Difuon Fog–Dual Tokenomics: *Redemptive Benefit Token*

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Abstract— . A novel dual utility tokenomics model is described consisting of both a medium-of-exchange (MoE) token and a store-of-value (SoV) token that together provide true separation of concerns between the need to support stable pricing, low friction, and high throughput transactions and the need for appreciative value to reward virtuous participation on the platform including investment. This approach avoids the inherent conflict between the two concerns that is the root cause of the failure of the single utility token model. A key insight is that optional utility is still utility. Once separated from the constraints of stability, low friction, and high throughput, the SoV token mechanism design can be fine-tuned to improving participation and value growth in the associated platform. A new complex SoV token is introduced called a redemptive benefit token that employs several complementary features that limit downward volatility and drive virtuous behavior and value during different growth stages of the platform. We call these *HoDling* powers. This approach is general and can be beneficially adapted to many utility token applications.

Index Terms— *Tokenomics, Dual Token, Utility Token, Mechanism Design, Stable, Investible, Separation of Concerns,*

1. Utility Tokenomics

Many Blockchain-based business models are of some form of two-sided marketplace or network. This is more formally called a *platform* business model [12; 23; 24; 32]. One the reasons for using a distributed ledger is to provide a trusted way for multiple parties to exchange value over a network by tracking the associated transactions in the ledger. Moreover, the trust in the system may be enhanced if the governance and control of the distributed ledger is decentralized or diffused across many parties. Obviously, a good way to facilitate and track the value exchanged in the transactions is to use a currency as the unit of account and the medium of exchange. A good medium of exchange has the following features: low friction, widespread access, high velocity, low latency, low average settlement cost, and stability. Low friction means that the use of the medium of exchange is highly convenient for the participants. Widespread access means that likely participants have the potential to obtain the medium of exchange in order to participate. High velocity and low latency mean that turnover in units of the medium of exchange is rapid so that transactions are not impeded by the mechanism for settlement of the transactions. Low average settlement cost means that the fees or overhead costs on average of using the medium of exchange for a given transaction are very low relative to the value of that transaction. Finally, stability means that the change in price of products and services in the medium of exchange due to volatility, appreciation, or depreciation is insignificant relative to the product life cycle. Fiat currencies like USD exhibit most of these characteristics, especially cash. The problem is that for a network the transactions must be electronic (digital) such that cash is not practical. This then requires some electronic payment channel which may introduce some latency to the transactions, and whose provider may charge relatively large settlement fees especially for micro- or nano-transactions. The requirement for an electronic payment channel may often limit access by some participants, especially the unbanked. But all else being equal the low friction, high velocity, and stability of fiat make it the primary candidate for an electronic medium of exchange.

The fact that the distributed ledgers can be used to support a cryptocurrency or a cryptographic token has created the option where the medium of exchange is a crypto token instead of a fiat currency. The main attraction of a cypto-token as a medium of exchange is the potential to have lower latency and lower settlement costs relative to conventional electronic fiat payment channels. Another attraction has been the potential to have pseudonymous transactions like cash but electronic. A popular type of crypto token is a *utility* or *usage* or *network medium-of-exchange* token [7; 30; 35; 43; 46]. The term utility is because the token derives value from its utility in the functioning of the associated network or platform. Typically, the primary function of the utility token is as a medium of exchange and unit of account for transactions on the network. Another function of utility tokens is to incentivize the participation in the network to support the distributed ledger and other related functionality. This is done by awarding tokens to participants who perform these functions.

