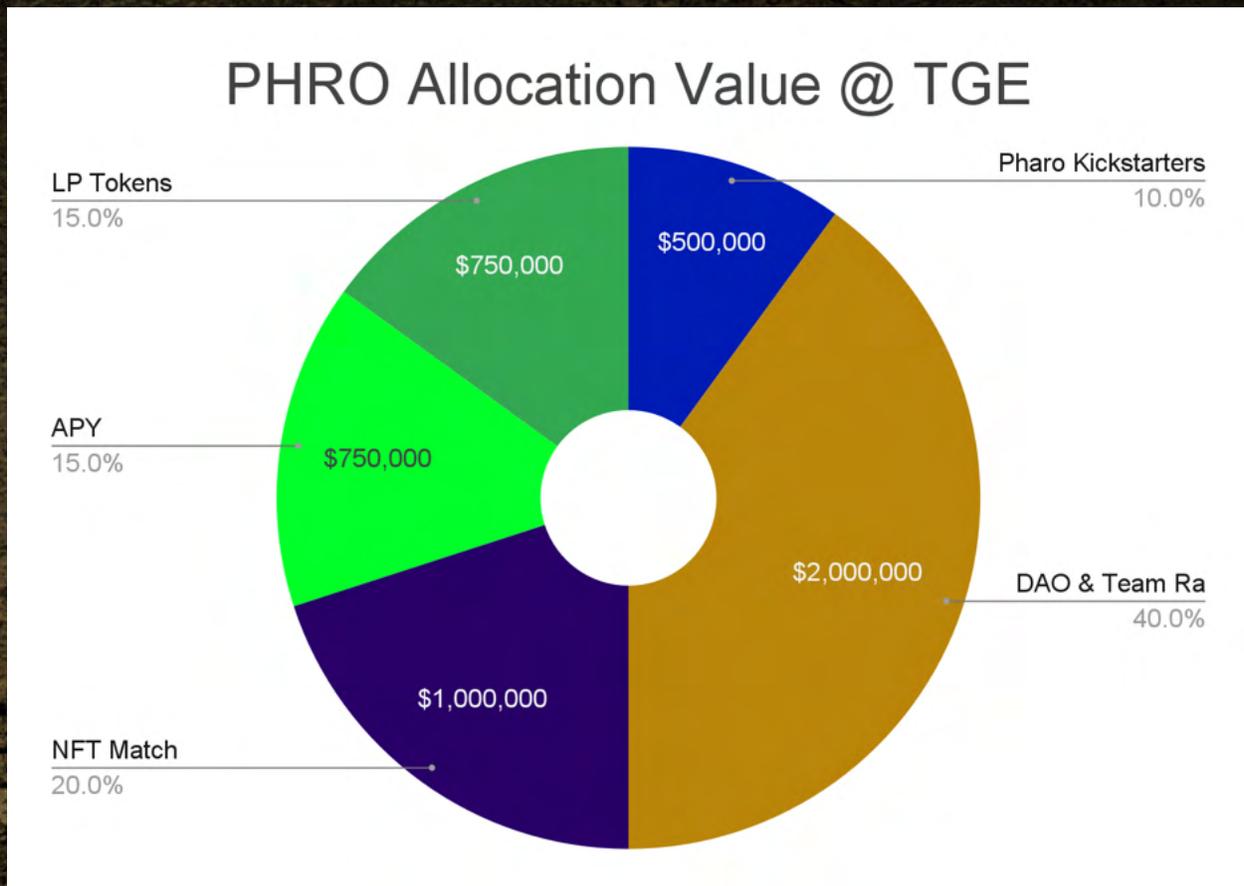
**IDO Kickstarter:** We want to reward our early liquidity providers with competitive multipliers and yield.

**DEX Liquidity:** PHRO reserved for providing liquidity to the Gravity Finance DEX after TGE.

**DAO Treasury:** PHRO reserved for building the fulltime team that will launch PHRO on mainnet.

**DAO Bounties:** We need to give the DAO a vehicle for engaging with independent developers as not all jobs are full time. As a result, we want to make sure the DAO can create jobs and allocate PHRO as bounties for these short-term jobs.

