Steak Protocol
ADA derivatives and rebalanced staking
White Paper draft

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Abstract

The objective of Steak Protocol is to revolutionize Cardano's current staking rewards and stake pool fee system by offering a decentralized solution powered by the emission of an ADA derivative as a key-value differentiator from stake pools outside of it. Thus allowing for a more decentralized and secure network, a more capital-efficient ADA, and a more vibrant ecosystem.

1. Disclaimer

Steak protocol proposes novel concepts to solve dynamic and ever-changing ecosystem problems. This paper is furthermore a draft. Therefore, the issues stated, the solutions proposed and the methods to apply will be subject to change, and so is this paper.

This paper was also made under time constraints, so it is going to lack rigor in its hypothesis and evidence-backed statements. This will change in the following weeks as the pertinent investigation is still being done up until now.

In section 2.3 the average stake pool rewards per epoch are taken from the APY estimated at 5%. This was done to simplify estimates for the paper, I am aware that stake pool rewards depend on other factors like the K factor, and pledge.

The current objective of this whitepaper is for more technically capable individuals to revise it and comment on the viability of the approach proposed.

Contents

2. Introduction

In this section, I will be explaining some concepts necessary to understand how this protocol fits in the dynamic Cardano ecosystem, and how it is going to do so.

Let's begin by understanding how Cardano POS works.

2.1 Cardano's POS

Cardano has its own novel consensus protocol named "Ouroboros Proof Of Stake" (POS). Its function is to verify transactions in a transparent and decentralized manner. It is more energy-efficient and scalable compared to other proof of work networks.

It divides time into Epochs and does a lottery between the nodes of the network. The nodes which get selected then get what's called a slot, the slot leader verifies the block of transactions and the other slots work as substitutes in case the slot leader misses its block.

The odds of a node being picked as slot leader is given by the following formula.

$$\frac{Staked\ ADA \cdot active\ slots}{circulating\ supply} = block\ chance$$

So for the following example we will have **1 million ADA**, with the current **circulating supply** and **active slots**.

$$\frac{1x10^{6} \cdot 21.6x10^{3}}{34x10^{9}} \approx 0.63$$

Meaning that on average a user with 1 million ADA mints approximately 0.63 blocks per epoch

The amount of active slots is given by a parameter that determines how often blocks are minted (every 20 seconds), and it, multiplied by all the 20 second periods that fit in one epoch gives the current active slot number ~ 21600.

$$\frac{1}{20} \cdot 60 \cdot 60 \cdot 24 \cdot 5 \approx 21600$$

When a block is minted the node which minted receives incentives that come from the transaction fees and from inflation of the circulating supply of ADA.

2.2 Stake pools and SPOs

We've seen in section 2.1 that nodes get to verify the transactions of Cardano. But what happens when a holder doesn't have the resources to maintain a node by itself?

Here's where the concept of Stake Pools comes into play, stake pools are a reliable server node that focuses on the maintenance and holds the combined stake of various stakeholders in a single entity.

To be secure, Ouroboros requires a good number of ADA holders to be online and maintain sufficiently good network connectivity at any given time. This is why Ouroboros relies on stake pools, entities committed to running the protocol 24/7, on behalf of the contributing ADA holders.

While Ouroboros is cheaper to run than a proof of work protocol, running Ouroboros still incurs some costs. Therefore, stake pool operators are rewarded for running the protocol in the form of fees.

2.3 Staking rewards

It was previously stated that rewards for validating nodes come from network fees and inflation. These rewards vary depending on certain network parameters and usage when a specific block is being validated.

To understand how staking reward distribution works, we will start by pointing out that without taking into account the pledge influence factor, K factor, and stake pool fees. One staked ADA coin is going to provide the same staking rewards on average as another on a different wallet.

Therefore, if it were not for those three factors, all stake pools should be equally as creditable. Meaning when analyzing the difference in profitability those factors are the ones to be noted. Stake pool fees are going to be explained in the next section of this paper.

The K factor works as a means to protect Cardano's network from centralization by establishing a soft cap on individual stake pool active stake amounts. The K factor currently sits at 500 capping the amount of active stake before reaching saturation at ~68 million ADA.

After a pool reaches saturation, all the additional ADA delegated past that mark is not accounted for when calculating the odds of giving the pool an active slot.

Another factor that may affect the amount of ADA received by delegating to a certain pool is the Pledge, which is ADA locked by the SPO inside a stake pool. It works as a means to show the SPO is financially motivated to keep a great performance at maintaining the stake pool.

It slightly affects the number of rewards received but not by any significant amount unless some specific cases in which pledges exceed 10 million ADA. Therefore pledge will not be given much importance on this paper.

