Hypha

White Paper

For a New Tokenomic Model

A White Paper for a Token Model as a Foundational Element of the Blockchain Economy.

Token Model

Contents

1 Introduction

Blockchain technology has enabled the evolution of Web3 economics, where multiple systems can operate and interact whilst maintaining independent decentralised economic and governance models. We have seen many prototypes and experiments for tokenised ecosystems appear (and disappear) over the last few years, as you would expect in the early adoption phase. There have been multiple iterations on the notion of a Decentralised Autonomous Organisation (**DAO**), designed to replace classical centralised governance, although most have suffered from the *Animal Farm* demise.

That said, blockchain is going through a positive change of ownership period, where crypto-natives exit, making way for enterprise adoption of the tools and technology. These early concepts, once built correctly, are critical to the evolution of a new global economic age.

- Decentralised infrastructure
- Utility Token
- DAO Governance

This current phase of the market is analogous to the post *dot.com* bubble, where hyperbole was dissolved, but the real winners began to emerge. In blockchain, we see this starting already as demand is increasing for product from traditional enterprise looking to integrate Web3 strategies into their current business models. This will not be reflected yet in the public observation of crypto, namely CoinMarketCap, where legacy models are exhibiting the post-bubble *death by a thousand cuts*.

Hypha has built a series of technology tools and components for the creation and operation of DAOs. Like any emerging market, infrastructure that enables growth and adoption has a value that is economically leveraged to the market itself. Hypha should be no different since it represents critical infrastructure for the true *real money* adoption phase of blockchain.

Since Hypha is itself a decentralised economy, the value of its services need to be solved through a dynamic unit of account, namely the HYPHA token. This is achieved by building a utility function around a rational capital model, which allows the protocol to self-price on a continuous basis and enable the HYPHA token to represent the economic health of the ecosystem.

2 Economic Principles

2.1 Utility Function

A DAO accesses services by Staking HYPHA tokens.

Staking for utility, where there is unknown economic benefit, is generally a better model than setting transaction fees.

(1) The fee is now *implied* through staking cost of capital.

(2) There is much lower user friction.

Mathematically, a transaction fee model and a staking model are equivalent, save for the explicit vs implicit nature of the fee structure.

2.2 Proportionality

A DAO Stakes a quantity of HYPHA that is a function of the number of its users.

In simple form, the more Members a DAO has, the more tokens they Stake, which is as you would expect.

2.3 Value

The underlying driver of HYPHA economics is DAO Members

We have now established an economic look-through from the HYPHA token to DAO Membership numbers. That is to say the cost of using the Hypha DAO tools for any DAO will always be related to the economic value of their Members

Since each DAO has a different economic benefit from their specific members, it is impossible to determine explicitly what that is worth. However, by using the $Staking \cdot Member$ model we are able to capture value for HYPHA that is dynamically proportional to the economic value without explicitly setting fee rates.

Conversely, the HYPHA model can be used to observe *implied economic value* of DAO Members which has other positive implications for ancillary user acquisition strategies.

Here, it is important to note, that this does not prevent other services being offered commercially to DAOs or their members. In fact, this model enables this type of activity and value generated naturally finds its way back to the HYPHA token.

2.4 Considerations

Figures 1 and 2 illustrate the general principles that the HYPHA model addresses to calculate staking requirements for DAOs.

Figure 1: Staking Amount per Member

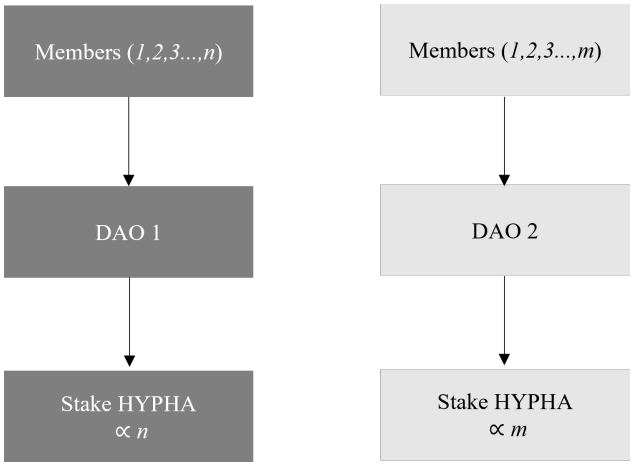
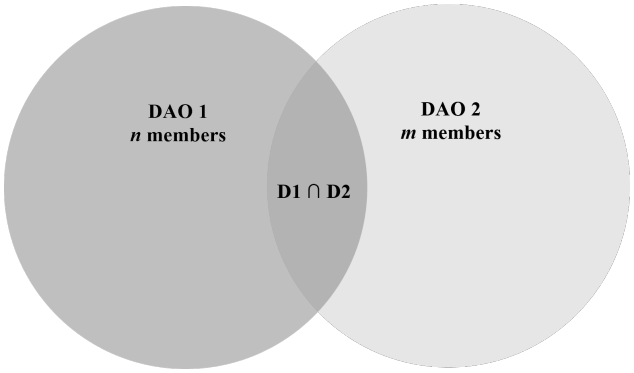