### PHRO Allocation Value @ TGE



**Pharo Kickstarters:** Includes the Advisors and Airdrops, aka PHRO we promised for pre-TGE support and action. These 10MM PHRO tokens, \$500K, represent the most significant sell pressure in the first week.

**Team Ra:** Includes the founders, full time hires, and the DAO. From this 40MM PHRO allocation, Roughly 4MM PHRO, or \$200K worth, will have sell pressure in the first month from vested tokens. The DAO will not start allocating and spending PHRO until the price stabilizes.

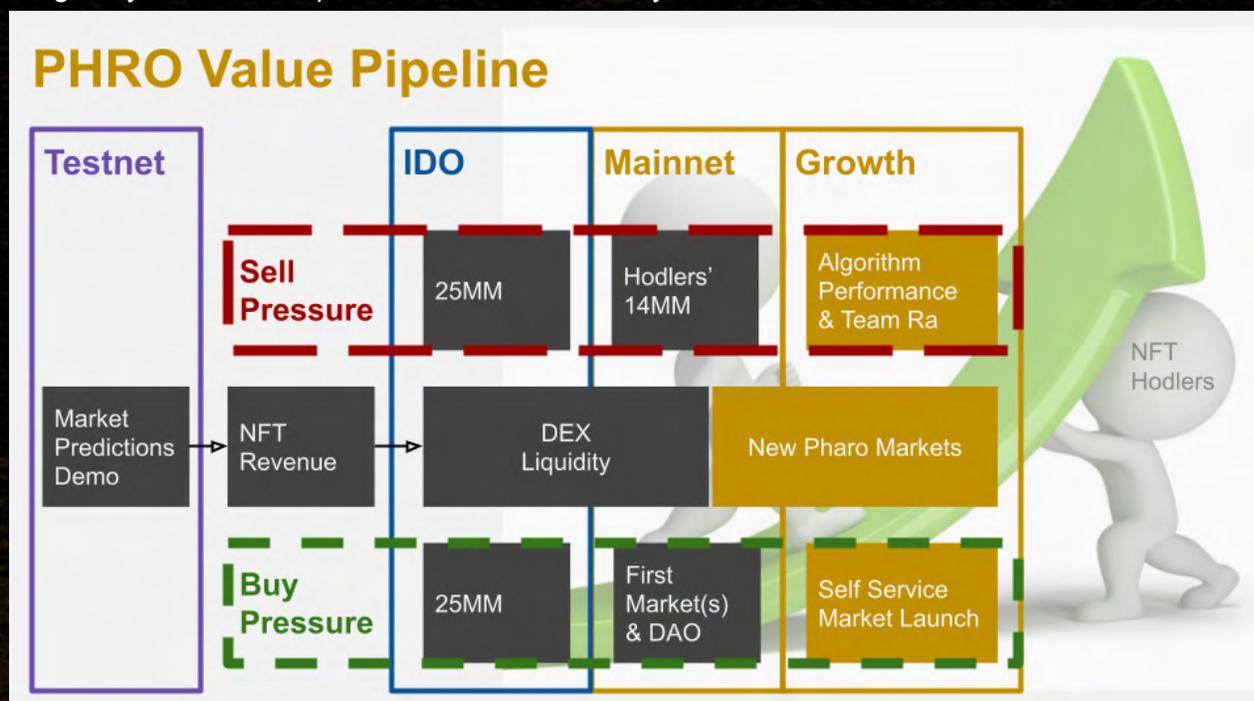
**NFT Match Airdrop:** This is our 50% discount for providing the initial liquidity, which is reflected in the valuation of those tokens. These 20MM tokens are held by our hodlers, so don't represent significant short-term sell pressure, but are still vested over a month.

**DEX Multiplier & APY Kickstarter:** These Kickstarter tokens represent supply post-TGE as people must exercise their PHRO, however obtained, to acquire their share of this supply. This represents a constant sell pressure until the price stabilizes. The incentives will be ramped down over time as PHRO market revenues ramp up; If we conservatively estimate the launch of the first Pharo market for Q3 2022, this creates a constant sell pressure of 20MM PHRO over six months, or \$167K per month. Hodling is incentivized as speculative prices will certainly be lower than prices from real market demand.