With the parameters taken at the time this paper was written, a node with roughly 1 million ADA mints ~0.63 blocks per epoch **on average**. Meaning that on a very extended time frame, the number of blocks minted per epoch is going to approximately match that number.

This is an issue in shorter timeframes, on which stake pools can get what is called “bad luck streaks” and not mint blocks for several epochs, thus not getting any stake pool rewards. This effect is amplified even more on stake pools with even less active stakes.

Stake pools with a great amount of active stake also suffer from a similar issue. Although they do mint blocks, the amount of active slots they get is not consistent, this effect gets diminished the larger the stake pool gets.

2.4 Stake pool fees

The majority of stake pools offer, on average, 5% APY on staking rewards. These percentage differs between different pools because of two factors:

- **Pool performance:** How reliable is the infrastructure the pool operator has put in place. This factor is superiorly bounded, meaning this factor is irrelevant when comparing different well-optimized pools.

- **Pool fees:** pool fees work as incentives for SPOs, these are also divided into two different categories:

    1. **Margin fee:** the SPO takes a percentage of the staking rewards of the whole pool, this fee doesn’t work differently on different sized pools. It does not have a minimum and it quantitatively scales with pool size.

2. **Fixed fee:** the SPO takes a fixed amount subtracted from the sum of the staking rewards of the pool. This fee has a minimum of 340 ADA per epoch (if the pool mints a block).

   How this fee affects rentability depends directly on the pool size, and is worryingly significant in pools with less than 10 million ADA of active stake.

   For demonstrating this, we will compare how the fixed fee affects a pool with 1 million ADA and how it affects one with 10 million.

   In section 2.1 it was stated that 1 million ADA mints on average 0.63 blocks per epoch on average.

   The fixed fee only is applied when a pool mints a block, so a pool that mints blocks more regularly also pays fixed fees more regularly

   A stake pool that does not mint block regularly then, pays cuantitatively less fixed fees, so:

$$\frac{avg\ fixed\ fees}{epoch} = blockchance \cdot fixed\ fee \Leftrightarrow blockchance \leq 1$$

   And the fixed fee is only paid once per epoch. Meaning that a pool mints multiple blocks in one epoch it pays the same fixed fee so:

$$blockchance \geq 1 \Rightarrow \frac{avg\ fixed\ fees}{epoch} = fixed\ fee$$

   To calculate the fees paid on average per epoch by a pool with one million ADA its necessary to first estimate how much rewards are generated on average per epoch

The metrics stated here assume that both pools have minted blocks on the same epoch. Blockchance is what determines the APY, so that information is implicitly stated in the following:

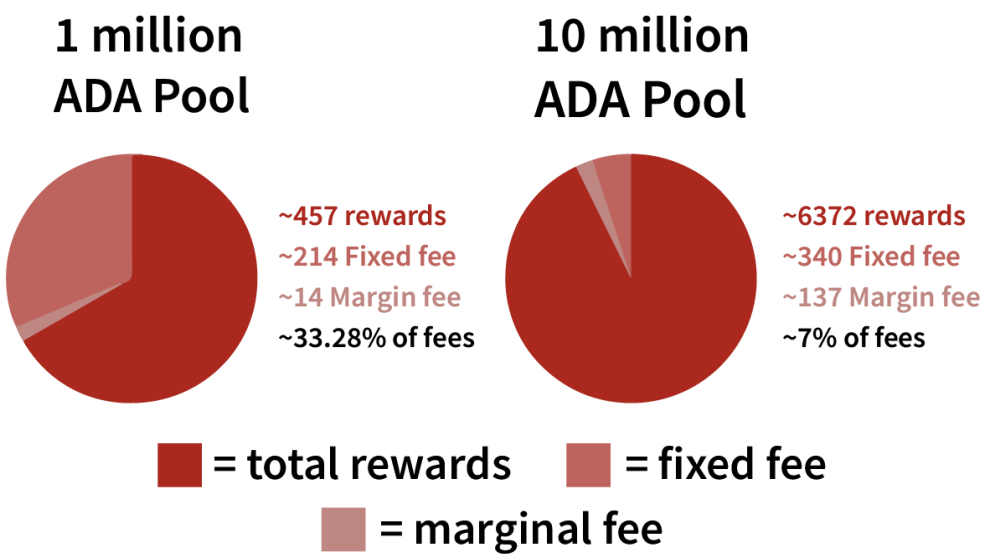
$$1x10^6\ ADA \cdot \frac{5\%}{100\%}(APY) \cdot \frac{5\ days}{365\ days} = \frac{avg\ rewards}{epoch} = 685\frac{ADA}{Epoch}$$