Figure 2: Common Members



DAOs Stake an amount of HYPHA according to their Members with an adjustment for the Common Member intersection.

3 Capital and Utility

3.1 Implied Fee

Without a centralised pricing authority, it is imperative that there is a rational unit of account that can provide dynamic price discovery for services offered. It has been customary to use a native token as a payment currency, such as gas fees on Ethereum.

However, there are challenges with the implementation of a transaction fee model in the case of valuing the benefits of Hypha services.

- A transaction fee is ultimately priced in an exogenous currency (hereon we use $ as a proxy).

  Otherwise, if priced *locally* in native tokens, the system pricing becomes too cheap or too expensive at any given moment for the services offered.

- To maintain a $ pricing for services, the HYPHA token would need to be constantly valued in $ in order to calculate HYPHA token fees.

  This introduces extra costs, including Oracle fees and security risks.

- This clearly cannot be achieved effectively in a decentralised system.

  Consensus on $ pricing would be difficult to achieve on a dynamic basis.

- And so setting a $ price does not allow the system to self-balance.

  It may be too cheap or too expensive since there is no way of knowing.

The fee model will *undervalue* the HYPHA token on the basis of:

- Value leakage through no dynamic capture.
- Lack of decentralisation.
- Inherent volatility that has a negative feedback loop.

Hence, we need to recognise that:

(1) Pricing for services should be denominated in $.

(2) There can be no explicit price setting.

(3) There should be no reference to HYPHA token value.

(4) Rational modelling reduces volatility which has a positive feedback loop.

In the proposed model we invert the transaction fee problem by using Staking as access to services.

This meets the expectations detailed above where:

(1) The cost of capital from staking HYPHA is denominated in $.

(2) There is no price setting.

(3) There is no reference to HYPHA token value.

(4) The market solves for a capital value that is rational thus reducing long term volatility.

In an explicit transaction fee model, for example where $ fees are set and the tokens burnt, the capital value of the token can be modelled as the present-value sum of all (expected) $ fees in perpetuity.

In the Staking model, the fee rate is now implied in that the yield *not generated* by the capital is equivalent to the fees. We can then say that the real yield actually generated is the utility of the Hypha tools.

If we consider that the HYPHA token yields utility on a perpetual basis, the $ capital value of the HYPHA token should represent the present-value sum of all future (utility) yields which, as above, is equivalent to (expected) future $ fees.

Hence, the usage of Staking, with its implied fee, achieves the same capital instrument as a transaction fee product but with the benefits outlined above and, crucially, without the need to set arbitrary fee rates.

Here we also note that staking does provide a necessary friction point to avoid spam or frivolous transactions.

3.2 Stake Considerations

Staking by a DAO must be proportionate to the number of its Members to maintain the economic logic of the model. However, there are the following considerations that are managed within the model.

3.2.1 Fixed Supply

The total HYPHA capital value should reflect a $ value of its underlying aggregate DAO Members. Thus, the overall HYPHA Staking amount should not change if Members increase or decrease, but instead the *individual Member staking requirement should adjust.*

> In simple arbitrary terms, if there was 100 HYPHA in existence and 50 DAO Members, we may say the Staking ratio was 1 HYPHA per Member, where 50% of the HYPHA supply would be Staked. If the number of Members increased to 80, the Stake requirement would move to 0.625 maintaining the 50% Stake ratio.

This may be unintuitive, especially from a crypto perspective. Increasing Members does not drive demand for HYPHA in its own right, but the implied utility value of the token increases.

