COMBINING STAKING WITH LIQUIDITY PROVISIONING

BY PARADIGM IN COOPERATION WITH ORBS.

Abstract

This research paper intends to give a theoretical overview of contemporary approaches to staking combined with liquidity provisioning.

CONTENTS

1 INTRODUCTION

Proof of Stake (PoS) is becoming more prominent given its higher efficiency, lower environmental impact, and increased freedom of engineering reward systems that were not possible before.

Main mechanism for incentivizing PoS network participants to act in accordance with the network rules is Staking. It implies locking a certain amount of a network token as collateral in the protocol to qualify for validating transactions and earning staking rewards. While this offers a solution to wasted computational resources of PoW mining mechanism, PoS networks are subject to a trade off on the side of liquidity since both staking and liquidity provisioning[1] require network tokens to be locked.

This trade off is especially noticeable in PoS networks with higher proportion of staked assets, since Staking and Liquidity Provisioning are ”competing for resources”, and liquidity is often at a disadvantage either due to the design of a staking mechanism not taking it into account or incentive schemes that favor staking.

This is a major problem for PoS networks, since on one side higher staking ratio is improving network’s security, but at the same time has a negative effect on liquidity of the network token. This may result in significant price slippage for users trying to buy/sell the network token, which at the same time could cause volatility in the token price and poor price discovery.

It appears that there is a need for alternative staking mechanism designs and incentive models within the PoS space, which would align the interests of

[1] e.g. through Automated Market Makers

all participants and take into account community's needs by utilizing staked capital without jeopardizing networks' security and liquidity provisioning.

Further, this research paper will focus on different approaches to combining staking with liquidity provisioning.

2 LIQUID STAKING

The term "Liquid Staking"[2] is used to describe protocols that issue token representations of staked assets, which creates the possibility to use these representations as collateral in financial applications or get immediate liquidity for the staked amount.

Effectively, Liquid Staking implies the creation of a new on-chain token to represent the staked amount. A particular mechanism is used to account for the rewards that an underlying asset is entitled to (staking rewards) as well as risks that the asset is exposed to (e.g. validator slashing risk). There is also a question of fungibility [3] - to avoid liquidity being split up among different versions of the token specific to each validator, so it is preferable to engineer those tokens to be fungible.

Tokenized stake representation allows to circumvent some staking limitations imposed by particular networks (e.g. unbonding periods, mitigation of slashing risks[4], deposit requirements among others). One of the major common limitations is locking of the stake in the protocol, which renders this capital unavailable for trade, is lifted and staking positions could be traded or potentially used in combination with Liquidity provisioning.

While unbonding periods and slashing risks are generally intended to ensure that stakers adhere to the rules of the protocol as well as reduce turnaround among validators, this appears to have a perverse effect of incentivizing centralization of PoS assets in custody of companies offering staking management services. Yet, PoS was not designed with these actors in mind, and such development poses a potential network security risk, especially for blockchains with on-chain governance mechanisms in case of high degree of voting power centralization.

This makes Liquid Staking an important approach to consider, given the potential benefits to increasing network security in a decentralised manner as well as unlocking the value of staking deposits locked in PoS protocols.

2.1 *Delegation vouchers*

One of the ways of achieving tokenization of stake is through Delegation Vouchers. This mechanism is summarised in Figure 1.

In this approach, User 1 would deposit their stake into the Pool for Validator 1 and receive a Voucher Token representation of their stake, which then could be traded freely (e.g. with User 2) and used as a claim for the underlying asset in Pool for Validator 1.

