

Tokenized Deflationary Mutual Fund Based on Synthetic Reserves - Vessel Protocol V1.0 Whitepaper

Amir Kashapov, Phillip Zlatkovic, Elmore Shaw, Grady Tucker

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Introduction

The purpose of this paper is to simplify the yellowpaper and to provide a more accessible perspective on the protocol. Vessel Protocol will maintain that all information relating to the protocol is transparent and accessible to all individuals at all levels of proficiency and exposure to the cryptocurrency space. This paper will primarily cover the first iteration of the protocol, the competition Vessel Protocol faces, and a brief look at where this proverbial vessel is sailing. Please consult the yellowpaper for a more detailed overview of the mathematics and algorithms underlying the protocol.

Vessel Protocol

Vessel will support a DAO-governed (Decentralized Autonomous Organization) mutual fund based on synthetic reserves. Vessel Protocol and its initial release sets out to provide a safe, diversified bundle of assets that both experienced and inexperienced investors alike can easily expose themselves to by holding one token – Vessel.

The first iteration of the protocol will support a mutual fund comprising twenty different cryptocurrency tokens, each with an adjustable percentage allocation within the fund. Similar to a traditional index fund, the Vessel token represents the underlying assets and the price action of all tokens within the fund collectively. In contrast, Vessel Protocol will not hold any of the underlying assets or real reserves associated with the fund. This is why the fund is considered to be based on synthetic reserves. The main purpose of this is to enable a truly decentralized experience for users looking to invest in a diversified portfolio of assets. By basing the fund on synthetic reserves, the team cannot hold any power over the community in terms of fund assets as the protocol never holds any. The protocol and its machinations are merely regulated by the fluctuations in the dynamic supply of the Vessel token itself in addition to pure market forces.

Vessel Protocol also integrates a rebasing mechanism and this is how it mirrors the price action of the underlying mutual fund without the need to hold any real assets. A rebase protocol implements automatic periodic adjustments to the circulating supply in response to price fluctuations.

What follows is a brief outline of how Vessel's rebasing mechanism works. Whenever the value of the fund goes up, the token will attempt to reflect that by burning tokens from the circulating supply with the intent of subsequently driving the value of the token up. The opposite will occur when the value of the

fund goes down, whereby the vault will mint new tokens into the circulating supply with the intent of subsequently decreasing the value of the token.

Vessel Protocol's DAO incorporates any given token holder's ability to create protocol proposals and to vote for or against protocol proposals that are put forth. In addition, one of its primary utilities is to allow users to vote on the percentage allocations of the constituents of the fund as mentioned before. The power of the DAO is thus leveraged by the fact that the community will always have the ability to steer the course of Vessel's future by helping implement and adjust novel protocol policies as well as continuously shaping the fund.

High Level Technical Overview of Vessel Protocol

The following section briefly outlines how Vessel Protocol works and serves as a simplified overview of the yellowpaper. Vessel tokens aim to represent the value of an underlying mutual fund akin to an ETF token, and as a result, we can assume the following:

$$\text{value of vessel token} = \left(\sum_{i=1}^n \text{ratio of token } i \text{ in fund} \right) \times \text{value of the vessel token}$$

Let us now also represent the change in the value of the vessel token and the change in value of the underlying mutual fund between two epochs, which are currently affixed to 7 days:

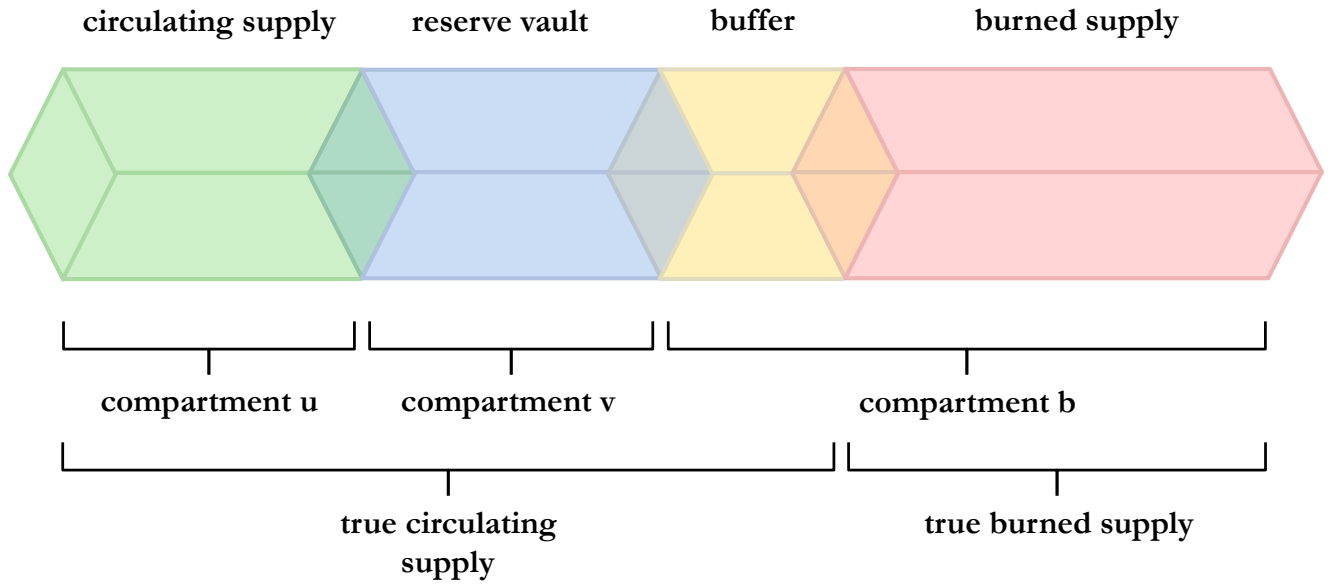
Δt := inter-epoch change in vessel token value

Δw := inter-epoch change in underlying fund's value

The fundamental aim is for Δt to mirror Δw to the highest degree possible, however before we proceed it is important to note that the current iteration of the protocol is loosely coupled, something Vessel aims to fix with our subsequent second iteration based on Seigniorage shares.

Currently, Δt mirrors Δw by relying on altering the supply of the token and assuming supply is unitarily elastic (i.e. a percentage change in the supply results in an equivalent percentage change in the price of an asset), which is an ideal scenario. To that end, at the end of an epoch, tokens are either minted or burned from the circulating supply.

Please refer to the following diagram:



In the above figure, compartment u is representative of user supply, compartment v is representative of the reserve vault of assets, and compartment b is representative of the burn compartment.

In the event that tokens are to be burned, tokens are thus to be placed into compartment b. Throughout an epoch, taxes shift tokens from $u \rightarrow b$ and, should the deltas not match, additional tokens are burned from the compartment of reserve tokens in the vault ($v \rightarrow b$).

In the event that tokens are to be minted, they are to be placed back into circulating supply. The true circulating supply consists of compartments u and v, and as a result, tokens are transferred $b \rightarrow v$ and, if the vault is full (its ratio is maximally 1:1 with the supply held by the users, thus $|v| : |u| \approx 1$), $v \rightarrow u$.

In order to avoid the rather wild possible fluctuations (as is common in the world of cryptocurrencies) at the early stages of the protocol release, rebalancing won't be computed for the first four epochs in an "accumulation" stage and, following this stage, all transfers between compartments will be capped at a ratio relative to the size of compartment $|v|$. This ratio will grow until it gradually reaches its maximum value and the price behaves in a more stable manner as the user base grows to its core adopters.