**DEX LP Tokens:** To receive DEX Multiplier & APY rewards, hodlers will first need to pair their PHRO with MATIC, USDC, or GFI. These 15MM PHRO tokens are reserved for people aping into the Pharo IDO and represent buy pressure in the first weeks.

## IDO Executive Summary

The IDO will pay our early supporters, and build a mainnet launch team to literally build value for PHRO hodlers. The IDO will use NFT sales to provide initial DEX liquidity, and Pharo will use market buy pressure to multiply prices after mainnet launch. Vesting ensures PHRO isn't dumped on the market, and users are incentivized to hodl as Pharo markets' launch on mainnet will greatly increase the price of PHRO and thereby hodlers' returns.



# PHRO Token Utility

## Rewards: Incentivizing Discovery

PHRO is designed to incentivize crowd discovery of each market's event rate. PHRO rewards decrease as the market stabilizes, meaning market events fall within the expected probability of the event rate based on users', The Crowd's, event rate estimates. Individual rewards are based on each user's predictive performance compared to:

1. Their proximity to the observed event,
2. Their proximity to The Crowd's prediction
3. The Crowd's proximity to the observed event

The value of PHRO is derived from the use of that crowd sourced event rate. PHRO is required to buy cover or provide liquidity, giving early market performers a cut of that buy pressure as they sell their PHRO back into the market. The Pharo DAO can vote to change the amount of rewards earned to ensure balance between discovery performance and market stability over time.

## Pharo Markets

The PHRO token is required for participation in all Pharo Markets. This creates the consistent buy pressure that ensures the value of PHRO and Pharo NFTs.

## Pharo Markets & PHRO Prices

Pharo markets provide constant buy pressure, so hodlers profit increases with more and active Pharo markets. This effect on PHRO price can be precisely calculated using the Buterin definition of currency price (*Credit: <https://invest.net/token-velocity>*):

$$C = T * H / M$$

Where,

*M is the total money supply*

*C is the price of the currency*

*T is the transaction volume (economic value of transactions per time)*

*H is users' hodling time before use*

For those that LOVE math word problems 😊 we can speak this equation as:

*PHRO price is its transactions' value and frequency of use, for all circulating tokens.*

As market buy pressure locks-in more PHRO and reduces supply *M*, PHRO price increases proportionately. For example, a stable Pharo market collecting a constant principle each cycle

with a constant hodl rate, will see a constant rate of the PHRO supply locked in its reserve pools. If those reserve pools represent 10% of all PHRO in supply, hodlers will raise their PHRO price  $C = T * H / M = T * H * (1 / 0.9) = T * H * 1.11$ , a 11.11111% price increase; 50% of all PHRO yields a 100% price increase.

Looking for 10x returns from locked-in PHRO?

$$C = T * H / M$$

$$10 = 1 / M$$

$$M = 0.1$$

How many markets will Pharo need to lock-in 90% of PHRO tokens for a 10x return? 100x? What percentage of PHRO may the DAO utilize? An active DAO could plausibly lock 10% of all PHRO for gPHRO, effectively removing that percent from supply, or greatly increasing the average hodl time.

## PHRO Allocation Summary

A static analysis of tokens that represent buy, sell, and hodl pressure would be 25MM buy pressure vs 15MM sell pressure vs 40MM hodl:

- 25MM Buy Pressure = 15MM DEX LPs + 10MM NFT
- 25MM Sell Pressure = 6MM Airdrops + 4MM Team Ra + 15MM DEX APY
- 50MM Hodl Pressure = 4MM Airdrops + 36MM Team Ra + 10MM NFT

In reality all tokens will not simultaneously enter the market, dynamics are represented by the vesting periods and time to earn PHRO from staking. This timed release of PHRO will need to be bought by hodlers or reintroduced as DEX liquidity, with a goal of stabilizing in time for the first Pharo market launch.

People hodl because they believe in the future. The future of Pharo and PHRO are its markets, which provide constant buy pressure, so hodlers profit increases with more and active Pharo markets.

## Pharo DAO & Governance

\$PHRO can be staked for gPHRO, which allows participation in the Pharo DAO proportional to their stake. Pharo NFTs can also be staked; each Pharo NFT will receive gPHRO equivalent to the lowest Pharo NFT sale price.