> In a traditional user acquisition model, a business may pay $10 for a user. Lets assume this is analogous to staking 1 HYPHA token. If users on the platform double, the stake requirement is 0.5 HYPHA tokens. The business still recognises that the cost of acquisition is $10 but now can acquire another user. All other things being equal, the utility value of the token has doubled.

3.2.2 Common Memberships

Since there are a fixed amount of HYPHA tokens in existence, it is not possible for DAOs to stake infinitely more HYPHA for a Member of more than one DAO. Nor is this economically sound since any Member has a finite economic impact irrespective on the number of DAOs they join, and we want staking to reflect economic value of DAO Members.

- The Staking factor for Members starts at 0.5 (as above) and increases with the number of DAOs they belong to following a halving pattern (0.75, 0.875 ...). This gets to 1 as the Member belongs to infinite DAOs.

- The Staking burden is shared *equally* between all DAOs for their Common Members.

  In our simple example above, if all of our 50 Members joined a second DAO, the staking ratio would increase to 75 HYPHA with each DAO staking 37.5 HYPHA each.

More DAO Memberships per Member does increase demand for HYPHA but in a non-linear manner. This reflects the decreasing relative economic impact of each incremental DAO joined.

Since the Staking increment is sub-linear, and the denominator of DAOs increases linearly, the Staking requirement for the DAO for the Member joining other DAOs will always decrease.

4 Supply Curve

HYPHA issuance is generated from a population sigmoid function, P:

$$P(t) = \frac{M}{1 + ke^{-ct}} \tag{1}$$

Where,

M is the maximum supply of 150 million HYPHA (see Section 6.1).

t is a time count with k and c constants for calibration.

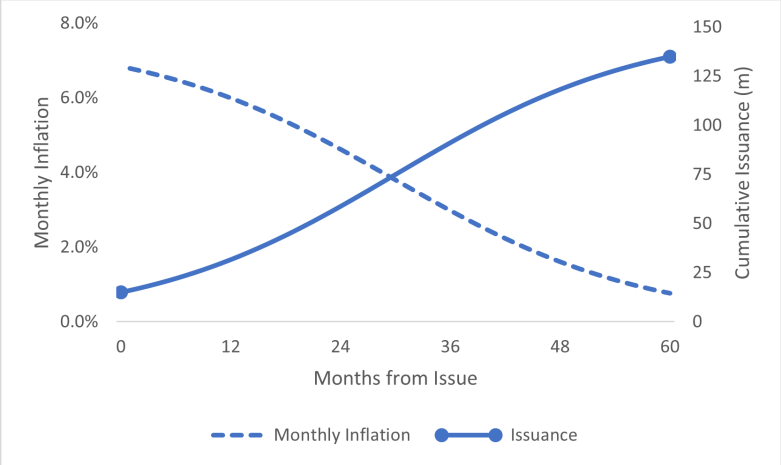
The curve is calibrated to have:

A *half-life* inflection point at 15 months

Initial issuance of 10% of maximum supply, that is 15 million HYPHA (See Section 6.2).

The curve is dynamically *time-dilated* by the ratio of total HYPHA staked to cumulative issuance (also referred to as circulating supply).

Figure 3: Issuance of HYPHA Tokens at 50% constant Staking



5 Staking

5.1 Nominal Stake per Member

We determine the Nominal amount of HYPHA tokens N per Member from the circulating supply of HYPHA tokens $P(t)$ and the total number of Members n in the total ecosystem.

$$N = \begin{cases} \frac{P(t)}{n}, & \text{if } \frac{P(t)}{n} < 10 \qquad (n \in \mathbb{N}) \\ 10, & \text{otherwise} \end{cases} \tag{2}$$

We have capped N at 10 to take into account the early adoption phase and the practical cost of Staking large amounts of HYPHA when n is small relative to P. This means that in the first instance, based on the initial supply of 15 million tokens, N remains static until $n \geq 1.5$ million Members.

5.2 DAO Memberships

For each Member i, we calculate the total stake requirement S_i based on the number of DAO Memberships D_i for that Member.

$$S_i = N\left(1 - \frac{1}{2^{D_i}}\right) \quad (D \in \mathbb{N}) \tag{3}$$

From Equation (2) we note that as D_i gets very large, S_i tends to N, and when $D_i = 1$, $S_i = \frac{N}{2}$ (as described in Section 3.2.2).