2. Single Utility Tokenomics

But what has really accelerated the adoption of utility tokens is as an alternative means for raising non-equity-dilutive capital in order to fund the creation of the associated online marketplace [10; 13; 30]. This is done through a series of token generating events, where tokens are sold to investors that are then traded on exchanges. In order for a utility token to be attractive to investors it must have an appreciative quality, meaning that the investors must be able to buy low and sell high. The hypothesis is that a large appreciative driver of price for the token can be created by limiting the supply and making network function highly

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dependent on the use of the token [17; 46]. As the value of transactions on the network grows demand for transactions will drive demand for tokens which given the limited supply and functional dependency will drive the price upwards. The token then acts as a store of value that is appreciating over time[6; 8]. The simple approach to forcing functional dependency is to have a single utility token for all functions of the network. This also simplifies the software needed to support the network function relative to the token. This is the approach that the majority of the early and existing token generating events have taken. A source of problem is the thought that one should add as many sources of value to the token as possible in order to enhance the market value of the token [46].

There are two serious flaws in this hypothesis. The first is that merely limiting the supply and functional dependency are not sufficient to drive the price upwards, the velocity of turnover of the token must also be kept low [3; 11; 14; 43]. That is, relative to the latency of transactions, the availability of token reuse for subsequent transactions must be kept low. This is in direct conflict with the desirability of using a cypto-token as a low friction, low latency medium of exchange. The second flaw is that appreciative price of the token is in conflict with its use as a stable medium of exchange. As the token appreciates in price, the price of products and services on the network also increasing making the network as a whole less attractive to alternative markets that provide competitive products and services[11; 14; 29]. This becomes a disincentive for participants to use the network to exchange products and services. Only products whose demand is highly elastic relative to the price will be attractive on a platform where the pricing is going up fast relative to the product lifecycle and opportunity cost elsewhere. Together the low availability of tokens and the appreciative pricing are strong counter drivers to product demand. These means that the network value never grows or grows so slowly that the intrinsic demand for the token as a medium of exchange never grows or grows slowly thus nullifying the appreciative driver that was the motivation for using a utility token in the first place as a means of raising capital. In other words, it is not practical to use a single crypto token as both a *store-of-value* (investable, appreciative) and as a *medium-of-exchange* (low friction, stable).

The result is that the most of single utility tokens have failed already or are predicted to fail in the marketplace [18; 27; 28; 44]. The usual lifecycle of a single utility token follows: The initial sale price to investors is usually discounted from what the expected price will be once the network is functioning and is approaching its market potential for transaction volume and value. Prior to network going online, the tokens are traded on an exchange and the price is purely speculative. Hype and promotion of the potential value of the network (*pump*) incentivizes secondary buyers to acquire the token at a higher price, thus allowing the initial investors to liquidate their tokens at a profit. In most cases, the liquidation floods the market with more tokens than the demand can absorb and the price drops, thus incentivizing investors to liquidate even faster (*dump*), thus driving the price to a relative zero [16; 22]. The price charts for the vast majority of single utility token raises have followed this pattern [33]. Two examples are shown below.

Fig. 1. EOS Price chart

Fig. 2. Tezos price drops as soon as listed on exchange.

A small percentage of networks funded this way have gone online and are selling products and services. In many of these cases, however, either the velocity of the token is high enough that the network is functional without the token price appreciating back to anywhere near its pre-launch levels or the network pricing has appreciated making the products and services uncompetitive. In a notable case, QuantStamp for example, the network added a fiat payment channel in order to restore price competitiveness [5]. This addition removed most of the value of the token (the network is no longer functionally dependent in a non-trivial way). Prior to this change the Quantstamp token had been generally appreciating. Afterwards the price declined never to recover.

Fig. 3. QuantStamp (QSP) Price Chart

The failed actual performance of dozens of networks over the last few month due to these characteristics is a strong refutation

of the single utility token hypothesis [26].