## Proposals

Anyone with gPHRO can submit a proposal for a vote by the Pharo DAO. Proposal priority, meaning the order in which they're voted on, is determined first by whether they're holding a Pharo NFT, which elevates that proposal over those without, and second by the amount of

gPHRO staked on that proposal. Proposals have a shelf life, after which point they are considered “on ice” and the gPHRO is released.

## Voting

The Pharo DAO will use quadratic voting to approve proposals, which will either be executed by the Pharo Core team or as Bounties.

## Bounties

Bounties are created by the Pharo core team based on successful proposals, or proposals themselves can be bounties. Once approved, using the same proposal process, funds are set aside and the bounty is announced. The Pharo core team accepts or rejects bounty submissions, which also determines release or absorption of the funds. Bounties can be removed by a DAO vote, or by the Pharo Core team with cause.

Bounties can include anything from bug fixes, to new Pharo Market research, to algorithm research, to feature development, to branding or artwork; Really anything that’s Pharo centric.

## Invest in Pharo

Pharo’s 2022 Initial DEX Offering has a variety of actors and different ways to invest, pre and post IDO; Here’s what you need to know:

### Pre IDO

#### Anubis Bounties

The Pharo IDO timeline begins with testing the heart of our system: The Anubis Algorithm. Users will first [stress test Anubis on testnet](#) and Pharo will award bounties to whomever can successfully break Anubis.

#### Wisdom of Crowds Competition

[demonstrate Anubis’s “Wisdom of Crowds”](#) will win PHRO tokens and Pharo NFTs for risky yet accurate SHIBA INU predictions.

#### Share & Earn

Users might ask: Why SHIB predictions? Predictions from when? What predictions have value?

To help users in their quest to earn, we will airdrop our discord community for:

1. Answering questions about Testnet.
2. Sharing and promoting Pharo

Join our discord to learn more.

## IDO Actors

The Pharo IDO begins with the Token Generation Event (TGE), which will supply 40 Million PHRO Tokens. The IDO will have five primary actors:

1. Pyramid Club VIPs
2. Community Hodlers
3. Liquidity Providers
4. Investors
5. Market Makers

Let's meet everyone.

### Pyramid Club VIPs

To become a Pyramid Club VIP, users must own at least one [Pharo NFT](#)

Our VIPs will be airdropped PHRO every week, starting two weeks after the TGE. Each week our VIPs will be airdropped 5% of the PHRO they hold in their wallet, for each Pharo NFT they hold, for 20 weeks, fulfilling the 100% matching, aka 50% discount, for each Pharo NFT. This means our VIPs are HEAVILY incentivized to hodl, thereby maximizing the PHRO matched in their wallets.

In addition, after mainnet launch, our VIPs will receive reward multipliers, have DAO governance rights and the ability to stake NFTs to earn greater market rewards. Watch our [Pharo NFT video](#), or read our [NFT Launch blogpost](#) for more detail.

### Community Hodlers

Those who engage in our community, who drive our IDO. Pre IDO our community earned rewards by helping others in the community and spreading the word. As our community grows beyond the IDO so will community rewards. [Join our discord](#) to learn more.

### Liquidity Providers

Pharo will be the IDO's first DEX Liquidity Provider, and many more will come for the staking rewards, VIPs will of course get special benefits.

Generally speaking, after mainnet launch, users can provide liquidity in: our DEX, where you can collect AMM rewards as Pharo Markets create buy pressure; In specific Pharo Markets, where you see an opportunity for discovery rewards or high premiums; In Pharo Market indices, where you can diversify across many Pharo Markets; Or in Pharo Reinsurance, where you can collect premiums from Pharo Market LPs in case an event happens. Details on returns can be found in the Tokenomics section of this GreenPaper.

## PHRO Investors

As an early investor you get the benefit of being first in the system and thereby reaping the most rewards, not to mention driving confidence for other investors like yourself, to become the fiscal backbone of DeFi.

