Education | Digital Assets

Staking Primer

May 2024

This primer highlights conversations related to Proof-of-Stake (PoS) consensus mechanisms, as well as staking-related developments and the importance of staking data for institutions, in the broader blockchain and cryptocurrency sector.

The primer also includes details on staking for three assets, including notable assets such as Cardano (ADA), Ethereum (ETH), and Solana (SOL).

The report is compiled from Digital Asset Research's (DAR's) data sources, public sources, media reports, and press releases, and, while wide-ranging, covers only representative initiatives related to staking in the digital asset space.

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Introduction

Blockchain technology has evolved significantly since the introduction of Bitcoin in 2009. The foundational premise of blockchain is the use of a decentralized ledger that enables multiple participants to reach an agreement on the outcome of events, such as transactions, without the need to rely on centralized intermediaries. Blockchains use “consensus mechanisms” as their processes to achieve agreement across a decentralized network while maintaining trust and security.

Bitcoin utilizes a Proof-of-Work (PoW) consensus mechanism, which relies on computational power, to reach consensus, validate transactions, and secure the network. As the blockchain industry matured, new types of consensus mechanisms emerged.

The most popular consensus mechanism in recent years is Proof-of-Stake (PoS), which relies on a process called staking. As staking has emerged, so has the ability to generate rewards from participating in the validation process, which has opened up new opportunities for institutions.

What is Proof-of-Stake?

The concept of PoS was first introduced in 2011 by Sunny King and Scott Nadal in their Peercoin whitepaper. It emerged as an alternative to the energy-intensive PoW model, which requires miners to solve complex cryptographic problems using massive amounts of computational power to validate transactions and secure the network.

Over time, many industry participants argue that the capital expenditure and operational costs of mining Bitcoin have become a barrier for smaller players, leading to the centralization of mining pools. Additionally, PoW as a consensus mechanism also has a challenge in scaling up its transaction throughput. As a result, the majority of newer blockchain networks have decided to adopt a different consensus mechanism than PoW, with PoS being the most popular alternative.

In PoS networks, those who help approve transactions and secure the network are commonly called “validators”. Validators are responsible for the same actions that miners do in PoW networks, such as validating transactions and securing the network. However, instead of deploying computational power, validators are required to “stake” the native token associated with the underlying blockchain network that they are participating in. In exchange for participating in the network, validators are rewarded with additional tokens.

How Staking Works

There are numerous implementations of PoS. At its core, PoS validators are chosen to create new blocks and validate transactions based on the number of tokens they hold and are willing to "stake" as collateral. Validators are then incentivized to do the right thing as their staked tokens can be forfeited if they act maliciously or harm the network.

Instead of risking capital in the form of costs for mining hardware and electricity as they would in a PoW blockchain, validators in a PoS network risk their capital by staking the native token of the blockchain they are validating. This aligns incentives between the validators and the blockchain network while reducing the need to sell their rewards to cover expenses. The goal is to create a compounding loop that increases their market share (and consequently their rewards) if validators decide to stake their rewards.

Proponents of PoS argue that this compounding loop contributes to the safety of the consensus mechanism as validators have a vested interest in the long-term health of the network due to their staked tokens. This makes it expensive and unprofitable for attackers to compromise the network.

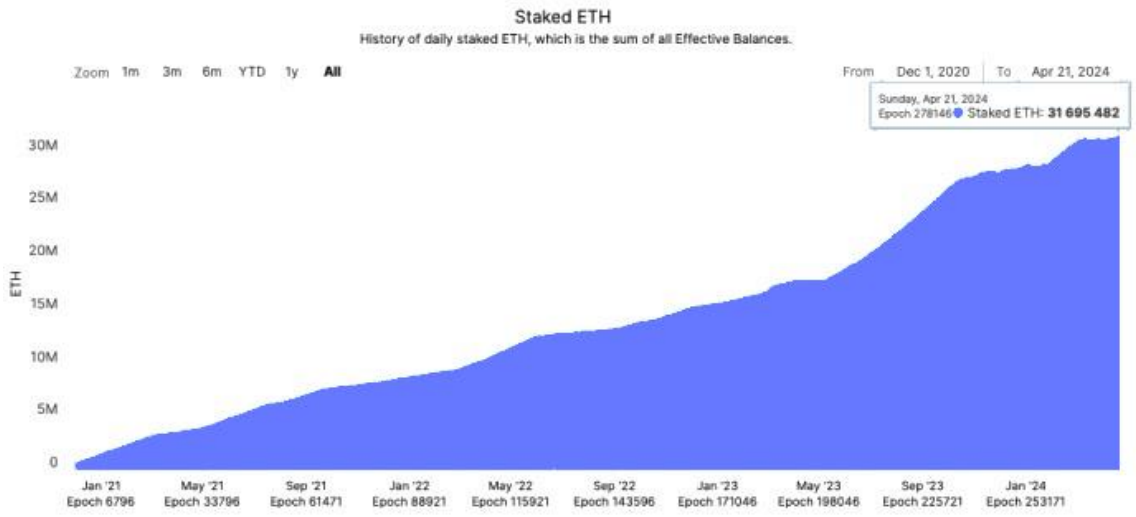
Yield and Energy Efficiency

There are also two additional benefits of PoS related to yield and energy efficiency.