3. Multi-Utility Tokenomics

A more complex nuanced approach is to use two or more tokens for the function of a given network. Given the failure of single utility tokenomics, a motivation for a dual or multi-token approach is to support the separation of concerns between the use of a token as a medium-of-exchange (MoE) (non-appreciative, stable) and a store-of-value (SoV) (appreciative, investible). Somewhat confusing is the fact that some networks like Ethereum (Ether and Gas) and VeChain (Vet and Thor) use dual utility tokens to separate other concerns such as a floating price relative to Ether in Gas for the spot pricing of computation on the network independent of the pricing of products and services provided by the network [34; 39; 42]. Such is an example of dual utility tokens for two different network functions. Also confusing are dual tokens of different types. The first token is a utility token, which is used as a medium-of-exchange on the platform. The other token could be of a different type such as a security token or an asset backed token [1; 20]. A security token has rights to equity or share of profits and is not part of network function but appreciates based on the value of the equity and/or profits generated by the network [40; 41]. The problem with security tokens is the lack of viable security token exchanges [4]. An asset backed token derives its value from an associated asset that has intrinsic appreciative value based on property (real or intellectual) or a scarce commodity [2]. Of note is the distinction between a utility token that is sold as a security and a security token. Under US securities law the Howie test determines whether something is a security or not. Simply if a token is sold that does not have true consumptive value or the buyer does not have reasonable consumptive intent then that token could be a security. Before a network or platform launches a medium-of-exchange token has no consumptive value and is therefore its sale is likely to be considered that same as the issuance of a security [25; 31; 45]. Once the network launches then sale of the token might not longer be considered a security issuance.

> *To that end, a better line of inquiry is: "Can a digital asset that was originally offered in a securities offering ever be later sold in a manner that does not constitute an offering of a security?" In cases where the digital asset represents a set of rights that gives the holder a financial interest in an enterprise, the answer is likely "no." In these cases, calling the transaction an initial coin offering, or "ICO," or a sale of a "token," will not take it out of the purview of the U.S. securities laws. But what about cases where there is no longer any central enterprise being invested in or where the digital asset is sold only to be used to purchase a good or service available through the network on which it was created? I believe in these cases the answer is a qualified "yes."*[45]

Herein we focus on multi-utility tokenomics for the purpose of separating the two concerns of medium-of-exchange and store-of-value. The core thesis is that an appropriately designed *dual utility token model* allows one of the tokens to be a store-of-value utility token which provides liquidity to investors when traded on available exchanges (unlike security tokens) and may appreciate as a function of the value of the associated network while the other token acts as a low friction high velocity medium-of-exchange thus avoiding the drawbacks of a single utility token model. The key insight is that optional utility is still utility. The network can function as a successful competitive business consummating transactions merely with a medium-of-exchange utility token without requiring a store-of-value utility token. However, the store-of-value token, although optional, can provide additional value to the participants in the network and to the function of the network that may be appreciative in nature [37]. Indeed, the flawed hypothesis that *required utility* is essential forces the inherent conflict between appreciation, pricing elasticity, and velocity that has resulted in the almost universal failure of single utility token models for anything other than as pump-and-dump speculative vehicles.

The medium-of-exchange token could be fiat. Indeed, given the low friction, relatively high stability, high availability and low latency of fiat, it is difficult to argue that the medium-of-exchange should be anything other than fiat. Currently most non-fiat tokens have super high friction to on-boarding participants and converting their fiat to non-fiat utility tokens. This friction has become even higher in the USA, because the IRS classifies non-fiat crypto token exchanges as asset transactions subject to capital gains taxes. The biggest motivation for using a non-fiat token would be lower latency and lower settlement costs than existing electronic fiat payment channels. But in either case, because the world runs on fiat, having a transparent fiat payment channel to access a non-fiat medium-of-exchange token is essential to universal adoption of the network. One way to achieve both stability and lower settlement costs is to peg the utility token to fiat for stability, but batch the conversion to and from fiat to reduce settlement costs. The simplest peg is an ephemeral two-way one-to-one peg with a liquidity pool in fiat. Ephemeral means the token is minted and burned on demand. A fiat-pegged stable ephemeral utility token is not appreciating or depreciating by design so it is not investable or tradable, but may only be used to acquired products and services on a platform. These are good features from a regulatory perspective. This type of ephemeral peg is in contradistinction to non-ephemeral but stable crypto-currencies that are meant to be traded [15].