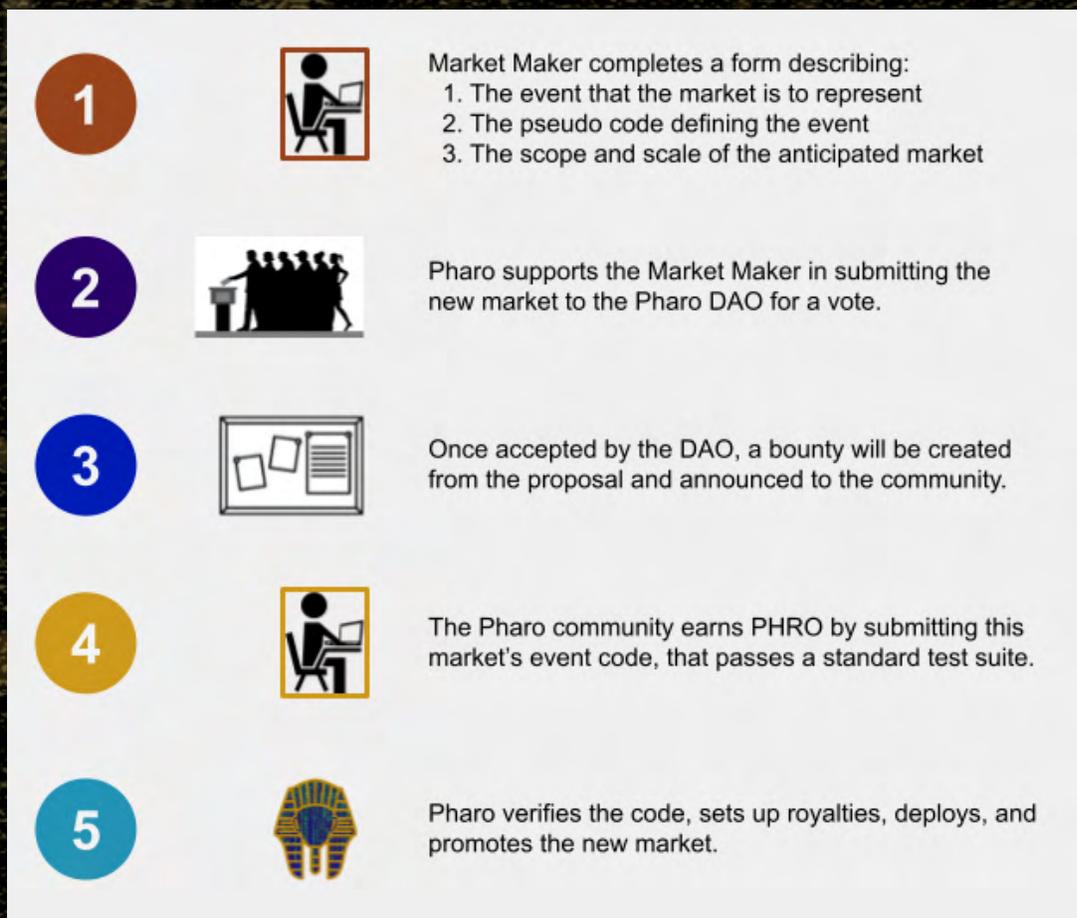
## Market Makers

Pharo's secret weapon and scaling champion is the Market Maker. Pharo and PHRO live and die with Pharo markets, and we're excited Pharo is designed to empower Market Makers, throughout the DeFi ecosystem, to establish, host, and promote their own decentralized insurance markets.

Market Makers share market revenue with Pharo and the DAO, and The Pharo DAO will be prioritizing new markets in anticipation of mainnet launch.

## Making new Markets

Establishing a market is a multistep process which is kicked off by the Market Maker and is supported by the DAO and a bounty system. The full diagram is below:



Detailed steps are:

1. First the Market Maker, the expert in the theoretical part, needs to complete the Pharo Market Creation Form describing the event that is to be covered, the pseudo-code that defines the event that is being covered and an estimate of the scope and scale of the market.
2. Secondly, Pharo will push the proposal to the Pharo DAO to prioritize and vote on the proposed markets.
3. Third, proposals which are approved will be hosted as a bounties, for the programmatic experts, and funded by the DAO.
4. Fourth, bounty hunters, the programmatic experts, will earn \$PHRO bounties by providing code for programmatic binary (true, false) resolution of the proposed Market event.
5. Lastly, the Pharo community will formalize the event on chain with the programmatic code resolution, provided by the bounty collector, which describes the binary outcome of the event.