The buffer in compartment b is representative of the accessible portion of the burn wallet that can be utilised to mint the burned "buffering" supply back into circulation if needed. It is affixed at

$$|b| - \frac{1}{4} \times \sum (\text{all transaction taxes})$$

What results is something akin to a wrestling match between the compartments whilst trying to mimic the price action of the underlying fund to the best possible degree. Some important things to keep in mind at a high level include Vessel's voting algorithm which is available in the yellowpaper to allow the fund and allocations within it to be shaped, the fact that this is a loosely coupled system aimed at deflation, and the fact that we are shifting to a Seigniorage-based system to fully mirror the value of the fund in real time.

The primary deflationary pressures that are in-built within the protocol include the tax on all transactions and the vault operations. The tax serves to bolster the locked liquidity on a DEX of the token supply and to burn tokens into the burn compartment as mentioned above. Additionally, at the end of each epoch, the vault will burn a portion of the circulating supply to adjust for the price movement of the fund. To reward users, a segment of the tax will allow token holders to take advantage of automatic staking rewards for holding through reflection mechanisms (this is rather involved and thus elaborated upon in the yellowpaper).

Lastly, Vessel can be deployed on any EVM-based network, however interactions with the smart contract cannot be called at any arbitrary time from within itself without the use of third party services such as Chainlink Keepers, and as a result rebalancing the epochs must be done externally. An incentivization scheme to involve the community and to encourage decentralization in the rebalancing process has been created for this purpose, whereby the first wallet to trigger the smart contract call to rebalance the token after an epoch ends in a new epoch will be rewarded with 0.01% of the Vessel supply.

Elaborations of some of the above components are provided subsequently, albeit at times redundantly for the purposes of complete clarity.

Key Components of Vessel Protocol

Token Tax

All Vessel transactions are subject to a tax each time tokens are bought or sold. Protocols may have varying purposes for which they implement a tax, but fundamentally it is present in Vessel to protect the token's value in a number of ways. These include a selling disincentive, a pressure to conduct fewer transactions, and a mechanism for the liquidity to be ever-growing. We will next further elaborate upon Vessel's token tax.

Burn

A percentage of each transaction is transferred to the burn wallet. The burn wallet's function is to house tokens removed from circulation forever, thus providing a deflationary pressure on the value of the token.

However, our implementation of a burn wallet makes use of an innovative mechanic. The burn wallet works in such a way that there are both accessible and inaccessible portions incorporated. The accessible portion of the wallet is what will be referred to as the "buffer". The buffer refers to tokens that have been sent to the burn wallet but are yet to be officially fully burnt, so to speak. The inaccessible portion of the wallet, in contrast, is where the burned tokens will ultimately be fully burnt. In other words, this is where the tokens deducted from the burn tax will stay indefinitely, and, as a result, this will facilitate a reduction in Vessel's circulating supply and attempt to subsequently create an upward pressure on the value of the token. The buffer comes into play when Vessel protocol needs to reflect a negative price change because of the value of the synthetic fund going down. Vessel and its vault make use of this buffer by taking the tokens sent to this portion, which would have otherwise been burnt, and minting them back into the circulating supply. This effectively creates a downward pressure on the value of the token.

Liquidity

A percentage of every transaction will be transferred to the best performing decentralized exchange on the chain on which Vessel is deployed to bolster liquidity and thus improve the health of the supply. As such, the Vessel team will not have access to this liquidity and will provide complete transparency with regards to the verifiable process through which liquidity is locked and how and where it is verifiably stored.

Reflections

A percentage of every transaction is to be distributed or "reflected" to token holders. This is Vessel's implementation of an auto-staking feature with which token holders are incentivized to hold. The amount distributed to users is proportionate to the number of tokens they hold. As rewards are automatically distributed with this in mind, users do not have to actively participate in this scheme and simply auto-stake their tokens by holding.

Governance

Vessel's first release will facilitate user voting that specifically influences the allocation percentages of each underlying asset of the synthetic fund. Initially, the fund will comprise of twenty top-performing blue-chip

cryptocurrencies and each asset will be allocated a 5.00% ratio within the fund. After the initial launch, the community will steer the direction of the fund and its synthetic assets by using the governance system. As such, Vessel gives the community the ability to create proposals on the inclusion and removal of different cryptocurrencies.