Yield

The rewards generated from PoS networks are a substantial source of what some have called “yield”. Yield generated from staking and participating in a blockchain network could be thought of as having some parallels to a stock dividend that is given in the form of the underlying equity or shares. By contrast, in PoW systems, there is no pathway for an asset owner to receive more of the same asset by participating in the network; PoW assets such as Bitcoin require asset owners to lend out the asset in order to receive yield.

Yield is used to incentivize users to help secure the network by depositing their tokens as collateral. Thus far, the growth of assets being staked has shown that market participants are willing to deposit their capital in return for yield, helping secure the underlying network in the process.



Source: beaconcha.in

Offering staking rewards allows for a more direct means of earning as compared to a PoW blockchain, where mining requires significantly more expertise and resources. A PoS-based consensus mechanism could potentially benefit a wider range of users.

Energy Efficiency

PoW requires computational power for miners to effectively do their job. At a large enough scale, the energy consumed can be extremely significant. As the second largest digital asset by market capitalization, Ethereum was using 5.13 gigawatts on a continuing basis with PoW, or roughly equivalent to the same amount of energy consumed by 2,100 American homes. After transitioning to PoS, Ethereum is using 30,000x less energy.

PoS Adoption

Today, many of the top digital assets by market capitalization are using PoS consensus mechanisms. Ethereum, which is the largest blockchain by Total Value Locked across its DeFi ecosystem, transitioned to PoS in September 2022. Additionally, 12 out of the top 25 digital assets by market capitalization are using PoS. See the table below for details.

Asset	Market Cap Rank	Consensus Mechanism
Ethereum (ETH)	2	Proof-of-Stake
BNB (BNB)	4	Proof-of-Stake
Solana (SOL)	5	Proof-of-Stake
Toncoin (TON)	10	Proof-of-Stake
Cardano (ADA)	11	Proof-of-Stake
Avalanche (AVAX)	13	Proof-of-Stake
Polkadot (DOT)	16	Proof-of-Stake
TRON (TRX)	17	Proof-of-Stake
Chainlink (LINK)	18	Proof-of-Stake
Near Protocol (NEAR)	19	Proof-of-Stake
Polygon (MATIC)	21	Proof-of-Stake
LEO Token (LEO)	24	Proof-of-Stake

Source: Digital Asset Research | Data as of 23 April 2024

Why Staking Data Is Important For Institutions

As institutions seek to expand their offerings in the digital asset space, staking creates opportunities to generate yield and introduce new products. For example, a staking index could be used as a total return benchmark if it tracked the performance of the underlying proof-of-stake asset and any staking rewards that were reinvested. Alternatively, a multi-asset staking index could track the yield associated with a basket of PoS assets.

Similarly, staking strategies can help with portfolio diversification, passive income generation, and contributing to the ability to earn a more predictable rate of return. Various models can be applied to include or exclude specific types of rewards, as well as variables related to validator fees, liquidity, and weighting.

Accurate and transparent staking data serves as the foundational backbone of staking-related strategies. Generally, datasets related to staking should include, at a minimum, details on the amount of tokens that are staked and the amount of tokens earned for each type of reward provided by the blockchain across a standardized time period. Staking data providers should also be transparent about their methodologies and provide details on what is included or excluded in the calculation of their data. For the most accurate data, look to a provider that is running their own nodes and pulling data directly from the blockchain, rather than a provider that is reliant on third-party information.

Conclusion

In conclusion, PoS and staking activities are significant components of the digital asset market. The majority of top assets by market capitalization with smart contract functionality have adopted PoS in recent years. While there are ongoing discussions and improvements that can be implemented in the existing PoS landscape, PoS is currently the dominant consensus mechanism for Web3 and decentralized applications.

Alongside the emergence of staking, institutions now have new opportunities to generate yield and introduce new products. When navigating the staking landscape, accurate and transparent data is a foundational component of strategy development and execution.

Staking Details for Individual Assets

Information on staking for individual assets appears below, in addition to a Glossary that defines terms related to staking.

Cardano (ADA), Ethereum (ETH), and Solana (SOL) are included in this sample.

What is the expected gain of a staker?