5.3 Stake Requirement

As the Staking requirement increases as a Member joins multiple DAOs under Equation (3), this Stake is shared by all the respective DAOs equally.

Each DAO j has the stake requirement for their member:

$$S_{ij} = \frac{S_i}{D_i} \tag{4}$$

5.4 Staking Summary

The number of HYPHA tokens staked is a function of total DAO Members on the platform[1].

Figure 4: Staking Amount per Member (S_i) at 75m Circulating HYPHA

Memberships ↓	Members (m) → 1	2.5	5	7.5	10	12.5	15	17.5	20
1	5.0	5.0	5.0	5.0	3.8	3.0	2.5	2.1	1.9
2	7.5	7.5	7.5	7.5	5.6	4.5	3.8	3.2	2.8
3	8.8	8.8	8.8	8.8	6.6	5.3	4.4	3.8	3.3
4	9.4	9.4	9.4	9.4	7.0	5.6	4.7	4.0	3.5
5	9.7	9.7	9.7	9.7	7.3	5.8	4.8	4.2	3.6

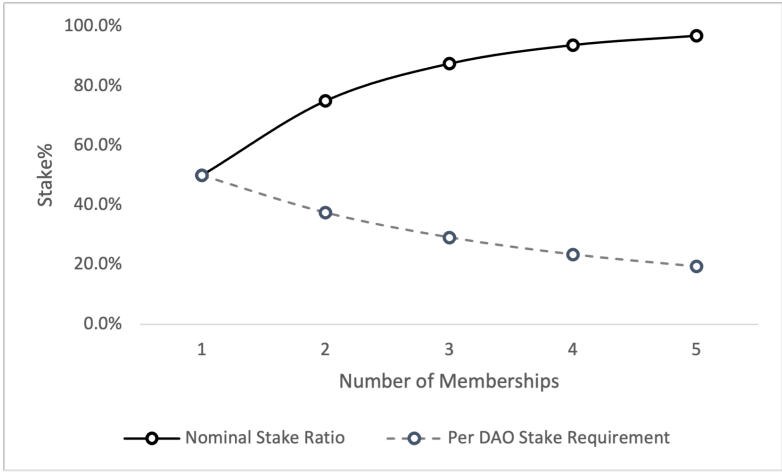
Figure 4 demonstrates the changes in staking requirement per Member, as total Hypha Members increase or decrease, together with the effect of Members joining multiple DAOs.

And we can note that the staking amount;

- Decreases as members increase.
- Is capped when Members are less than 7.5 million
- Increases as Members join more DAOs.

Although staking increases as Members join multiple DAOs, the stake requirement for each DAO decreases since the stake is shared.

Figure 5: Stake Requirement Per DAO



[1]We take the inflection point of P to assume 75m Hypha tokens in circulation.

Figure 6 illustrates the proportion of circulating supply that would be staked under these scenarios.

Figure 6: Total Staking %

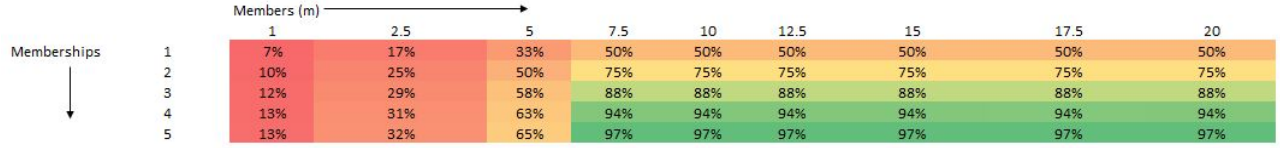


Table 1 shows the changes in Members affecting the relative stake requirements of DAOs.

Table 1: Member Change Staking Effects

	t			**t+1**			**t+2**	
	Members	Stake %	Change	Members	Stake %	Change	Members	Stake %
DAO 1	50	50	+50	100	50	+100	200	66.67
DAO 2	50	50	+50	100	50	0	100	33.33
Total	100	100	+100	200	100	+100	300	100

Where DAOs are equally increasing members, they do not experience a relative change to stake requirement, but one adding more than another will cause staking to rebalance. Staking is relative to contribution, which is as expected.

