A Framework for DAO Token Valuation

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Introduction

In this article, we discuss a valuation framework for Decentralized Autonomous Organizations (DAOs). As previous work on DAO valuation is limited, we attempt to introduce a formalized framework on the subject. Although we base ourselves on conceptual frameworks from corporate finance, we introduce DAO-native valuation concepts. It should be noted that the proposed DAO valuation framework is preliminary as we are just learning about the idiosyncrasies of DAOs and how participants in the market value them. A valuation framework would allow the community to gauge DAOs' performance in value generation for token stakeholders and help introduce more accountability towards the development teams behind the DAO.

Many protocols embrace a dual corporate-DAO structure where the corporation acts as the development company and operator of the underlying protocol of the DAO. This paper focuses on the valuation of DAO tokens which represents a separate valuation framework compared to the development company behind the DAO. We argue that DAO token valuation can be mainly done in two ways, namely, according to a fundamental valuation approach and a comparable analysis approach. In the fundamental valuation approach we attempt to value the DAO token according to fundamentals while in the comparables approach we attempt to compare DAO tokens based on various metrics. Finally, we discuss various token specific considerations to potentially take into account in the valuation exercise.

DAO Token Valuation

First of all, we need to properly define what we are pricing. In this paper we view DAOs as organizations that are (quasi) autonomously run on smart contracts and managed by the community of stakeholders. A dual corporate-DAO structure exists with many protocols

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where the corporation acts as the de-facto development company and operator of the underlying protocol delegated by the DAO. The corporate behind the protocol tends to be created before the DAO and maintains ownership of relevant IP and assets. For example, Uniswap could be seen as a DAO with a governance token (UNI) where the development is handled by the company Uniswap Labs. This paper focuses on the valuation of DAO tokens which represents a separate valuation framework compared to the one used for equity of the development company behind the DAO.

Web3 utilizes tokenomics for the purpose of stakeholdership and token incentives in order to create appropriate decentralization and incentive alignment. Tokens are also used as a partial fix to the cold-start problem where token incentives are used to onboard users and reward appropriate user behavior. Fundamentally, a token's value is demonstrated through community membership, the utility of the token within the ecosystem, and the attached governance rights. The value created by a DAO is generally not for the purpose to distribute the generated value among token holders but to provide utility and governance participation. Without diverging into the legal debate on securities – as this discussion is far from being settled – DAOs have been careful not to directly distribute value to token holders as it could potentially cause the token to be classified as a security. Value created by the DAO can indirectly flow to token holders through various channels – for example one can value the value of staking, benefits of the community, membership and the general growth of the DAO (segment). On a case to case basis one could also incorporate direct value distributions to token holders as some protocols have done.

Valuation Methods

First of all, there is no one-size-fits-all valuation method and a DAO can cover numerous different concepts. For example, Hennekes (2022) divides DAOs into eight categories: protocol DAOs, grant DAOs, philanthropy DAOs, social DAOs, collector DAOs, venture DAOs, media DAOs and sub DAOs. Friend With Benefits DAO is a community-based endeavor with a lot of its value derived from social capital while Orange DAO is a collective venture investment endeavor. As a result, each DAO requires a valuation methodology specific to its category and the importance of different factors will differ based on the DAO category. We could, however, provide a general framework to think about valuation that can

be approximately applied to different DAOs given appropriate category-specific adjustments are made.

We argue that DAO token valuation can be mainly done in two ways, namely, according to a fundamental valuation approach or a comparable analysis approach. In the fundamental valuation approach one attempts to value the DAO token according to fundamentals related to the utility of holding the token and expected token value accrual. In the investment comparables approach one attempts to compare DAO tokens based on various metrics. The fundamental valuation approach would be more in line with, as the name suggests, attempting to put a price on the token based on fundamentals while the comparables approach is a more market consistent valuation method as we attempt to infer valuation from the market in terms of comparable DAOs.

Fundamental Valuation Model

One could think about a fundamental valuation model for DAO tokens in the following way

DAO Token Value = Value [Expected Token Flow] + Value [DAO Benefits]
+ Value [Expected Staking Rewards]

Valuation is both an art and a science, and many subcomponents require discretionary estimates and assumptions. In what follows we discuss the various subcomponents that come into play in this fundamental valuation exercise for DAO tokens.