Over the course of each week token holders will be able to submit votes with regards to how they would like the fund to evolve. Allocated votes will be towards the ratios of the coins within the fund, each of which will in turn be represented by the weighted average of all users' votes. The fund will ignore coins that have had less than 5.00% of all votes cast towards them in order to ensure only coins in demand shape the fund at any given time.

It is important to note that every individual wallet's voting power is restricted to 1/1000th of the total possible votes at any given time. This is a preventative measure to prevent large token holders from negatively influencing the evolution of the fund. Regardless, Vessel retains the right to step in and repair instances of abuse by removing a token in situations where clear abuse of the voting system has occurred. As such, if the Vessel team or community deems an asset that is on its way into the fund (as indicated by a successful proposal) as extremely risky, the team will step in and stop the token from being placed into the fund. Community guidelines to this end will be established and will be open to adjustments by the community itself. This will also become a fully decentralized process over time.

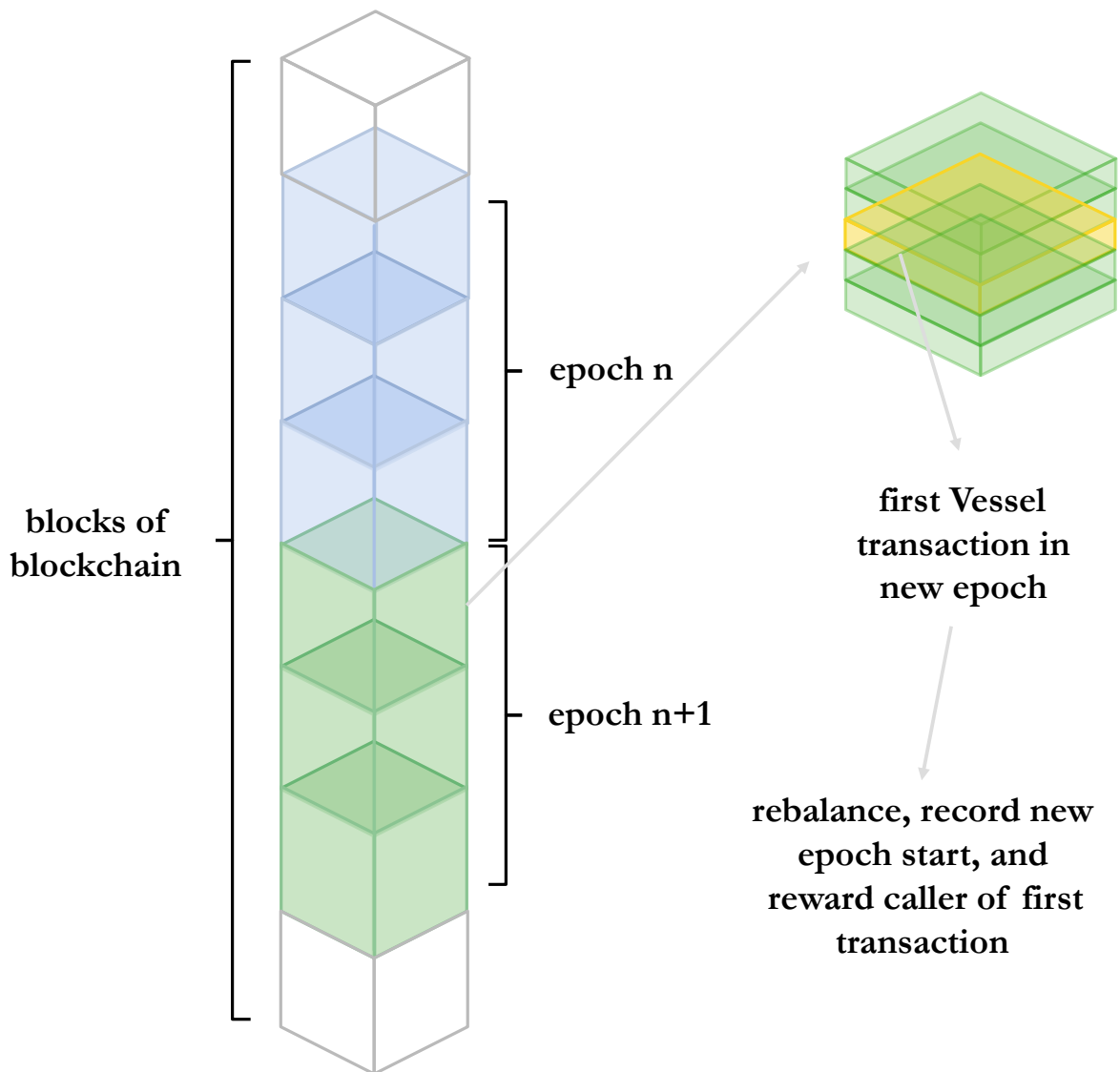
Bounty

Users will have the unique opportunity to facilitate the synthetic mutual fund's inter-epoch rebalance. Epochs are an arbitrarily defined period and in the context of the fund's rebalance it is currently set to happen every 7 days. The Vessel fund will thus rebalance itself every 7 days and require a user to interact with the rebalance function that is in the smart contract.

Vessel's smart contract has been programmed such that when an epoch comes to an end, an external automatic call to the smart contract from a developer's wallet after approximately 5 minutes will be triggered. However, any wallet can trigger the inter-epoch rebalance function first through the dApp or smart contract, and as a result be rewarded with 0.01% of the Vessel supply.

This bounty incentivization scheme was introduced to deal with the issue of the protocol being unable to trigger smart contract calls at any arbitrary time from within itself. A common solution is provided through Chainlink's Keepers, however Vessel has avoided using this in order to create a community bounty and to ensure that the protocol can be deployed on any EVM-compatible network.

This is illustrated diagrammatically in the following diagram:



Market Research