An example of a utility token medium-of-exchange with a fiat payment channel is the Stellar network, wherein fiat anchors provide credit from fiat accounts for end-to-end fiat-to-fiat transactions that use the utility token (Lumen) as an ephemeral medium-of-exchange [36]. The fiat anchors provide fiat liquidity pools to back the credit they extend for the duration of the transaction settlement time (< 5s). The result is that Stellar acts as a transparent, low friction, low latency, fiat payment channel with low average settlement costs. The Stronghold network on top of Stellar is providing a USD pegged anchor [9]. Utility tokens used as a medium-of-exchange would want to exhibit similar features.

There are other more complex ways to implement a stable utility token such as using an algorithm for fine tuning dynamic supply that may make the token even more stable than fiat. However, for many two-sided network business models, fiat is sufficiently stable such that a simple peg is all that is needed if not fiat itself.

Given that a low friction, high velocity, stable medium-of-exchange token (which may be fiat) is used to consummate transactions and pay participants for supporting the network, an optional companion store-of-value utility token can be added without conflict with the function of the medium-of-exchange token. Primarily the optional utility comes from using the store-of-value token to promote and reward virtuous participation in the network. Such a token may provide value as a marketing tool to incentivize adoption, shape behavior, and reward participant-sourced improvements to the network. These are all good drivers of the positive two-sided network effects that enhance value of the network. These drive the network dynamics with positive feedback loops. The goal is that the platform via its mechanism design and associated algorithms may automatically result in appreciation of the SoV token as the network grows.

3.1. Redemptive Benefit Token

We have designed a new kind of optional store-of-value utility token as a companion to a medium-of-exchange in a dual token model. We call this new store-of-value token a *Redemptive Benefit Token* (RBT). Mechanism design is a term used to describe the process of coming up with the functions of a token in a system that drive it to attain certain behavioral characteristics. The redemptive benefit token is based on a mechanism design with mutually reinforcing feedback loops that incentivize desirable behavior and de-incentivize undesirable behavior in the tokenomics. Its primary goal is to incentivize growth and good behavior of participants in the network while limiting downward volatility and allowing for upward appreciation in the price of the token. The token benefits both its holders and the network. In homage to the internet meme resulting from the drunken mispelling of *hold* as "*hodl*" to describe the practice of holding onto store-of-value tokens, which serendipitously is also an acronym for "*Hold On for Deal Life*" *(HODL),* we have titled these mechanisms the "*HODLing powers*" of the redemptive benefit token [19; 21; 38].

3.1.1. Hodling Powers of the Redemptive Benefit Token

The redemptive benefit token (RBT) approach to providing a store-of-value (SoV) token that works with a companion medium-of-exchange (MoE) token combines the beneficial properties of gift card, loyalty, rewards, and staking programs to incentivize acquisition and holding of the SoV token in the following ways:

(1) **Redemption:** Like a gift card SoV tokens can be redeemed at the rate specified by the MoE tokens for items on the platform's products and services menu. The menu is two-sided with one side priced in the SoV token and the other side in a MoV token which is pegged to fiat. This provides a composite floor value of the SoV in fiat that is equal to the consumptive weighted average of the fiat value of the items in the menu. This is designed to minimize downward volatility and help ensure purchaser's of SoV tokens who purchase at a discount realize positive returns and also virtuously ensures that later purchasers of SoV tokens are protected from downward volatility. The redemptive value is effectively a worst-case value for the SoV token once the network is life.

(2) **Promotion:** Like the points in a loyalty program, SoV tokens may be redeemed for MoE Tokens for products and services at promotional prices provided only to members of the program. This allows conversion at better than retail rates and allows for anti-Moore's Law appreciation as service classes through the Menu are upgraded over time in response to technological advancements. This drives early adoption by users of the Project and enables repeated adoption acceleration as new products and services are introduced to the network through the menu at promotional pricing.