With this approach Pharo ensures that:

1. Market Makers have technical programming support for creating their markets.
  2. Talented programmers can earn rewards for helping our community grow.
- Pharo is able to rapidly scale the number of markets so we are meeting our users needs.

### Self-Service dApp

Our ultimate goal is for in time, anyone will be able to create their own Pharo market with a few simple clicks. To be self-service, we'll guide the user step by step, including the event equation, initial capital or loan amount required, wallet confirmation, marketing collateral, market performance, and more.

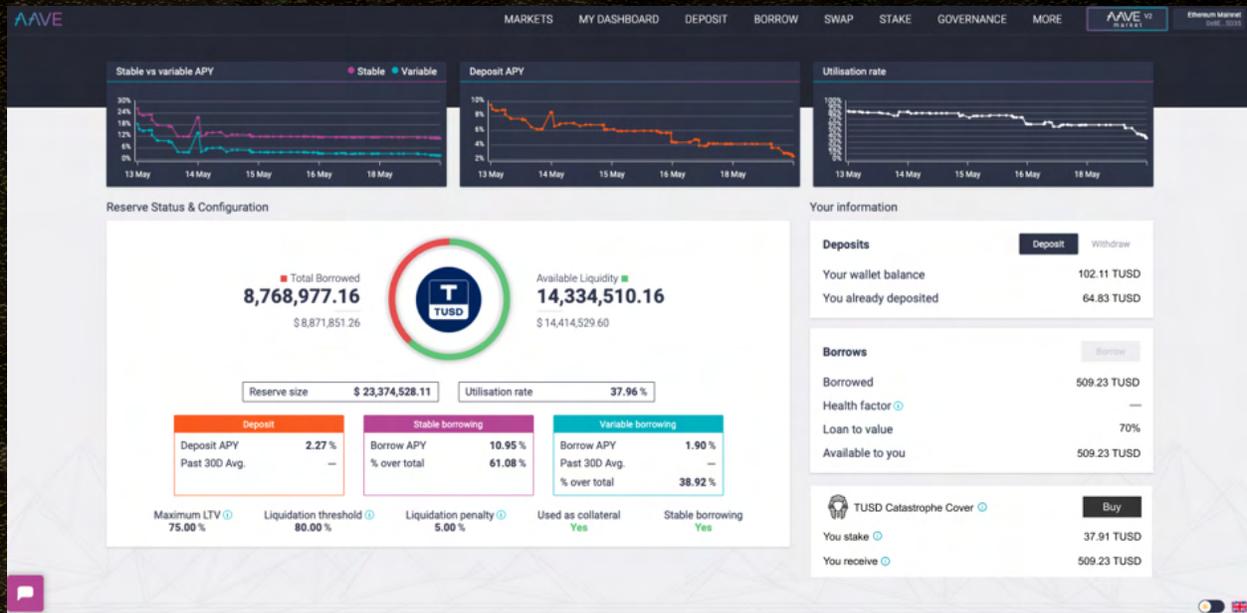
## Partnering with Pharo

Pharo Inc. has strategic partnerships with future Market Makers and complementary companies and projects. Pharo prioritizes complementary relationships that can support new Pharo Markets, but can also be mutual support in marketing, promotion, whiteboarding, development, sounding board, shoulder to cry on, peer review, services, advice, or any investment that just seems like a mutually good idea.

Interested in partnering with Pharo? Ping us on discord or email us at [agents@pharo.tech](mailto:agents@pharo.tech)

## Engaging with Pharo Protocol

Users can stake with Pharo on our main page, and Pharo will be providing documentation to integrate cover markets directly in their applications. Let's imagine AAVE wants to provide their users cover in case stablecoins staked in AAVE fluctuate more than 5%. The image below is an artists rendering of the interface that's possible with Pharo.



This same market can also be accessed from the Pharo market app, which may suggest similar markets or include additional index markets.