To calculate the fees the pool gets we use this formula:

$$685 - margin\ fee - \frac{avg\ fixed\ fee}{epoch} = remaining\ reward$$

$$685 - 14 - 214 = 457$$

Doing the same procedure for a staking pool with a 10 million ADA stake and putting the data in a pie chart we get the following graph

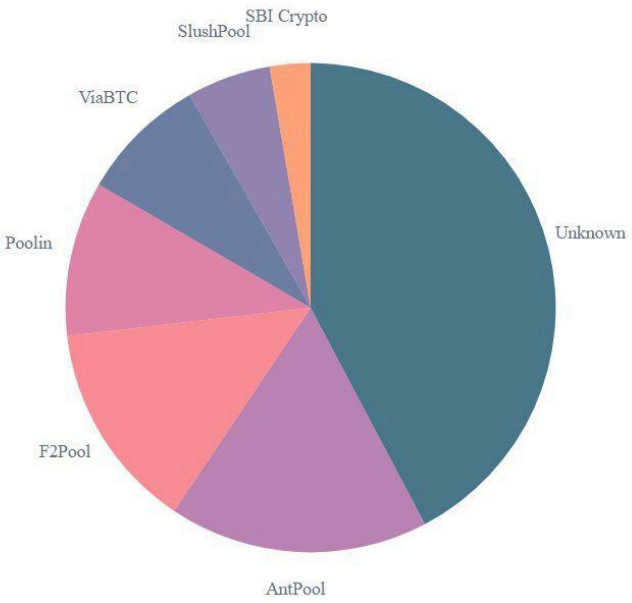


This presents a critical problem for Cardano, as it makes it unviable to start a new stake pool, as most new delegators would have to sacrifice a significant amount of staking rewards to delegate to a pool with a less active stake.

This issue will be revisited in section 3.4.

2.5 Stake distribution and decentralization

A means to analyze how decentralized a blockchain network is is to analyze the distribution of the validating power. On POW networks like Bitcoin and Ethereum, this is measured in hash rate, and on POS networks like Cardano and Polkadot in active stake.



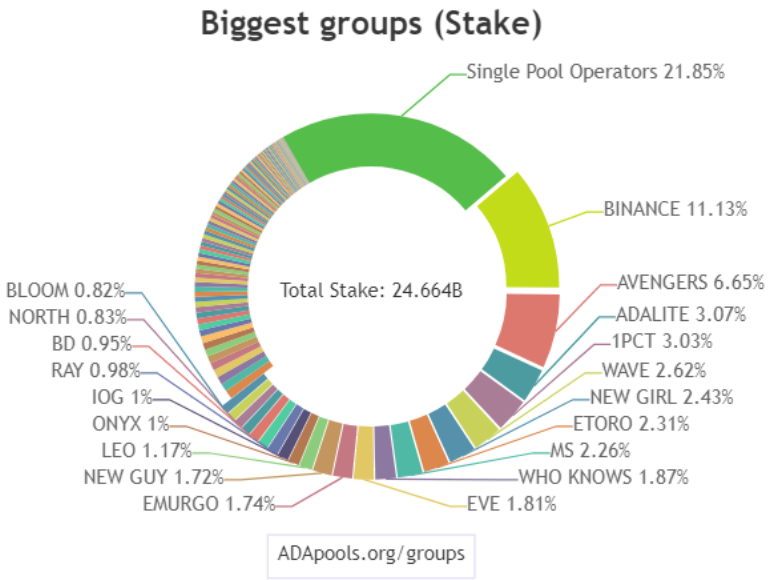
In the graph above Bitcoin's hash rate distribution is displayed. This is a very important decentralization metric as it shows what it would take for certain federations to take over the network.

In Bitcoin's case, as can be appreciated in the graph, it would only take 3 entities to act maliciously to attack the network.

In Cardano's case, the allocation of the active stake of the network is going to be a metric of its decentralization and security of it. In the graph below, it can be seen that Cardano's situation is far better by comparison, although a lot of progress can be made.

A lot of effort is being put towards accomplishing this goal via different initiatives such as Stake Pool alliances, education campaigns, etc.

Although a lot of progress is being made by these, it would be much easier to accomplish this goal if users had a direct incentive to delegate their ADA to individual SPOs.



As can be noted above, single SPOs consist of just ~22% of the network and it would take +30 entities to be malicious for an attack on the network to be feasible.

Even though these metrics are quite healthy compared with other networks, the stake allocation of single SPOs is trending downwards if compared with the same graphic snapshot from one year ago.

It can be hypothesized that this trend is due to DeFi protocols starting to get launched on Cardano. And, as delegators of single SPOs seem to be the more active network users, the ratio on which their ADA gets undelegated is greater than those of federation delegators.

2.6 Capital efficiency and double yields

Capital efficiency (ξ) is a metric of how much capital is needed to generate the same level of revenue.