This approach has a few benefits:

1. Delegation Vouchers are subject to the governance by the staking token holders, rather than an exchange for example.

[2] also "Tokenized Staking"
[3] All tokens having exactly the same characteristics; exchangeable between each other
[4] Depends on particular implementation

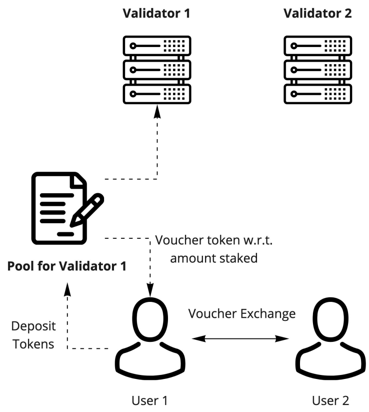

Figure 1: Delegation vouchers schematic

2. There might be tax benefits[5] due to replacement of reward distribution by a claim to a share of the pool.

3. This could be a foundation of a more advanced solution that would address some of the limitations.

At the same time, there are some limitations:

1. Vouchers are Validator-specific, due to different reward and risk characteristics, thus tokens are non-fungible between different validator pools. This in turn results in overall liquidity being split between different validator tokens.

2. The liquidity is created for the tokenized stake, and not for the underlying asset.[6]

3. There does not appear to be much of an economic incentive to adopt this solution.

Projects that are working on implementation of Liquid Staking and adjacent solutions:

- StaFi
- LiquidStake
- RocketPool
- Staker DAO
- Ramp Defi
- Acala DeFi
- Kira Network

[5] Tax regulations are specific to each jurisdiction.
[6] "Proof of Liquidity" could offer a solution to this limitation, refer to Section 3.

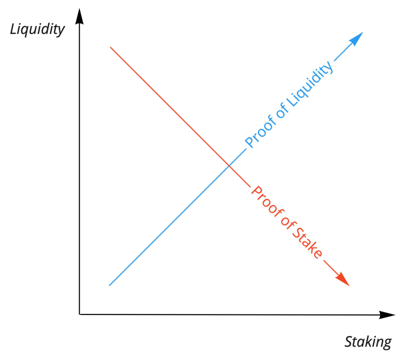

Figure 2: Impact of Staking on Liquidity in conventional Proof of Stake vs Proof of Liquidity

3 PROOF OF LIQUIDITY

In a typical PoS cryptonetwork, staking implies taking the network token out of the circulation, which reduces liquidity.

It appears that it would be better if liquidity could be growing with increased staking, which is the aim of the Proof of Liquidity approach. The main idea is to use Liquidity Pool tokens (e.g. from Balancer, Uniswap) as a proof of liquidity. These LP tokens could then be staked instead of the network token - this way increased staking would ensure higher liquidity.

Liquidity Pools act as Automated Market Makers (AMMs), and maintain the proportions between the tokens that they contain. For example, if a pool contains 60%DAI and 40%ETH, an automated algorithm will maintain this proportion by buying and selling DAI/ETH. For contributing to a liquidity pool, a user receives a corresponding amount of Liquidity Pool (LP) tokens for a particular pool, e.g. depositing 20% worth of liquidity to the pool will yield you 20% of the LP tokens that can be exchanged for a 20% slice of the whole pool. Naturally, as LP tokens represent a claim to a portion of the assets in the pool, and underlying assets are traded on the Decentralized Exchange (to maintain the set proportion among assets in the pool), LP tokens also have a potential to be used as proofs of liquidity.

This method potentially solves the problem of aligning staking and liquidity provision, though will probably require adjusting staking smart contract to allow for staking LP tokens. Staking rewards could be based on the balance of the network token in the corresponding share of the liquidity pool.

On top of this, staking liquidity provision also allows stakers to get fees from trades made against the liquidity pool, as well as less volatility in the value of the stake due to other assets in the pool (e.g. DAI, ETH etc.).

It is important to consider that this approach will likely require vetting of Liquidity Pools, eligible to provide proof of liquidity for staking.

4 EASY STAKING WITH XDAI

xDAI is a second layer blockchain solution on top of Ethereum, where native token (xDai) is a 1-to-1 bridged representation of DAI on their blockchain.

xDai team engineered a unique incentive structure that allows to encourage higher staking amounts, longer staking time, while tunnelling the rewards unclaimed by stakers to liquidity providers. First of all, the total protocol emission was capped at an annual rate of 15%.

The annual rate of return depends on 2 factors[7]:

- Supply-based: depends on a proportion of staked tokens to the total token supply.
- Time-based: the amount of time that a particular deposit had been staking for. The longer the time period, higher the rate. Rate increase is non-linear, so marginal increase in the rate starts to flatten after about 4 months of staking.