Documentation will also show developers how to start their own Pharo markets, independent of the Pharo Core team. All new markets will need approval by the core team, or ultimately by the DAO, both for liability reasons and to mint new PHRO to service that market.

## Coverage Buyers

Users can start and end as a cover buyer with Pharo, either through integration with another application or directly on the Pharo market app.

## Reinsurance & The DAO

Users can deposit PHRO into a reinsurance pool, to collect premiums from liquidity providers looking to re-stake after an event payout, and to collect their gPHRO for participation in DAO governance. In time we plan to fully transition Pharo control to the DAO, with minimal executive staff.

## Pharo Inc. & Team Ra

The Pharo Core team will be accepting applications for employment after the IDO/TGE.

# (Appendix) Applications of Pharo

## How (Value Depression)?

Since the start of 2021 there have been a variety of “meme” stocks which have gained significant attention due to the behavior of short sellers, and the capacity for retail investors to compete with institutions. Short sellers in the traditional market bet that a stock will significantly underperform its current position in the long run. Hindenburg Research does a tremendous job of successfully establishing their shorts, so successfully that their public announcements will often single-handedly drop a stock’s price, as seen with Draft Kings and Nikola.

Unfortunately for those who invest in stocks that are the targets of substantial shorts, the loss of value may not only be sudden but permanent if the retail masses do not see value. Short sellers, influential whales, and retail chaos are also present within DeFi, and can also have substantial impact on the price and future health of a token, but whether traditional markets or DeFi, both have many different responses to significant short activity on single or multiple assets. DeFi uniquely operates 24 hours a day and around the world, creating 24 hours of intensity, requiring investors to have contingency plans for activity that takes place when they are not online.

Fortunately for the DeFi investor, Pharo can hedge against a possible short price impact, eliminating concerns when investors are sleeping (aren’t online). We aim to use blockchain technology to help make the sale and purchase of risk more efficient, enable lower operational costs, and provide transparency into the industry. Blockchain can provide the means to disinter-mediate the market with a peer-to-peer risk platform that helps us act as society’s safety net. We envision new individuals building their own markets and products on top of the Pharo protocol. In this case sophisticated investors can come together to protect themselves from short depressions within the 24 hour investment cycle that is DeFi.

## How (Rug Pulls)?

Smart Contracts are open source, are pieces of code built by others and sit on a public blockchain. To build confidence you may read the tweets, discord, blog posts or even try to read the code. However, even the smartest and most diligent of individuals cannot identify every loophole or forecast every rug pull. This balance of confidence building and implicit trust is what compels us to support new projects, thereby making money, yet we must still protect ourselves against extreme volatility.

Rug pulls are an example of a high volatility and high impact event that everyone from retail to sophisticated crypto investors need to be familiar with and aware of. In fact, this type of volatile event often causes individuals to drag their feet on otherwise high return and possibly safe plays. Pharo is here to solve that problem and give you the confidence and protection you need

when making decisions about crypto, and eventually non-crypto, that expose you to volatility and ultimately a financial risk.

Pharo provides liquidity for volatile events using the wisdom of crowds and statistical models to build consensus about the odds of an event, such as a rug pull. The collective liquidity providers share the risk, and the associate service fees, based on their unique perspective while the coverage buyers purchase protection from the pool. To calculate services fees Pharo transforms those unique perspectives into a risk index which is used to maintain a sustainable market. As time progresses towards an event, Pharo will use service fees to provide coverage and rebalance with new odds data, which means:

1. Lead investors can recover most of their investment.
2. Gap investors at least have water they can dip their toe in.
3. Early investors can be more judicious with their investments.
4. Bandwagon investors know people have put their money where their mouth is.
5. Fearful investors and crypto pundits will have popular talking points.

## How (Flash Loan Attacks)?

Crypto Protocols are based on code built by developers who are looking to empower individuals in DeFi, and there are a variety of tools and functionality that have been made available in support of this. One tool that is often used by sophisticated investors is a flash loan. Flash loans allow users to access funds at magnitudes greater than the initial principal invested because a set of DeFi transactions are completed, and the loan is paid back, within a single block chain transaction. Since the borrow and repayment are within the same transaction, the provider of the loan can give the user access to large amounts of funds at low/zero risk and low cost to the user.