A) Discount Factor

The discount rate can be estimated by the weighted average cost of capital (WACC) which is computed by taking the weighted average discount rate of its funding sources. These funding sources can consist of debt or equity (token). More specifically, WACC is computed as follows

$$WACC = \frac{D}{D+T}\, Cost\ of\ Debt_i + \frac{T}{D+T}\, Cost\ of\ Token_i$$

where D represents the value of the debt of the DAO and T represents the total value of the token of the DAO.

For the cost of debt one should simply take the value-weighted average of the charged interest rates on the debt. However, in the large majority of cases, there is no leverage within the DAO funding structure which means that the WACC basically becomes equal to the cost of token capital.

We could estimate the cost of token capital by computing the expected return within a DAO native factor model framework. The literature (e.g., Liu and Tsyvinski, 2021) has shown that crypto markets are a separate asset class with their own idiosyncratic movements and limited correlation to other macro asset classes. However, there has been a relatively strong and increasing correlation with equities, and more specifically, the tech equity market. Especially for DAO tokens this shouldn't surprise as these tokens could be viewed as stakeholdership in Web3 organizations. We can lend concepts from asset pricing in equities, however, a DAO-native model approach would be required given the idiosyncrasies of this asset class. Factor models have been popular in the stock market to estimate expected returns and the estimation of discount rates.

Previous studies have shown that a three factor model captures a large part of systematic returns in crypto. As seen in the principal component analysis of Botte and Nigro (2021), the first three factors capture approximately 70% of the co-movement which is roughly in line with the three factor model in equities. We have seen a change in the crypto market from token returns being strongly linked to Bitcoin to tokens increasingly decorrelating from Bitcoin. There is thus more idiosyncratic risk-return within the crypto market and one can argue that DAO tokens would be more correlated to the DAO token market segment and generally less correlated with the crypto market in the middle to long term.

In the case of a traded DAO token with sufficient history we could estimate expected returns using a factor model. In the absence of a traded token (or too few data points) we could use a set of comparable DAO tokens and correct for relevant factors such as size and illiquidity. The factor model is constructed in two steps: firstly factor returns are constructed and secondly a regression of the DAO token on the factor returns is performed. Factor returns are estimated as the returns of long-short portfolios which are rebalanced monthly and computed on a value weighted basis. Jiasun Li and Guanxi Yi (2020), however, find greater significance for long-only factors in crypto. The larger significance of long-only could be potentially explained by the relatively high costs of shorting in crypto which creates less downward

pressure. A standard practice within factor research is for portfolios to be value-weighted, however, in crypto there tends to exist a large dominance of certain tokens in terms of market cap which would make the value-weighted construct skewed towards a handful of tokens. As a result, we suggest using a log value weighting scheme to acknowledge the market cap of the top tokens but not skew the portfolio too much towards a few selected ones. Furthermore, factors should be estimated on data that is free from survivorship bias and includes failed DAO projects.

We propose to use DAO market, ecosystem, size, value, liquidity and momentum as the factors in the DAO factor model. This represents a traditional 5-factor model complemented with a blockchain ecosystem factor. The market factor captures the broad crypto market exposure and is computed as the average return of the DAO token universe. It should be emphasized that we specifically use the DAO market and not the crypto market in general. The ecosystem factor captures the systematic correlation with the L1 ecosystem token where the DAO is based (e.g., Ethereum, Solana, Avalanche). One can argue that the DAO token is fundamentally linked to the ecosystem it is part of for its existence. For example, DAOs on Ethereum rely on the Ethereum network for the execution of the smart contract and will have tokens within the ERC-20 framework. This ecosystem factor is computed as the excess return relative to the L1 ecosystem token (e.g., ETH, SOL, AVAX). The size factor captures the size exposure and is computed as the return of a portfolio that is long on small DAO tokens while short on large DAO tokens. The value factor in the traditional sense is difficult to define in DAOs. One could construct value factors based on some of the metrics discussed in the comparables section of this paper as these represent measures of value based on financial and business variables. The liquidity factor captures liquidity exposure and is computed as the return of a portfolio that is long on low liquidity DAO tokens while short on high liquidity DAO tokens. Various liquidity measures can be used such as volume, bid-ask spreads or Amihud illiquidity measure. Finally, the momentum factor captures momentum or trend exposure and is computed as the return of a portfolio that is long on the best performing DAO tokens while short on the worst performing DAO tokens.