Each factor could yield up to a 7.5% APR, and the resulting sum of rates based on these two factors will determine the APR that a staker will get. The difference between the APR dedicated to the staker and annual emission cap is distributed to the Liquidity Providers every 7 days on average (exact date is randomized). In Table 1 there are example cases of such yield distribution[8].

Staking Time	Staker APR	Liquidity provider APR
1 Month	5.02%	15 - 5.02 = 9.98%
4 Month	7.44%	15 - 7.44 = 7.56%
9 Month	7.70%	15 - 7.70 = 7.30%

Table 1: Time-based APR distribution examples

For the following example calculation, we would assume 25% of all network token supply to be staked. In case a staker deposits 1000 Tokens into a staking contract for 28 days, then his APR will be calculated as follows:

- Supply-based: $0.25 * 7.5\% = 1.875\%$
- Time-based APR: 28days will correspond to 4.53%[9]

For staker:

- $Yield_{365days} = 1000 Tokens * (4.53\% + 1.875\%)/100 = 64.05 Tokens$
- $Yield_{28days} = 64.05 * 28/365 = 4.91 Tokens$

For liquidity providers:

- $Yield_{365days} = 1000 Tokens * (15\% - (4.53\% + 1.875\%))/100 = 85.95 Tokens$
- $Yield_{28days} = 85.95 * 28/365 = 6.59 Tokens$

In this particular case, liquidity providers would be sharing the resulting 6.59 tokens based on the respective shares of the liquidity in the pool.

This approach effectively penalizes short-term stakers with lower APR, while channeling the difference (with the yearly emission cap) to the Liquidity Providers. For long-term stakers it may be interesting to have their staking rewards diversified by assigning a portion of their staking capital to liquidity provision.

Through employing a similar solution it is likely that a cryptonetwork will see an increase in liquidity available in Liquidity Pools. Also, such a reward sharing model appears to recognize and reward the liquidity providers who bring value to the network through employing their capital in the liquidity pools.

7 xDAI Emission rates: https://www.xdaichain.com/for-stakers/easy-staking/emission-rates
8 LP APR implicitly assumes the proportion of staked tokens to total supply to be close to 0.
9 Mapped using sigmoid-type function. Reference: https://www.xdaichain.com/for-stakers/easy-staking

5 COMPOSITE SOLUTIONS

This section presents composite solutions, which describe how different approaches discussed previously could be combined.

5.1 *Liquid Staking combined with Liquidity Provision*

This solution is inspired by DeFiDollar[10] architecture.

Main idea revolves around abstracting away parts of the process from the User, and handling Liquid Staking through Ethereum smart contracts. Summary of the architecture can be seen in Figure 3.

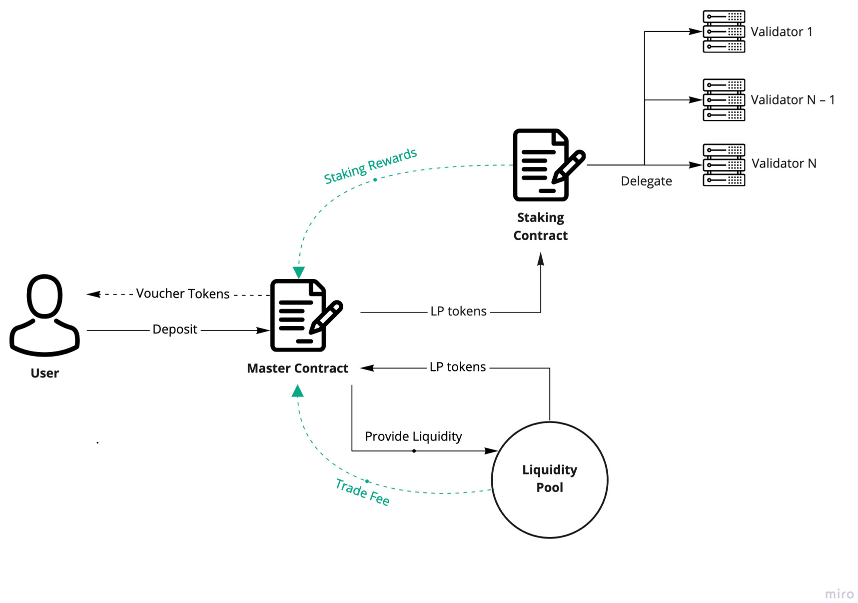

Figure 3: Composite scheme: Liquid Staking with Liquidity Provision

There are a few integral parts to this composite solution:

- **Master Contract**: smart-contract that interfaces with the User and coordinates all the token flows to/from Liquidity Pool, Staking contract, as well as issuance of Staking Voucher Tokens and distribution of accumulated rewards to Voucher holders.
- **Staking Contract**: smart-contract that allows depositing LP tokens Proof-of-Liquidity[11] for staking. This contract could then delegate the underlying network tokens from provided LP shares to selected validators[12]. All the generated staking rewards would be forwarded to the Master Contract for distribution.

For the User, the process would not be much different from that of a Liquid Staking (Delegation Voucher) scheme described in Section 2.1, namely, user deposits a certain amount of Tokens to the Master Contract and receives a Voucher Token representation of the staked amount, which then could be

[10] Source: https://docs.dusd.finance/
[11] As described in Section 3
[12] This step would require further consideration, since particular implementation may potentially influence fungibility of the resulting Voucher Tokens.

exchanged with other Users. These Voucher Tokens would represent a claim on a provided deposit amount, as well as rewards generated through staking and LP trade fees.

There are a few benefits of the composite approach which create a greater degree of flexibility:

1. Holders of Voucher Tokens could be entitled to receive *both* staking and LP trade fees.

2. Staking Contract could potentially be implemented in a way that makes the resulting Voucher Tokens Validator agnostic, implying fungibility regardless of the validator.

Special considerations for such a solution:

1. **Staking LP tokens**: the choice of a mechanism to account for amount of tokens being staked from LP token representations is not trivial, since the amount of the underlying network token may change due to the exchange rate fluctuations, as well as go up or down significantly over time.

2. **Delegation of token amounts to validators**: one solution could be to distribute the amount evenly across all the validators, or w.r.t. amount that validators have at stake. So that Users are not exposed to risks of any particular Validator and thus the resulting Voucher Tokens are Validator agnostic.

3. **Redefinition of Slashing**: Staking LP tokens implies that in case of slashing event LP tokens would be slashed instead of the underlying network tokens locked in the Liquidity Pool. This calls for changes in the slashing mechanism and potentially redefining Slashing altogether. One of the side-effects is that slashing does not necessarily have to affect liquidity provisioning in this case.

6 PRELIMINARY CONCLUSION

It appears that there are a few approaches to combining staking with liquidity provisioning that have the potential to be successful in practice. In fact, xDai model is live and resulted in relatively stable amount of liquidity on Uniswap of about $2.4m[13] at the time of writing this research.

Proof of Liquidity approach also appears promising, given the simplicity of the solution and alignment of staking and liquidity provisioning.

Lastly, there is a large field of possible composite solutions combining individual schemes in different ways similar to a Liquid Staking and Liquidity Provisioning combination briefly discussed in Section 5.1. Though there are a few non-trivial aspects requiring deeper analysis such as fungibility of the resulting stake representations as well as developing a robust accounting mechanism for staked amounts and rewards.

It is important to mention that implementing any of these solutions has its own benefits and drawbacks, as well as less apparent positive and negative externalities which could potentially affect network incentives, governance, and security. These effects have to be carefully considered and modelled with specific network's conditions in mind.

[13] Source: https://info.uniswap.org/pair/0x3B3d4EeFDc603b232907a7f3d0Ed1Eea5C62b5f7

Further research could focus on a more practical side of these solutions, looking into specific staking and governance mechanisms used by Orbs. This would allow to provide a contextualised advice with regard to which method would be an optimal solution for combining staking and liquidity provisioning for Orbs.