5.5 DAO Stake Rebalance

Since there are a few moving parts in the staking calculations there are practical implications of *when and where* these numbers are calculated. In general, this can be solved using a sensible calculation period with checks and balances (for example monthly) and reducing friction for DAOs. Whilst it might seem complex, DAO staking will become automated and several tools and protocols can be developed to reduce workload as the system matures. At the outset, the staking requirements will be fairly simplistic with low usage.

Figure 7: DAO Stake Vectors

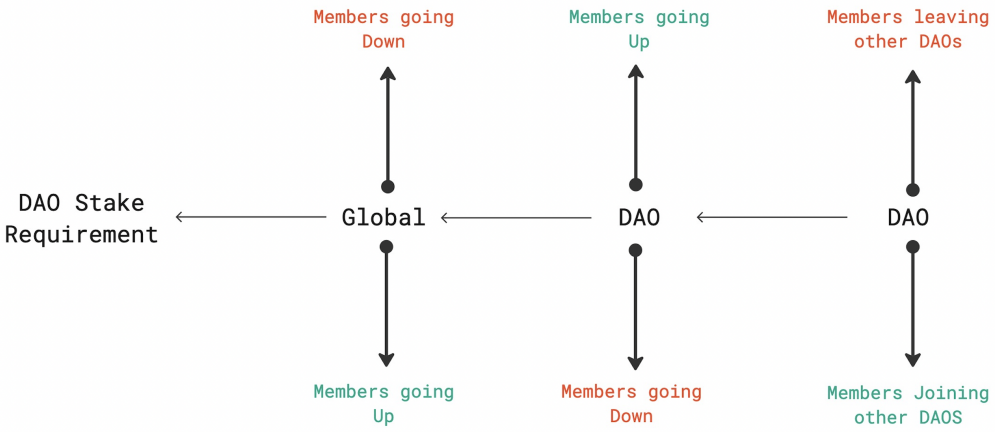


Figure 7 shows the effect of a DAO's Membership pattern and the overall Membership of Hypha on their staking requirements.

6 Token Supply

6.1 Gross Allocation

The HYPHA token supply to-date stands at 46 million, on a fully diluted basis, which has been issued over 4 years for contributions to the project. Going forwards, the HYPHA token economy consists of:

- A maximum supply of 150 million tokens.
- A present-day allocation of 75 million tokens.
- An allocation of 50% of total supply, 75 million HYPHA, for DAO adoption incentives.

Table 2: General Allocation

Cohort	**Supply(%)**	**HYPHA(m)**
Early Stakeholders	30.7%	46
Hypha DAO Treasury	12.7%	19
Launch Stakeholders	6.7%	10
Incentives	50%	75
TOTAL	**100%**	**150**

Noting that, as in Section 4, the starting circulating supply is 15 million HYPHA, or 10% of total supply.

6.2 Circulating Supply

The circulating HYPHA increases following the supply curve and releasing liquidity for the various allocated cohorts and incentives. However, there are some liquidity *preferences* within the model.

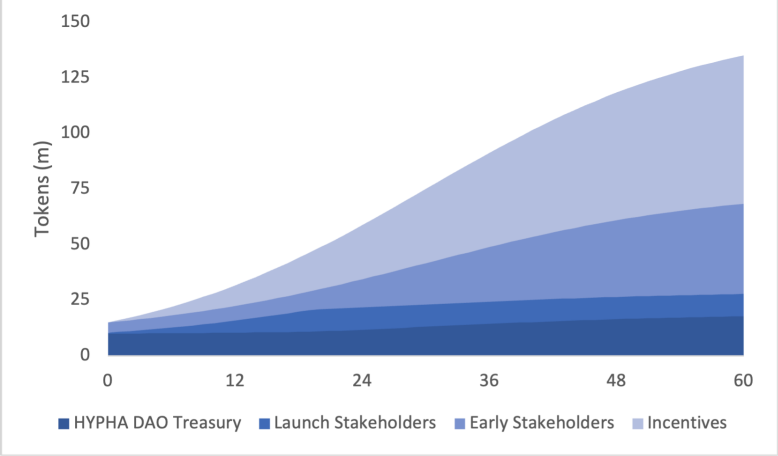
1. Hypha DAO Treasury receives a relatively large proportion of the initial issuance to ensure the project is adequately capitalised.
2. Early Stakeholders receive 10% of their allocation on initial issuance.
3. Launch Stakeholders receive preferential liquidity on ongoing issuance pushing back liquidity for the other cohorts.