Finally, a regression of the DAO token on the factor returns is performed as defined by the following equation

$$R_t - RF_t = \alpha + \sum_{i=1}^{n} \beta_i F_{i,t}$$

where R_t represents DAO token return, RF_t represents risk-free rate or funding rate return, α represents alpha return of the DAO token, β_i represents the exposure of the DAO token to factor i and $F_{i,t}$ represents the return of factor i. The "risk-free" funding rate captures the cost of liquidity. For example, liquidity within the Ethereum ecosystem is handled via ETH where the staking return on ETH could be considered as the base funding rate. The estimated beta coefficients can be used to compute the appropriate expected returns and discount rates.

C) Valuation of Future Token Flow

One of the most prevalent fundamental valuation models is the Discounted Cash Flow (DCF) model which is based on the discounted valuation of future (free) cash flows of the entity. Using a similar line of thought one could think of discounting token flow where one could compute the free cash flow of the DAO. The DCF model uses three main components: cash flow, discount rate and assumptions on future expected cash flow (growth). In the case of DAOs we could introduce the term Free Token Flow (FTF) which would consist of the real token liquidity that the DAO generates and could be computed using net income, asset depreciation, change in working token liquidity, and systematic token expenditure. More specifically, Free Token Flow could be calculated as

Free Token Flow = Net Token Income + Asset Depreciation & Amortization - Change in Working Token Liquidity - Capital Expenditure

Net income, asset depreciation, working token liquidity and capital expenditure could be defined as in conventional accounting and corporate finance practice. It should be noted that the field of DAO accounting is still young – cfr. Lommers, Ghanchi, Ngo, Song, and Xu (2022) who discuss DAO accounting –, and various methodological adjustments could be argued based on the idiosyncrasies of crypto accounting and DAOs.

Discounted token flow (DTF) could be computed as

$$DTF = \sum_{t=1}^{n} \frac{1}{(1+r_t)^t} FTF_t + \frac{TV}{(1+r_n)^n}$$

where FTF_t represents free token flow in year t, r_t represents the discount factor in year t, and TV represents the terminal value.

One could also assume that the DAO would grow with its market segment and use that growth rate to estimate future free token flows. A recent report from McKinsey (2016) argues in favor of the value of discounted cash flow models to value tech start-ups. They suggest analyzing the expected longer term development of the market segment targeted by the startup and work backwards from there. The DTF calculation becomes

$$DTF = \sum_{t=1}^{n} \frac{(1+g_t)\,FTF_{t-1}}{(1+r_t)^t} + \frac{TV}{(1+r_n)^n}$$

where FTF_t represents free token flow in year t, r_t represents the discount rate in year t, g_t represents the growth rate in year t and TV represents the terminal value. A major assumption in the model would include the future growth rates but this can be handled with scenario analysis (e.g. continuation of growth rate, halving of growth rate, doubling of growth rate, etc.).

This token flow could accrue to token holders both directly and indirectly. For example buyback and burn mechanisms. expansion of value of token holders, direct distributions, etc.

B) Value of DAO Benefits

Token ownerships in DAOs can come with various benefits in terms of being part of the community, certain membership rights, governance rights, etc. As aforementioned, there is no one-size-fits-all in DAOs and various DAOs can provide different benefits with a range of available options currently enabled by DAOs. For example, one benefit of most DAOs consists of membership of the community. As argued by Agarwal (2021), communities are inherently valuable as they allow to set up community-based co-operative initiatives, leverage common resources, share knowledge and skills, etc. Governance rights are another common benefit of holding a DAO token and reflects the degree of community involvement in decision making. In order to measure governance quality, Regner (2022) proposes various measures such as number of proposals, proposal threshold, proposal acceptance, vote participation, etc.[4] There has been a recent discussion within the community whether

[4] There are numerous services available to track DAO governance such as Deep DAO.

governance rights have impact on token value – e.g., Buterin (2022) argues that governance rights should have no impact on token value –. We would argue that this could be decided on a case to case basis: whether value is distributed to token holders, how much community involvement there is in the DAO operations, etc.

It should be noted that DAO benefits can differ based on token holdings. For example, Mnema DAO divides provided benefits in tiers based on the amount of token holding with the highest tier being significantly more valuable relative to the lowest tier. Furthermore, being a blockholder has certain strategic advantages in governance which could be argued to be similar to the control premium in traditional corporate finance. Furthermore, the valuation of the DAO benefits can differ for each token holder so there is a discretionary element in this valuation exercise. However, one can try to estimate the approximate average value of the provided benefits which could be an avenue of future research.