(3) **Rewards:** Like a rewards membership, holders of the SoV may earn MoE tokens as of function of both their holdings of SoV and their spending in MoE on the platform. These earned MoE Tokens may then be redeemed in exchange for Fiat at the rate specified in the Menu or used to purchase additional products or services on the platform. The earning rate of MoE per expenditure of MoE is an inverse nonlinear function of the number of SoV they hold. For example, a holder of 10,000 SoV would earn MoV at a higher rate (but less than 10x) for the same expenditure of MoE than a holder of 1,000 SoV. The exact nonlinear function and parameters is tuned to the market dynamics. An example would be an inverse quadratic function. This incentivizes large users of the platform to hold increasingly large numbers of SoV in order to obtain larger rewards in MoE. The amount of SoV held increases as a function of the market cap of the network in services provided.

(4) **Staking:** Like membership in a club, participation in several activities within the network require the staking (holding) of SoV. These include, either directly or as a delegate, the hosting of support nodes, the voting on the use of community tokens for bounties, or the voting on features and upgrades to the network protocol. This staking rewards good participant behavior by providing the opportunity to share in the revenue generated from fees associated with supporting the network and dis-incentivizes bad behavior as participants would lose their stake as a result. The participation strength is an inverse nonlinear function of the amount staked. This also greatly incentivizes the holding of large numbers of SoV that increases as a function of the size of the network infrastructure.

Given that the supply of SoV is limited, then the holding drivers above would increase demand for SoV as the transactional value of products and services exchanged on the network increases, thereby providing an appreciative driver to its price.

The Redemption HODLing Power above is designed to limit downward price pressure when the network is small whereas HODLing Powers 2, 3 and 4 above are designed to provide upward price pressure for SoV tokens well above their redemption value as technology improves, usage expands, and participation in the platform increases. The intent of this design is to produce a price curve with beneficial characteristics. A notional example is shown in the following diagram.