With staking alone, ADA has a capital efficiency of ~0.05 (without accounting for inflation)

Decentralized finance protocols provide different paths to giving ADA holders the possibility of augmenting their capital efficiency at slight risk-taking.

When more opportunities for holders come out with the advent of Vasil hard fork, lending platforms, and DEXs. And with them, staking is going to compete more with these alternatives.

The opportunity to give ADA a capital efficiency to risk ratio unseen in the whole crypto space lies in the fact that staking does not have to necessarily compete against these, both can happen at the same time as they aren't mutually exclusive.

That can be seen in projects like Wingriders, where you can stake ADA on their platform and provide liquidity at the same time. So the possibility of combining yields from DeFi protocols and Staking is not a possibility, but a reality.

2.7 DeFi protocols and active stake.

Since the Alonzo hard fork went live on September 12th, 2021, Cardano entered the Goguen era, and with it, the possibility of supporting smart contracts. With these smart contracts came the development of what are and are going to be Cardano 1st DeFi protocols and dApps.

The number of projects that can be defined as DeFi protocols is immense, being this the reason they are going to be categorized into three groups:

- DEXs: Allow users in the Cardano network to swap native assets in a decentralized manner. At the same time, it allows lenders to participate in liquidity pools to provide liquidity to earn yields with a risk profile different from just token price exposure.

- Lending platforms: These are going to allow users to lend and borrow native assets in a decentralized manner with interest rates set by supply and demand. Given enough collateralization of the lent assets is put in place, these protocols can be perceived by the users as a great way to earn passive yields as lenders.

- Stablecoin protocols: These are going to allow users inside the network to be protected against price exposure and volatility of the crypto markets without going through a centralized entity. It is also going to allow collateral lenders to earn interests. These protocols are going to be key for Cardano projects with real-world applications.

All of these protocols are going to need a system that allows them to stake ADA, and then use that staked ADA in these protocols. Unless a token that represents staked ADA is universally used.

If neither of those two scenarios takes place, then those protocols are going to have to compete with staking, therefore reducing the liquidity of said protocols and the active stake of the network.

2.8 Cardano's security and active stake.

Cardano is guaranteed to be secure so long as 51% of the stake – in the case of Cardano, ada – is held by honest participants, which, in addition to other novel concepts, is achieved through the random leader selection mentioned in 2.2.

Note that what was stated above meant 51% **of the stake**. Which is not the same as circulating ADA. This means that the value of 51% of the active stake is what protects Cardano against most attacks.

In section 2.4 it was established that, due to incentives, staking is currently competing with DeFi protocols, making the ratio of staked ADA go down and, consequently, the network security.

2.9 Financial derivatives.

In finance, a derivative is a contract that derives its value from the performance of an underlying entity. This underlying entity can be an asset, index, or interest rate, and is often simply called the "underlying".

The clearest example of this concept applied to crypto is that of wrapped BTC, on the Ethereum blockchain. It allows users from Ethereum to hold any Ethereum token whose value is given by the underlying asset, BTC, on its network.

Note that for derivatives to work, there has to be a manner of redeeming the underlying asset if need be.

3. Steak protocol mission and objectives

Steak protocol aims to revolutionize how the Cardano ecosystem works by:

- Providing universal double yields for the whole ecosystem.

- Revolutionizing the stake pool system by making staking rewards and fees constant regardless of active stake.

- Increasing Cardano's dominance in the crypto space.

3.1 Universal ADA double yields

Steak protocol is going to allow ADA holders to benefit from the additional capital efficiency that comes with double yields. The approach taken by **Steak** to provide this is completely non-intrusive.

Aiming to give Cardano users the possibility of earning staking rewards regardless of which DeFi protocol they decide to put their ADA on, as **Steak** was designed to be symbiotic with them indistinctly.

Thus making staked ADA universally coexist with all lending platforms. And, as staking rewards are mostly taken from the value generated by the network transactions. **Steak protocol** can make ADA one of the most versatile and capital-efficient investments overall.

This, in turn, could boost ADA's adoption due to the sheer power of incentives to hold it.

Achieving this would also mean active stake is not going to diminish because of DeFi protocols. Increasing the staked ADA ratio and making the blockchain more secure. And more active stake for SPOs.

3.2 Revolutionizing the staking system

The second objective of the **Steak protocol** drastically improves upon the current staking system.

By providing a simple solution to both the randomness of the staking reward system and the issues low stake pools have to offer competitive yields.

Steak's approach aims to allow delegators to enjoy consistent staking rewards mitigating the randomness involved via an index. And also help Stake pools with a relatively low active stake to completely redo their fee structure.