Finally, the discounted value of benefits (DVB) could be computed as

$$DVB = DB_0 + \sum_{t=1}^{n} \frac{1}{(1+r_t)^t} DB_t + \frac{TV}{(1+r_n)^n}$$

where DB_t represents the value of DAO benefits in year t, r_t represents the discount factor in year t, and TV represents the terminal value of the DAO benefits after year t.
One could also assume that DAO benefits would grow with the market segment and use this growth rate to estimate future benefits. In this case the DVB calculation becomes

$$DVB = DB_0 + \sum_{t=1}^{n} \frac{(1+g_t)\, DB_{t-1}}{(1+r_t)^t} + \frac{TV}{(1+r_n)^n}$$

where DB_t represents the value of benefits in year t, r_t represents the discount rate in year t, g_t represents the growth rate in year t and TV represents the terminal value of the benefits. A major assumption in the model includes the future growth rate but this can be handled with scenario analysis (e.g. continuation of growth rate, halving of growth rate, doubling of growth rate, etc.).

D) Expected Staking Rewards

The majority of Web3 projects with a native token allow to stake the token for blockchain consensus generation, tokenomics incentives or protocol development where token rewards

are earned by these stakers (Cong, He and Tang, 2022). In financial terms one could view this as passive income generation by locking up the capital for a certain amount of time. One could thus compute an expected staking reward discounted by an appropriate discount rate. As aforementioned, the ETH staking yield could be considered as the cost of liquidity within the Ethereum ecosystem. As a result one could argue that the cost of liquidity of tokens within the Ethereum ecosystem is equal to the ETH staking yield with an added risk premium. The risk of staking mainly consists of the loss of flexibility as tokens are locked for a certain period: price volatility in the native token, fall out in the project, and potential platform hacks (Royal, 2022). It should be noted that staking yields can be relatively high in the early stages for the purpose of incentivization of early users. In these cases staking yields can be significantly higher than the risk-adjusted cost of liquidity.

Comparables

Assuming that the value of the DAO token is linked to the value of the DAO we could evaluate the DAO as an entity using comparables on various relevant metrics. Comparables analysis uses ratios or metrics to determine valuation estimates. More importantly, it uses the valuation based on similar competitors, and is thus a more market consistent valuation approach. Comparable analysis leverages on fundamental accounting and business information to compute key metrics related to profitability, financial position, user traction, etc. We would like to argue that DAO-native metrics need to be developed to evaluate organizations within this new paradigm.

Comparable DAOs could be defined in terms of category and size. If no comparable DAOs are available in terms of correct size and category one would need to find the closest possible comparables. If a comparable DAO is found in the category but with a large difference in size, one could estimate a size correction. For example, the average valuation difference between large and small DAOs within categories can be estimated and used as a valuation correction. If possible one should try to take various competitors and compute a valuation range.

Standard comparables include metrics on revenue, profit, EBITDA and profit margin. There are numerous popular metrics used in Web2 companies with some of the most important ones including monthly unique visitors, bounce rate, average order value, number of active users,

customer conversion rate, churn rate, cost-per-visitor, and viral coefficient (Corporate Finance Institute, 2022). These metrics can be used to compare companies and thus their relative valuation based on these metrics. It is important to distinguish DAOs from traditional (Web2) tech companies in order to construct relevant comparables.

As argued by Hsu (2022), valuation in Web2 tends to focus on customer acquisition and user activity. We would like to argue that relevant factors in DAOs (and Web3 more broadly) include the degree of decentralization, community engagement, protocol users, protocol dev activity, integrations with other protocols, blockchain ecosystem metrics, and protocol revenue. As a result, we could suggest the following metrics for Web3 valuations: unique protocol users and token holders, protocol fees collected, engagement of token holders in governance, protocol transaction volume, token transaction volume and velocity, community interaction (e.g., discord), treasury spending and growth, protocol ecosystem growth, user acquisition costs in terms of token incentives (e.g., vampire attacks), and user net present value (e.g., value received in terms of token - value provided). This list is by no means comprehensive, and we would like to encourage the community to help expand this list of relevant Web3 metrics.