This section serves to highlight how Vessel Protocol differentiates itself from its competition. Given that the main product is the fund and the rebase mechanics are merely used to facilitate its operations, we will primarily look at other tokenized index fund protocols as opposed to rebase protocols in general.

Competitors

The on-chain cryptocurrency indices market does not span wide. Less than a handful hold the vast majority of the market share in this space.

“Index Cooperative” \$INDEX is one of the leaders of on-chain cryptocurrency index products with roughly \$200M in client funds spread across their product suite at the time of writing this. The primary token utility of \$INDEX is to provide a governance system in which users can make and vote on proposals relating to the protocol. “Index Cooperative” offers eight different indices to their clients which span across many different sectors within the cryptocurrency space. Each index is represented by a separate token. For instance, their largest index, the DeFi Pulse Index, exclusively tracks DeFi assets across the market, whereas their Metaverse Index will track the “trend of entertainment, sports and business shifting into a virtual environment.”

“Index Cooperative” have historically been successful with their products. This is largely because of the hand-picked tokens they have pooled into each fund and the success those assets have seen over the early 2021 bull run. However, the protocol arguably falls short on a number of points. For instance, the protocol's accessibility at scale. For a user to take part in the entirety of the protocol and its product suite, they must invest in both the \$INDEX governance token as well as one of their index funds. Additionally, the governance system does not account for “whales” or large token holders and the overwhelming influence they may have on proposals. Another unnecessary addition is management fees for each of their index funds on offer. This is despite the fact that a major advantage of utilizing blockchain and community influenced allocations is absolving the need for management fees and centralized control.

“Crypto20” is the world’s first tokenized cryptocurrency index fund. This protocol was launched by the “INVICTUS” trading platform and offers a single product: the \$C20 token. \$C20 represents an index fund that tracks the top twenty cryptocurrencies. The product utilizes a fund management team to make decisions relating to their protocol but otherwise, the fund rebalances itself weekly to track the top twenty cryptocurrencies on the market and is effectively an on-chain replica of a traditional index fund.