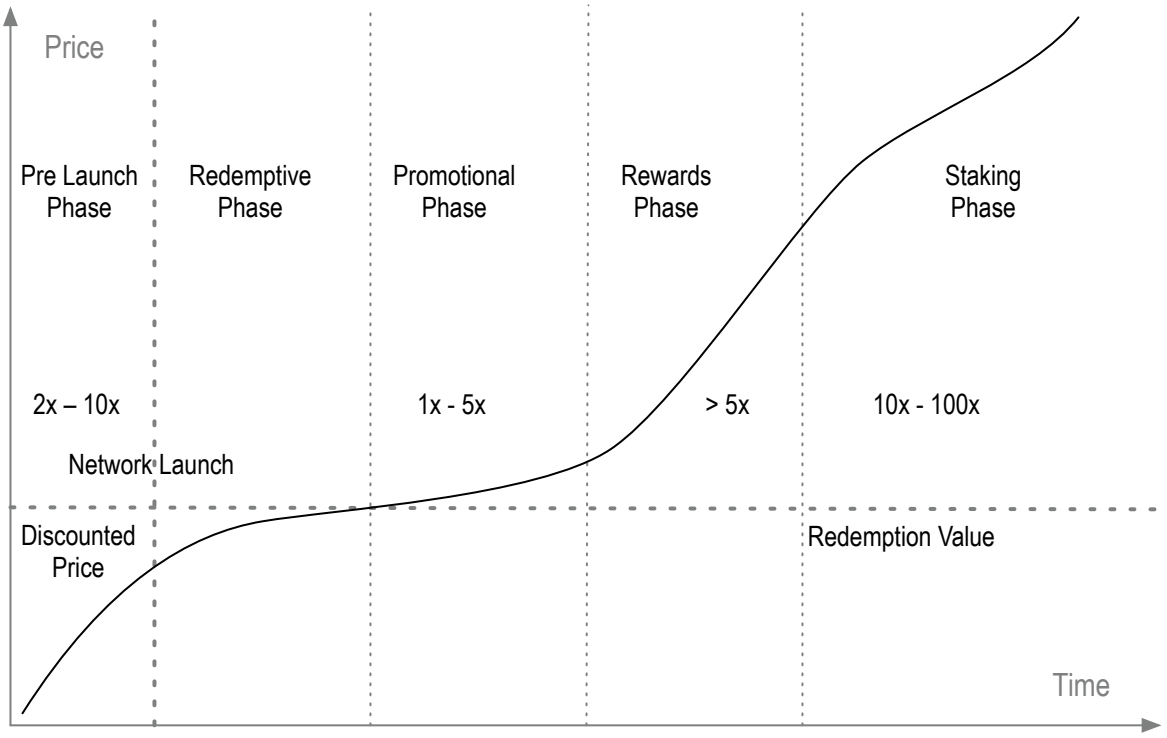

Fig. 4. Notional phased price versus time for SoV token with HoDling powers.

Discounted pricing of the SoV may be viewed as a type of warrant on future margins of the products and services. The number of discounted SoV tokens must therefore be limited and only be available prior to network launch during a pre-sale with a cap on money raised. To limit the rate of redemption of discounted SoV tokens and further incentivize holding, time locks and/or time variable redemption rates can be employed. A time lock can freezes or locks a token so that it cannot be redeemed until the lock expires. A time variable redemptive rate increases the discount as a function of time up to some maximum. This allows for immediate redemption but rewards the holder for waiting longer to redeem.

There are two main paths to obtaining MoE Tokens in order to purchase products and services off the menu. The first path is by purchasing SoV tokens and then redeeming them for MoE Tokens that may then be used to purchase products and services from the Menu. The second path is by purchasing MoE Tokens for fiat directly. The first path may reward investors and other platform participants. The second path may enable wider adoption through more conventional retail fiat purchasing. Products and services are priced in MoE Tokens and the MoE price is pegged to fiat. This stabilizes the price of the MoE token so that it is less susceptible to the pricing volatility which could hurt the competitiveness of the platform. Indeed, the MoE token could be fiat. A good peg is USD because of its ubiquity as a reserve currency but may be changed to one or more alternative fiat currencies on a geographic basis or to a basket of fiat currencies or some other pegging mechanism. The goal of this approach is a more stable price for products and services relative to fiat that is decoupled from the price dynamics of the SoV token.

Once the network is launched, the platform may offer additional retail SoV (at their redemption price) in limited amounts to ensure liquidity, pay usage based earned rewards, and as bounties for team and community efforts to build and enhance the platform.

3.1.2. Examples

Consider for example a consumer that wishes to purchase products or compute services listed in the menu:

- The consumer is not interested in participating in the platform other than merely buying compute services at the prices offered in the menu. The sharing economy nature of the network should make some of those services competitively priced. Using the fiat purchase path the consumer can then buy those services using a similar payment channel to existing alternatives. The fiat payment channel transparently converts fiat to MoE tokens which are used as a medium of exchange and unit of account on the network. This payment channel seeks to minimize the friction to the consumer.
- Alternatively, the consumer may prefer to take advantage of the promotional pricing that may be available via an SoV purchase from the platform directory or the consumer may instead be able to buy an SoV token from someone else at a discount to its redemption value for products or services on the menu. The menu is two-sided with each item priced in both SoV and MoV tokens. Some items on the menu might be of more use to a given consumer based on the consumer's need and thereby might offer better value when purchased via the SoV channel rather than for fiat. A consumer, may be able to create better overall value for themselves. rather than by using fiat payment channel.

Consider another example where a consumer bought SoV at a discount or even at retail face value but held onto them until the network has grown and the reward or staking demand for the SoV has raised the price of the SoV token on an external exchange

to above the redemption value of those SoV tokens via the Menu. Further, suppose the consumer now desires to purchase products or services from the platform. Given the SoV value on an external exchange is above the redemption value from the network for the SoV held by the consumer, the consumer may instead seek to obtains a greater number of products or services for those SoV than their face value by first selling some SoV on an exchange for fiat and then use the fiat payment channel to buy MoE tokens to obtain the products or services from the network.