Comparable valuation should be best performed by looking at different measures which could be specific to the type of DAO. For example, DeFi protocols that are structured as a DAO require different metrics compared to social DAOs. Total Value Locked (TVL) is considered as one of the core metrics people look at when analyzing a DeFi protocol. For example, Maker DAO (2021) has proposed total risk assets outstanding, interest income correlation, net interest income, total DAI outstanding, DAI market share, DAI on-chain volume, gross interest income, and vaults opened. One could compare the various dimensions where the DAO is relatively overvalued/undervalued, and take a weighted average based on the relative importance of the dimension in question.

Other Token-Related Considerations in Valuation

Since token price is the result of an equilibrium of the demand and supply of the token, it is important to consider token supply dynamics. As a result, sustainable and sound tokenomics becomes part of the token valuation exercise. Protocol tokenomics should be composed in a way to facilitate and optimally incentivize productive value generation. Since the majority of

circulating cryptocurrencies represent utility tokens, one could argue that token value should represent the utility of holding the token and depict the utility provided by the protocol ecosystem. Fundamentally, a sustainable tokenomics design would facilitate a closer linkage between the token value and the ecosystem's utility. When comparing DAO tokens one should correct for future token supply in order to have an appropriate apples by apples comparison. For example, an "open" token supply brings more uncertainty on future valuation compared to a fixed token supply.

Furthermore, as argued by Samani (2017). it is important to take into account token velocity when valuing a token. In the case that the token is used as a means of transaction within the ecosystem of the DAO one could use a framework such as quantity theory of money (QTM) as an additional factor for future token appreciation. Transactional demand for the token puts a natural demand (with subsequent price pressures) for the token without investment considerations. QTM states that the price level of goods and services within an economy is proportional to the circulating money supply. More specifically, QMT posits the following equality $M * V = P * Q$ where M represents token supply, V represents velocity, P represents price and Q represents the ecosystem use. One could predict future transaction token price as $P = [M * V] / Q$ using predictions on token supply, velocity and ecosystem growth. One could add this as a factor in the token price estimate. Ecosystem growth does not necessarily mean that price increases if the velocity increases as the token would be more actively used by participants. High velocity tokens where there is little incentive to hold the token have less price appreciation. Samani (2017) suggests a few ways in which protocols can decrease velocity such as introducing profit-share mechanisms, building staking functions, balanced burn-and-mint mechanisms and gamification to incentivize holding.

Most DAO tokens are listed on decentralized exchanges as the listing on centralized exchanges can be a long and expensive process. Especially for non-blue chip tokens, liquidity can be thin with large price impact of trades. This poses significant risks in price volatility based on out-of-the-ordinary trading activity. For example, if a block holder would sell their position this could have a significant negative effect on token price. Related to this argument is the distribution of tokens where the case with large block holders could be considered to pose significant risks. In this exercise, however, one should make abstraction of tokens held within the protocol treasury, tokens in exchange pool contracts, etc. as these tend to be more sticky or pooled together for a specific purpose (e.g., market making of token). Furthermore,

early stage investors and development teams tend to have a vesting schedule where tokens cannot be sold within a specified period of time. Vesting schedules have proven to be consistent signals of token price movements as investors tend to take the opportunity to take profits. As a result, valuation should take into account token vesting time lines which can potentially cause substantial downward price pressure in the short term. Furthermore, liquidity within the treasury is important. As argued by Regner (2022) DAOs tend to hold a substantial allocation of their own token within the treasury. For treasury operations it is important to have liquidity. If there is no liquidity in terms of other tokens the treasury would need to sell its own token creating downward price pressure. Especially in the case of small to mid cap DAO tokens where the liquidity is relatively thin there could be large price impact of token selling of the treasury.

As a final note, we would like to emphasize the importance of providing value to and engaging with the community of token holders. Without mentioning specific names, a significant number of utility or governance tokens of some leading projects have not performed well. This is largely because they failed to provide a value add to their token holders. This comes back to the discussion between the DAO and the corporate, and more importantly the incentive misalignment between both. As previously mentioned, in many protocols the corporate behind the protocol tends to be created before the DAO and maintains ownership of relevant IP and assets. The protocol can experience strong growth with the company behind the protocol experiencing steep valuation increases while the token stagnates. The elephant in the room is that there can be relatively large incentive misalignment between the owners of the company behind the protocol (i.e. development teams and investors) and token holders. However, as argued by Walden (a16z), there can be progressive decentralization of protocols who start more centralized and become more decentralized (where IP, etc. is transferred to the DAO) which can be taken into account.