AMM Protocols, since they are based on code built by developers, may have flaws or weaknesses. Very clever individuals are able to combine the code flaws and the flash loan functionality to execute what is known as a “flash loan attack”. In a recent series of flash loan attacks on Binance Smart Chain, attacker(s) were able to manipulate the AMM protocols’ understanding of coin prices and the market value of these coins, yielding significant gains for the attacker(s) when they sold off the coins they were able to collect.

In other words, the attacker artificially devalued the coin within the AMM, swapped it, and sold it at the now higher market value, all in one transaction; which also happened to depress the price of the coin in the overall market. By using flash loans and completing this exploit in a single block along with multiple other transactions, arbitrage bots and other market participants are not able to correct or take advantage of the discrepancy in the price feed and the manipulated feed is only useful to the attacker. The attacks all exhibited the following behavior.

1. Execute a series of transactions in a single block, not via a UI, but interacting directly with the target protocol contract and flash loans provider.
2. Use flash loans to access large amounts of tokens, and deposit those tokens into liquidity pools to temporarily depress or inflate that token’s price.

3. Redeem more LP tokens than originally deposited, since their value has now been depressed.
4. The Protocol is now left with an insufficient balance of LP tokens, as compared to remaining rewards owed or LP tokens outstanding.

This attack is not victimless. Unfortunately, all those who provided liquidity for the pool of coins which the attacker used will soon find that when they try to redeem their LP (liquidity provider tokens) there are not enough coins to fill the LP demand. This is because the flash loan attack took place before stability could be achieved and this is where investors experience both a material loss and an emotional loss of trust.

Pharo can cover these lost LP tokens and Pharo can reconstitute trust. Pharo can verify the flash attack loss by observing that the total withdrawable value from the pool is less than redeemable LP Tokens. Pharo would monitor this event using the real time oracle associated with the AMM protocol's target pool. Pharo flash attack cover buyers would be protected from this type of potential loss, allowing them to hedge in otherwise risky AMMs or volatile coins, and feel confident about their DeFi positions.

## A Betting Platform?

For those wondering if Pharo is really a betting platform, remember the CBs are agreeing to lose money just to enter the market, which sounds like a terrible bet to me. CBs are paying a premium in exchange for long term stability, and LPs are accepting those premiums in exchange for short term instability.

## (Appendix) Math

### Buterin Currency Calculation

This "Market Deflation" can be precisely calculated using the Bruniske or Buterin definition of currency price, the short version is:

Burniske:  $MV = PQ$

Buterin:  $MC = TH$

Where,

*M* is the total money supply

*C* is the price of the currency

*T* is the transaction volume (economic value of transactions per time)

*H* is users' hodling time before use

*“In either definition, one can see that the velocity of the coin is inversely proportional to the value of the token i.e. the longer people hold the token for, the higher the price of each token. This is intuitive, because if the transactional activity of an economy is \$100 billion (for the year) and coins circulate 10 times each over the course of the year, then the collective value of the coins is \$10 billion. If they circulate 100 times, then the collective coins are worth \$1 billion. Thus, understanding and calculating the velocity in any token economy is extremely important.”*  
**Credit: <https://invest.net/token-velocity>**

We're interested in token price, so we solve for C:

$$C = T * H / M$$

For those that LOVE math word problems 😊 we can speak this equation as:

*\$PHRO price is its transactions' value and frequency of use, for all circulating tokens.*

So for a Pharo market with \$10MM Total Cover Locked (TCL) and an event rate of 110 hours, we can expect the collective premium  $T$  to be in the neighborhood of \$100k / hour.

Since premiums are designed to cover liquidity plus interest and fees, premiums will be renewed at the same liquidity rate plus interest and fees, we can estimate the cover hodl time  $H_c = 1.5$ , making the average hodl time  $H = 1.25$ .

Finally, we have to assign some number of tokens to service this market, which is mostly arbitrary since tokens have 18 decimal precision, so we'll assign 1 \$PHRO / 1 \$USDC making  $M = 15MM$ .

The \$PHRO token is therefore:

$$C = \$125k * 1.25 / 15MM = \$0.0104167$$