Table 3: Liquidity Profile

Cohort	**Total(m)**	**Upfront(m)**	**Residual(%)**	**Share(%)**
Early Stakeholders	46	4.6	30.7	∗
Hypha DAO Treasury	19	10.0	6.7	∗
Launch Stakeholders	10	0.4	7.1	**30.0**
Incentives	75	-	55.6	55.6
TOTAL	**150**	**15**		

Table 3 illustrates the liquidity preferences with Early Stakeholders and Hypha DAO Treasury sharing (∗), in proportion to their residual weightings, the *left-over* issuance after the Launch Stakeholders preference and the Incentive obligation has been met.

Figure 8: Issuance by Cohort at 50% constant Staking



Figures 9 and 10 show the impact of the preference, in particular with Launch Stakeholders being fully liquid by 20 months, in the scenario with 50% constant Staking.

Figure 9: Issuance by Cohort at 50% constant Staking

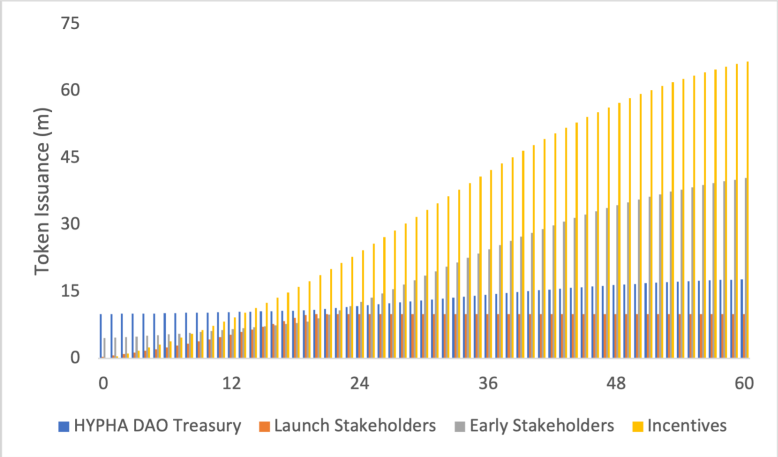
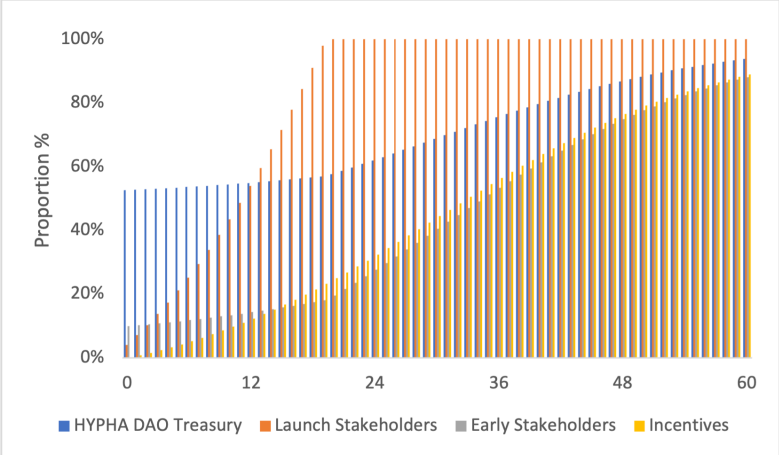


Figure 10: Allocation by Cohort at 50% constant Staking



With regard to Early Stakeholders, a constant staking ratio of 50% provides 75% liquidity by 48 months.

However, an *increased* staking ratio, i.e. greater economic engagement, would shorten the liquidity profile.