“Crypto20”, being the first index fund on any blockchain, held a unique first mover advantage. Their release in 2017 amidst the first major influx of casual investors into the cryptocurrency space allowed them to quickly claim the proverbial throne. The protocol is backed and actively managed by a credible investment team as well as a successful trading platform: “INVICTUS”. Innately, the protocol is centralized, which many may criticize as it does not leverage one of blockchain technology’s chief advantages in decentralization. In contrast, some may see this as a positive as many investors find solace in the fact that their investment is being managed by a reputable team. The major issue with “Crypto20” is that the protocol's development has effectively stalled. Development of “Crypto20” seems to be isolated to outreach and marketing as there are no plans to build on top of the index fund or to add any additional utilities.

“dHedge” \$DHT is another on-chain index product provider that puts fund creation and management into the power of the users. The protocol provides several utilities for their token such as allowing users to purchase bonds, stake, mine, and participate in governance. Their main product is providing a platform in which users can become their own investment managers by creating their own fund and use the platform to communicate effectively with those who decide to invest.

This protocol provides a unique utility as it is the first to allow users to create their own fund, manage it and have people invest in it. Despite the protocol holding a minor position in the crypto indices market, it holds promise in that the development team continues to build upon the protocol with additional utilities and integrations. However, there are major issues surrounding the protocol. For instance, it has relatively low user engagement with its protocol and its governance system is somewhat underutilized. Despite having a novel utility, the protocol is not beginner-friendly as it hosts hundreds of different index funds and this floods prospective investors with far too many options. Similar to “Index Cooperative”, investments are split for users in that the governance token and the index funds on offer are separated from one another. As such, these issues work against “dHedge” and its efforts to on-board new investors onto their platform. This is especially true for the casual investors who look to index funds for an investment that is risk-minimized.

Key Comparisons

Exclusive On-Chain, Decentralized Governance System

Protocols that introduce a governance system often fail to regulate it appropriately to prevent an abuse of power. For example, a major issue arises when a governance system has no restriction on large token holders and the voting power they have. This often undermines the votes of many protocol users and defeats the purpose of a DAO which is to move away from isolating power within a protocol. As such, Vessel imposes a strict limit of 0.10% on the voting power for an individual wallet so that any potential “whale” in the community will not have an overwhelming influence over any proposal.

Beyond this safety measure, all token holders have the ability to create proposals and vote for or against those already put out by the community. As such, token holders are effectively given the ability to make meaningful contributions with regards to Vessel’s future. The inextricable link between Vessel’s inherent utility as a fund and its use for governance allows anyone to participate in Vessel’s governance easily

without the additional barriers of entry common to the cryptocurrency space such as a secondary token and minimum wallet balance.

Many DAOs rely on off-chain third-party applications such as “snapshot” to facilitate their governance system. This reliance introduces a potential vulnerability and issue for those protocols as their governance process may be rendered useless if their chosen application experiences any downtime. This is especially critical for protocols for which more operations and utilities rely on the governance system. Vessel’s synthetic mutual fund is heavily reliant on the protocol’s governance system, and, as such, Vessel has developed its own governance interface and does not rely on external off-chain inputs. Ultimately, this allows Vessel to leverage the unique advantage of blockchain decentralization appropriately.

All-In-One Investment

Many protocols in the on-chain indices market provide their users the opportunity to invest in a number of different index funds. The purpose behind this is that each product and its underlying assets are focused on a specific sector in the cryptocurrency market and investors have the freedom to choose which area in the market they want to invest in. It is also common that index products and the governance system for a protocol are completely separated. This means that users have to split their investment into the index of their choice and a governance token if they are to engage with the protocol entirely.

With the first release of Vessel, users will be able to access the benefits of the synthetic mutual fund, the governance aspect of the protocol, and all future products currently set out in the roadmap through the Vessel token. By avoiding a separation of concerns in investments for the user the barrier of entry is lowered. Smaller and more casual investors will hence be able to confidently and easily partake in all aspects of the protocol.