Changing the current paradigm in Cardano, and paving the way for more mission-driven pools to appear. Some parameters are also going to be adjusted to benefit stake pools with a higher active stake to compensate for the higher competition this new system is going to present

SPOs inside the protocol are also going to enjoy the benefits of constant revenue from indexed fees and those that initially offered an APY higher than the index from the same benefit plus extra staking rewards.

3.3 Accelerating Cardano's expansion

This objective relies on the former two, we believe that, given enough adoption, the **Steak Protocol** can make Cardano expand its influence.

This is due to how the usage of the protocol makes the ecosystem itself more appealing to investors for the following reasons:

- **More capital-efficient ADA**: Thanks to the **Stake protocol** approach, ADA's capital efficiency is going to be one of the most competitive not just in the crypto markets, but overall. Making it one of the most desired assets.

- **A more decentralized and secure network:** The expected increase in active stake on the network due to **Steak's** approach, is going to make the Cardano network more secure. The improvements in the

staking reward and fees system will too decentralize the network allowing pools with fewer active stake to offer competitive rewards.

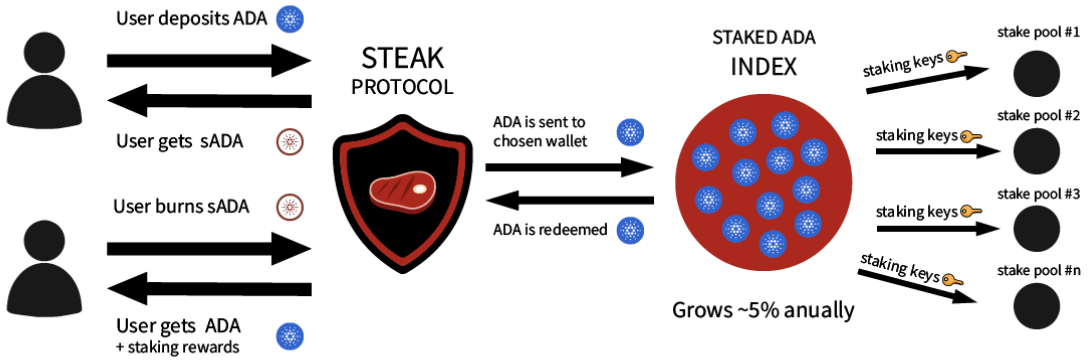
- **More reliable staking rewards:** With indexed staking, staking rewards will be consistent. This is a characteristic unseen even in other POS blockchains like Polkadot or Ethereum 2.0. Setting a new standard throughout the whole ecosystem.

- **More mission-driven pools:** With the standardization of the stake pool reward system there will be a much heavier emphasis on stake pools that provide value to the ecosystem, AKA, value-driven pools.

The combination of all these features makes **Steak protocol** a project with a sound value proposal that could benefit not just ADA holders, but also SPOs, other DeFi protocols, the network itself, and consequently every other player affected by those.

4. Steak Protocol infrastructure

In this section, a simplified layout for **Steak Protocol** will be displayed.



Users can either mint sADA by depositing ADA, or burn sADA and retrieve ADA. Whenever you deposit ADA, it gets sent to a staked ADA index, from where it gets staked in the pool chosen by the user.

As the staked ADA index rewards grow in value each epoch from staking rewards, so does sADA, as the index is its underlying asset.

From a profitability standpoint, the **“Steak index”** is going to offer one of the most competitive fee structures in the ecosystem. These are set by programmable parameters, opening the opportunity to later delegate the task of setting these to a DAO.

The **“Steak index”** approach allows the protocol to mint just one token instead of one per stake pool. Making sADA compatible with DeFi protocols and indistinguishable from ADA from a behavioral standpoint.

Staking keys are going to be given to **registered** stake pools, the amount delegated is going to mirror user input on the **Steak UI.**

5. Steak dApp UI

The UI or User Interface is defined as the point of human-computer interaction and communication in a device. The information user gives to the UI is called inputs and that which is provided by the UI to the user outputs.

In this section, the layout for the UI and the inputs and outputs of this system will be detailed in a simplified manner.

5.1 User inputs

The inputs provided by the user to the **Steak protocol** UI are the following:

- **ADA deposit:** when depositing ADA, the UI will ask the user to input the amount. The user will only be allowed to insert an amount lower or equal to its ADA balance.

- **ADA balance:** When the user's wallet is connected to the protocol, it will use the user's ADA balance information to cap the amount of ADA the user can input. This is made to improve UX in case the user wants to use a "max option".

- **sADA withdrawal:** when withdrawing sADA, the UI will ask the user to input the amount. The user will only be allowed to insert an amount lower or equal to its sADA balance.