Figure 11: Allocation by Cohort at 75% constant Staking

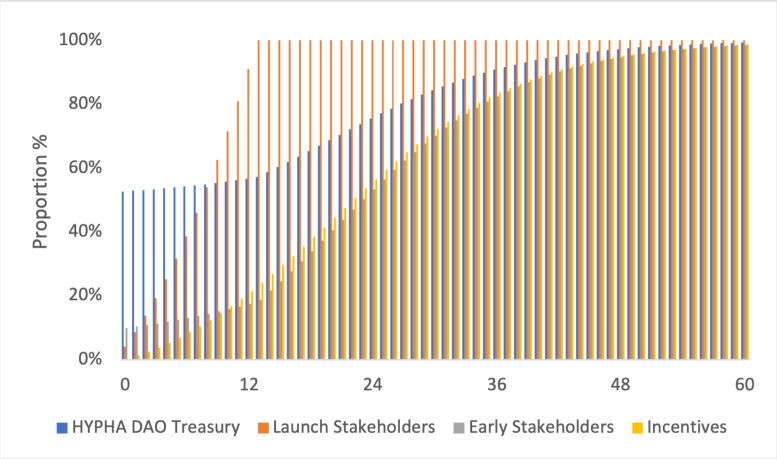
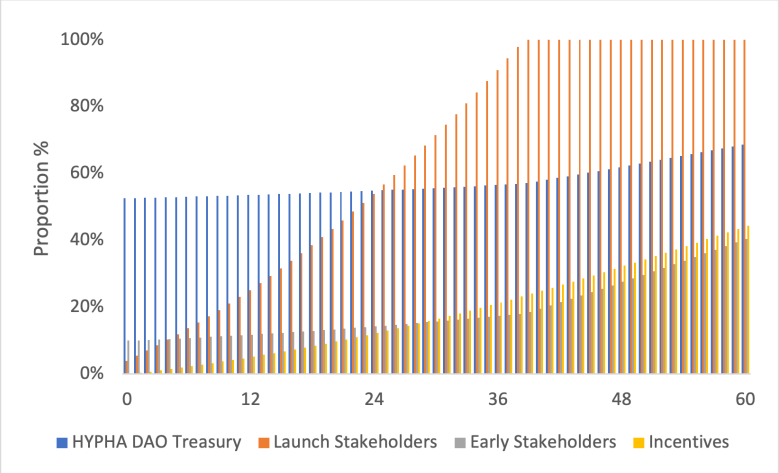


Figure 11 shows at 75% constant staking, Early Stakeholders reach 75% liquid by 32 months with Launch Stakeholders fully liquid at 13 months.

By contrast, a *lower* staking ratio lengthens the liquidity timetable. Figure 12 shows the liquidity timetable at 25% constant staking where Launch Stakeholders achieve 100% liquidity at 39 months.

Figure 12: Allocation by Cohort at 25% constant Staking



7 Practical Matters

There are various counts, checks and balances to implement in the model.

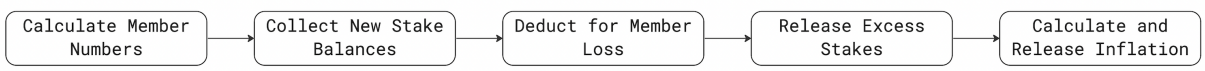
7.1 Calculation Period

The time period before DAOs need to rebalance. For instance this could be weekly or monthly. If it is too short, it will cause friction on re-balancing (e.g. Membership turnover) and too long will allow imbalanced economics (gives some DAOs a free ride at the expense of others).

7.2 Rebalance Period

There will need to be some time to collect stakes and rebalances and possibly re-run calculations. For example, A DAO not posting their stake would invalidate their Members and change the stake requirements for the other DAOs. However, this can be smoothed out by splitting the process into a few steps.

Figure 13: High Level Process



7.3 Default

In addition, we need to consider when DAOs are not staking enough HYPHA. Ultimately, they would be removed from the platform, or their access reduced to the stake amount they may be providing. There may be some interim commercially minded steps before draconian action is taken however.

A useful tool for the protocol would be a *credit-score* system to identify DAOs that consistently are behind on their staking obligations which has can have implications for their business model.

8 Summary

The HYPHA model has a rational relationship between *Capital and Utility* since Staking is proportionate to DAO Member assets. Several techniques are applied throughout to maintain this relationship, whilst managing the requirement for a fixed-supply token which should respond accordingly to true supply and demand. As a result, Staking now replaces the *transaction fee* pricing problem using *pricing by implication*. Inflation is dynamic enabling the system to provide incentives when it should whilst not blindly issuing tokens by time. Since the system is rational, it is able to integrate with (or generate) side-economies such as economic instruments for individual DAOs which creates a natural economic feed-back to the HYPHA token itself.