Future Development

The roadmap for many competitors within the indices market currently consists of expanding outreach and making minor adjustments to their protocol. Vessel will distinguish itself from others as the protocol plans to develop a variety of upgrades, each of which will build upon the synthetic mutual fund and bring new opportunities to token holders. For instance, the addition of Seigniorage will strengthen the coupling between the Vessel token and the synthetic mutual fund. As a result, this will provide users with the chance to engage in arbitrage opportunities. In the context of development, Vessel aims to contribute multiple utilities to the DeFi space and considers the launch of the synthetic mutual fund as only the beginning.

Roadmap

Vessel aims to develop a suite of products in the near future and these will be delivered in the form of Vessel's V2 and V3 releases. Although various updates or implementations may happen between version upgrades, the majority of time spent developing will be used to work on subsequent major releases.

The Second Release

The next version of Vessel will aim to implement two additional utilities to the protocol - namely Seigniorage and individual asset class staking.

Seigniorage

Inspired by the success of tomb.finance and their implementation of Seigniorage, the V2 upgrade will attempt to implement this concept to enable tight coupling between the price action of the fund and the token in real time.

Seigniorage attempts to keep the value of an asset A closely linked to that of another asset B. Simply put, when the price of A exceeds that of B, the protocol should mint more of A to dilute the price down to the price of B. In contrast, when the price of A falls below that of B, the protocol will burn A to help drive its price back up to B. tomb.finance's implementation is a good example of this in action. The protocol has three tokens; \$TOMB, \$TSHARE and \$TBOND. The \$TOMB token is pegged to the Fantom blockchain's native token: \$FTM. \$TSHARE is the governance token of Tomb and holders of \$TSHAREs are rewarded in \$TOMB in the scenario where the protocol mints new tokens to bring the price down to \$FTM's value. Finally, \$TBOND is exclusively bought with \$TOMB tokens and provides benefits in both the inflationary and deflationary cycles of the protocol. When \$TOMB is below \$FTM's value, \$TBONDS are issued and available for purchase, and, once purchased, the \$TOMB used is burnt which places deflationary pressure on \$TOMB's value. \$TBONDS can then be exchanged for \$TOMB once the value of the latter is above \$FTM's value.

Implementing Seigniorage effectively gives users the chance to take advantage of arbitrage opportunities that exist for tokens attempting to peg their value to an asset. As you see in the \$TOMB example, no matter which side of the peg \$TOMB sits, there is an opportunity for investors to take advantage of.

Vessel will build upon what Seigniorage protocols similar to tomb.finance have accomplished with its single asset pegs. The addition of Seigniorage to Vessel's protocol will allow Vessel's token to be pegged

to the synthetic mutual fund's value in real time in addition to the possibility of creating individual asset classes within Vessel which will each be individually pegged.

Individual Asset Classes

Another crucial extension we would like to address, ideally in our V2.0 release, is the ability to stake funds in individual asset classes yielding variable rewards based on the performance of the asset class. This is a highly complicated undertaking due to the synthetic nature of the fund, and thus, whilst we have formulas and ideas on hand, a great deal of work remains. We have every confidence the above two will be achieved in the near future and together will allow implementing an API-like "Mutual Fund/ETF as-a-service" model, which is a concise summary of what our end goal for the V2.0 release will be.

The Third Release

Due to the synthetic nature of the mutual fund, we are considering a release of, in conjunction with the above features, the Vessel DEX, whereby Vessel's V3 token would serve as a utility and governance token akin to Uniswap's. The inherent utility of the Vessel token would remain, however, in addition to the ability of users voting on the governance of DEX policies and on the evolution of the synthetic fund, the liquidity of the DEX itself will additionally be utilized to mould the constituent components and ratios of the synthetic fund. This would thus make the synthetic fund representative of the health of the most prevalent tokens on the DEX in addition to the user demand over how the fund should be shaped.