- **ADA balance:** When the user's wallet is connected to the protocol, it will use the user's sADA balance information to cap the amount of sADA the user can input. This is made to improve UX in case the user wants to use a "max option".
- **ADA delegation:** The user will be asked to input to which pool the ADA is going to be delegated. The UI will output a list of registered stake pools and will provide a search bar on which the ticker of the desired pool can be written.

  In another iteration of the protocol, the UI will offer a slider on which the user will be able to delegate to multiple tools at the same time using a slider.

5.2 UI outputs

The outputs provided by the stake protocol UI to the user are the following:

- **sADA mint:** determined by the amount of ADA imputed when deposited and the current sADA to ADA ratio. It is going to be displayed when the user is typing the amount of ADA they are going to deposit.

- **ADA withdrawal:** determined by the amount of sADA imputed when deposited and the current sADA/ADA ratio. It is going to be displayed when the user is typing the amount of sADA they are going to withdraw.

- **ADA balance:** determined by the user's sADA balance and the sADA/ADA ratio in the protocol. It is going to be shown in the user dashboard.

- **ADA on the Steak Index:** the determination of this output is explained in 6.1. Will be outputted in real-time.

- **Circulating sADA:** will be outputted in real-time.

- **Expected yields:** Its determination is to be explained on 6.2.

5.3 SPO dashboard

This will be an exclusive dashboard for SPOs, where they will be able to watch their delegation inside and outside the **Steak protocol** and their expected fees, also inside and outside the protocol.

In this section, SPOs are also going to be able to sign a smart contract with their reward wallet to register in the protocol.

Concrete data exchanges will not be displayed in this section as this process will be explained in 6.2 and 6.3.

6. “Steak Index”

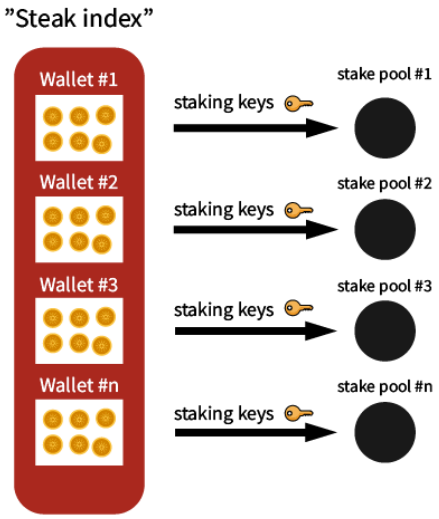
The **“Steak index”** is a novel and simple model that allows the protocol to provide all the aforementioned benefits.

In this section, the outlay for how this approach works will be thoroughly detailed.

We are going to start explaining where the ADA imputed by the users goes, this is explained in the following section.

6.1 “Delegation addresses”

The **Steak Protocol** sends all inputted ADA to different addresses depending on which stake pool delegation input was introduced. These are called “delegation addresses”, and there is one per registered stake pool in the protocol. Each address would then send its staking keys to the desired Stake Pool:



The “**Steak Index**” ADA balance is then given by the following formula:

$$Steak\ Index\ Balance\ =\ ad1\ +\ ad2\ +\ ad3\ldots +\ adn$$

Where “*ad*” stands for address and is equal to the balance of ADA inside of it, in simple terms, the Index is the sum of the balances of all addresses.

$$b\ =\ \sum_{x=1}^{n} adx$$

As the staking rewards minus fees arrive to each wallet, the entire index starts to grow nominally. The growth of the Index is going to be equal to the the average growth of all the addresses.

$$index\ APY\ =\ \frac{\Sigma ad\ APY}{N\ of\ addresses}$$

This allows the user to earn the consistent staking rewards of the index regardless of what stake pool they delegate to.

Due to how the fixed fee system currently works on Cardano, note that this was mentioned in 2.3. This approach would soon encounter small stake pools lowering the ROI of the index, and stake pools with a greater active stake not having an incentive for entering the protocol.

This would end up in the index not being able to offer a competitive stake and **Steak Protocol** not being able to fulfill its objectives.

That is why the **Steak Protocol** approach comes with a rebalance of the stake pool fee system, allowing fees to scale with an active stake inside the protocol.

The details of the proposed rebalance are going to be detailed in the following section.