Suppose instead that a large enterprise consumer of services from the platform wishes to obtain those services at a discount to their retail price. The SoV rewards program provides MoE tokens as a reward for the purchase of services as a function of the number of SoV tokens held at the time of such purchase. This effectively discounts the price of those services for such a consumer. The enterprise consumer would then buy and hold SoV tokens to enable the rewards of MoE tokens every-time the consumer purchased MoE tokens and hence services using the fiat payment channel. Notable is that the consumer does not redeem SoV tokens in this case but instead holds them in order to get rewards of more MoE tokens for the purchases of services through the Project.

Finally, suppose a participant on the network wishes to have a new feature added to the network and would like to vote for that feature. In this case the participant buys and holds SoV that it stakes SoV in order that the participant can vote on the new feature to be paid for with SoV tokens from the community allocation.

3.1.3. Summary

The goal of the dual token model is to provide more sophisticated tokenomics behavior that rewards and incentivizes participants as the network grows while also providing for competitive overall pricing.

To reiterate, the MoE tokens are pegged to fiat at a fixed stable exchange rate. Associated with the fiat payment channel will be a liquidity pool of fiat. When consumers of services originally buy MoE tokens using the fiat channel, some or all of the fiat used to purchase those MoE tokens will go into this liquidity pool. The associated MoE tokens are then used to buy services. The service providers receive MoE in exchange for providing services. From time to time the service providers may then choose to exchange their MoE back through the fiat payment channel and receive fiat from the liquidity pool. The motivation for using MoE tokens as a medium of exchange instead of fiat is that the settlement costs and latency of the fiat payment channel may be too high for the nano transactions needed to support services. The fiat-to-MoE conversions and the MoE-to-fiat conversions are batched to reduce costs and improve throughput. Over time, the liquidity pool may have an excess that is a result of the gross margin between what services cost in the menu and what service providers are paid. This excess can then be used for other purposes without negatively affecting MoE liquidity.

The tokenomics of SoV Tokens is wholly distinct. The platform will redeem SoV with MoE using the menu value of the associated services at the time of purchase (which can be valued at the corresponding pegged fiat value). This effective menu-based exchange rate may be significantly different from the floating exchange rate between SoV and fiat on a third party exchange. The associated MoE are then used to buy services. The service providers receive MoE in exchange for providing services. From time to time, the service providers may then choose to exchange their MoE back into fiat through the fiat payment channel and receive fiat from the liquidity pool. The liquidity pool will need enough excess to cover the eventual conversion of MoE back into fiat that were first sourced as SoV. This excess may come from funds raised on the sale of SoV or from the accumulated gross margin on the purchased services. There may be some liquidity risk should a large amount of SoV be sold at a discount greater than the equivalent gross margin of the associated services on the menu. The discounted SoV liquidity liability may be covered by the accumulated excess in the liquidity pool resulting from the gross margin on services bought by others at a less discounted price.

At some time in the future, once the platform is live and experiencing healthy revenue growth and profits and with appropriate regulatory approval, the platform may choose to also provide more convenient exchange paths for participants at the prevailing external exchange rate to directly exchange MoE for SoV, or SoV for fiat, or fiat for SoV. The reason for providing such exchange paths would be to reduce the friction experienced by participants in order to increase the rate of adoption and the size of positive network effect feedback. Initially, however, prior to network launch the only provided paths of exchange will be (1) SoV to MoE to fiat and (2) fiat to MoE to fiat. In each case, the fiat conversions will be through the fiat payment channel and liquidity pool. Direct conversion of MoE to SoV, SoV to fiat, and fiat to SoV, and will not be initially supported by the platform and must be performed on a third-party exchange, if at all.

4. Conclusion

By separating the concerns of medium-of-exchange and store-of-value a dual utility tokenomics model has the potential to fix the broken single utility token model. The store-of-value token is now relatively unconstrained by the demands of stability, low friction and high throughput. This enables the store-of-value token to be designed with beneficial properties that incentivize virtuous participation on the platform that include a side effect of appreciative value. This approach is general and can be beneficially adapted to many utility token applications.

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