6.2 Fee structure rebalance

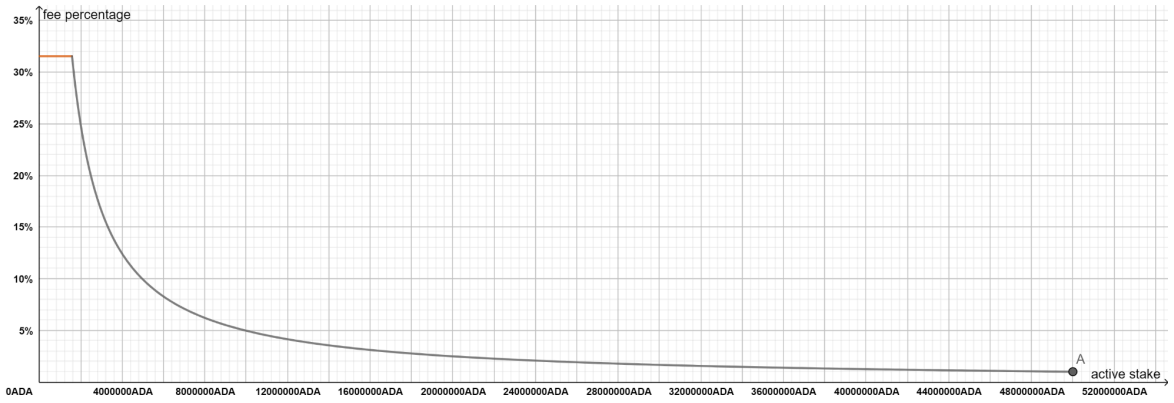
For the **Steak index** to be able to offer a competitive ROI, the **Steak Protocol** is going to rebalance how the fees of the registered stake pools are going to work.

First, note that pool rewards for delegates are dependent on the fee structure and pledge. Over an extended period, two stake pools with the same fee structure and pledge should have approximately the same ROI.

We have to then determine what impact fees and pledges have on the ROI of delegations on different pools.

Fixed fees

Here's a graph of the percentage of staking rewards fixed fees taken from delegators as a function of the amount of active stake on a specific stake pool:



The importance of the chart above is that it shows that a stake pool fixed fee impact on ROI can be predicted as a function of active stake.[1]

$$\text{fxfee\%impact(active stake)}$$

The fixed fee impact will also be affected by the pledge to delegation ratio, as the SPO's pledge is going to pay a share of the fixed fee, that share will be dependent on the aforementioned ratio.

$$fxfee\%\ impact = fxfee\%impact \cdot \frac{pledge}{stake}$$

From now on that factor will be called pledge factor (p). The impact of the fixed fee will now be called fixed fee factor (fx)

$$fx = fxfee\%impact \cdot p$$

So now the predicted impact of fixed fees is numerically defined from the pledge and active stake of the pool.

Margin fees

The procedure for quantifying margin fees requires us to define a factor we are going to name margin fee factor (mf) and it will be equal to the margin fee set by the SPO of the particular stake pool.

$$mf = margin\ fee$$

As this factor is already in the same format as fx there is no need to make further change expressions any longer.

Pledge

With Cardano's current pledge influence factor being 0.3, **Steak protocol** considers it negligible for calculating the impact it may have on profitability.

The protocol will still calculate the parameter in case this fact changes in the future. This factor (pl) will be of more important when dealing with private pools, since these will se a more significant increase in marginal rewards as most of if not all of their delegations consists of pledges, on which case it makes sense considering that factor.

Fee structure rebalance

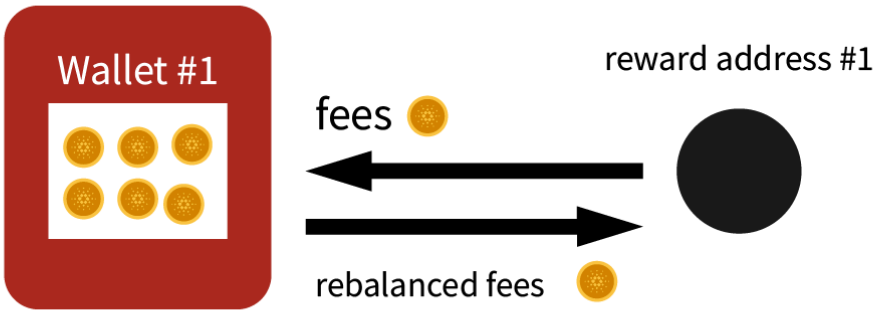
For rebalancing the fee structure, we first have to determine what would be a perfect balance between profitability for SPOs and for delegators. For that we will define a new factor that is the result of the following equation:

$$sf = fx + mf - pl + 1$$

This will be called **steak factor** (sf), the lower this factor is, the more rentable delegating to a certain pool becomes. Under the assumption that the pool is efficient. The +1 accounts for protocol fees.

The steak factor is subject to change and its determination would require a more rigorous examination. For the sake of simplicity and to explain how the protocol works the factor will be set at 5.

The registered pool's reward address is going to send the entirety of its rewards to the index if it managed to mint a block on the current epoch.



Steak Protocol will then give back an amount set by the following:

$$Rewards\ outside\ Steak\ +\ (rebalanced\ fees)$$

The rewards outside the protocol will be given only if the Stake Pool got an active slots, whereas the rewards inside are paid regardless.

Rewards outside the protocol are then given back, rewards inside it are given by the following formula:

$$\frac{ADA\ in\ pool\ Address}{ADA\ on\ the\ index}\cdot index\ rewards\cdot 0.04 = rebalanced\ fees$$

If the stake pool has a steak factor < 5 the rebalanced fees mean the SPOs of that category is going to enjoy extra fees. And, in the scenario where a stake pool $sf > 5$ the SPO gets fewer fees in order to compensate.

Both SPOs are getting the same fees relative to their active stake inside the protocol.

In the scenario where no fees from staking rewards arrived at the registered reward address because the stake pool did not get any active block in that epoch, there is no need to rebalance the fees because there are no fees to rebalance.

6.3 Pool registration

In order for the rewards address to be able to execute the smart contract that is going to rebalance the fees, the SPO is going to have to sign a such smart contract from that wallet.

Once the pool is registered, it is going to appear in the search bar that is shown to users for selecting a stake pool inside the index. An address is opened, and that address's staking keys are sent to the stake pool that was registered.

Registrations are going to be fully reversible. But, in order to protect the fee structure of the index, once a stake pool is unregistered, all of the active stake inside of its delegation address is going to migrate to the rest of the index across all delegation wallets in the same ratio as imputed by users.

7. sADA

sADA is the staked ADA derivative minted by the protocol, giving it an additional layer of utility. In this section of the paper the functioning of the underlying assets, as well as the native asset compatibility with DeFi protocols and Catalyst is going to be explained.

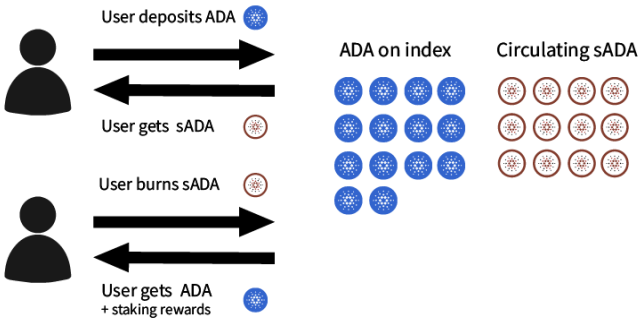
7.1 Underlying assets

When **Steak Protocol** launches, users are going to be able to mint sADA after depositing ADA on a 1-1 ratio. This is going to be the same for withdrawing and burning.

In this case, as the ADA on the index is equal to the circulating sADA, in which case the ratio for burning and minting sADA is kept as 1-1

$$Index\ ADA\ =\ sADA \Rightarrow ratio\ =\ 1$$

As the first epoch passes, with an sf of 5, and an average APY of 5%,the index should grow by 0.065% per epoch. Therefore sADA appreciates agains ADA by such ratio.



As the ratio changes, the mint and burn rates also change. Therefore, the users that minted sADA are now entitled to withdraw more ADA per sADA they hold. And new delegators are still going to be entitled to one ADA inside the index per ADA they deposit to mint sADA.

Therefore, sADA holders are going to get a constant stream of indexed staking rewards as a token appreciation, this appreciation can be redeemed as more ADA in all scenarios, as ADA's value is going to always be 1-1 backed by ADA, analogous to how a full reserve bank works.

In the next section, the utility of the sADA token derivative is going to be detailed.

7.2 sADA and DeFi protocols

The main utility of sADA relies on the fact that price exposure-wise, it behaves exactly like ADA. So it should be able to be used on DeFi protocols the same way ADA is being currently used right now.

This is going to allow sADA holders to put their sADA on other DeFi protocols, and receive both the staking rewards and the yields generated from the protocol the holder prefers.

Thus giving the user double yields and the increased capital efficiency that comes with them. Making ADA one of the most capital-efficient cryptocurrencies in the market, without having to expose the users to any extra risks.

As a side effect of this, the active stake of the network is going to be incremented, given enough adoption of the protocol has taken place. As the ADA locked on DeFi protocols is going to be able to be staked.

7.3 sADA and Catalyst

Due to how Cardano’s stake registration system works, the protocol is going to be able to withdraw their sADA tokens for ADA to be able to vote

in Catalyst, and then deposit and mint sADA again without charging the deposit fee in order to incentivize ADA holders to participate on Cardano's governance.

This is not going to affect the index, as it already keeps the staking rewards of two epochs after the user redeems their ADA from the protocol. This is due to how to stake registration works. If the user redeems ADA and deposits it again during a certain time window (for catalyst voting). These staking rewards are going to be given back to the delegator, Therefore, there is no monetary penalty for withdrawing to participate on Catalyst.