We calculate the rewards as the staking return in a PoS consensus context. For each period of block validation and by a forward approach, we prove that the interest is given by the ratio of the average staking gain to the total staked coins. Some additional PoS features are considered in the model, such as slash rate and Maximal Extractable Value (MEV), which marks the originality of this approach. In particular, we prove that slashing diminishes the rewards, reflecting the fact that the blockchain can consider stakers to potentially validate incorrectly. Regarding MEV, the approach we have sheds light on the relation between transaction fees and the average staking gain. We illustrate the developed model with Ethereum 2.0 and apply a similar process in a POW consensus context. For more information see A Crypto Yield Model for Staking Return.

Cardano (ADA)

DAR Asset ID

DA22JZ7

Key Links

Staking Information	https://docs.cardano.org/learn/stake-pools, https://docs.cardano.org/learn/delegation
Explorer(s)	https://explorer.cardano.org/en, https://cardanoscan.io/
Validator Information	https://adapools.org/

Staking Information

Minimum Staked Amount	A wallet must hold a minimum of 1 ADA to be eligible for delegation, while no minimum is required to run a stake pool.
Lock Up Period	No lock-up period when staking to a Cardano stake pool.
Wind Down Period	None.
Slashing Mechanism	There is no slashing mechanism for Cardano, but poor node behavior can lead to missed rewards.

Additional Information

- ADA holders have two options for earning rewards within the Cardano network: Delegate their stake to a stake pool that another user manages or manage their own stake pool.
- Daedalus is a full-node wallet and Yoroi is a browser-based wallet that supports delegation.

Ethereum (ETH)

DAR Asset ID

DASK8KY

Key Links

Staking Information	https://ethereum.org/en/staking/
Explorer	https://etherscan.io/
Validator Information	https://beaconcha.in/validators

Staking Information

Minimum Staked Amount	32 ETH
Lock Up Period	Staking withdrawals were enabled after the Shapella upgrade occurred on 12 April 2023. The maximum number of withdrawals that can be processed in one block is 16.
Wind Down Period	As of the Shapella upgrade, staked ETH can be withdrawn, but there is a daily limit to the amount of ETH that can be withdrawn.
Slashing Mechanism	Minor slashing penalties are imposed for actions or inactions that unintentionally impede consensus. Malicious actions trigger major penalties or slashes. If a validator is slashed, 1/32 of their staked ETH (up to a maximum of 1 ETH) is immediately burned.

Additional Staking Information

- Each deposit of 32 ETH for staking activates a set of validator keys, which are used to validate the network's status.
- A validator will automatically be removed from the validator set if its balance falls below 16 ETH. Validators with a balance approaching 16 ETH are encouraged to "top up" their balance by adding additional ETH.

Solana (SOL)

DAR Asset ID

DAXVC4R

Key Links

Staking Information	https://docs.solana.com/staking
Explorer	https://solscan.io/
Validator Information	https://solanabeach.io/

Staking Information

Minimum Staked Amount	No minimum amount of SOL is required to stake. However, to participate in consensus, token holders must have a voting account, which can cost up to 1.1 SOL daily.
Lock Up Period	Solana has no mandatory lock up period for staking, but a stake account can optionally set a lock up period when it is established. This lockup period can be modified by the stake account's lockup authority or custodian.
Wind Down Period	None at the network level. However, if a lockup was implemented by a validator, then a wind down period may be applicable.
Slashing Mechanism	Solana has slashing rules which, if violated, will cause some amount of the offending validator's deposited stake to be removed from circulation. For validators that go offline or fail to validate transactions during the validation period, their annual rewards are reduced.

Additional Information

- If a stake account is not delegated and all of its tokens are withdrawn to a wallet address, the account at that address is eliminated. It must be manually recreated before it can be used again.

Glossary

Delegation: The process by which token holders delegate their tokens to an entity associated with a staking pool.

Epoch Time: A standardized, specific length of time used to identify a period in which network events occur. An epoch may determine items such as when rewards are distributed or when validators are assigned to validate transactions.

Lock Up Period: A period of time during which validators or delegators are unable to unstake or withdraw their staked tokens.

Minimum Staked Amount: The minimum amount required to participate in securing the network and validating blocks by being a validator or delegator.

Reward Distribution: Rewards distributed to validators and delegators in exchange for their contributions to the network's security and validation processes.

Slashing/Slashing Mechanism: Mechanisms that are implemented to maintain the integrity of the network by penalizing participants who engage in behaviors that could harm the network's security or stability.

Slot Size: The period of time for which transactions can be processed in a single block.

Stake Pools: Pools of funds run by operators who have the knowledge and resources to ensure the node runs consistently. Delegators often stake their tokens through stake pools.

Validator Uptime: A measure of a validator's reliability and consistency in casting votes on transactions added to the blockchain.

Wind Down Period: Any period after a validator or delegator submits a request to withdraw their staked tokens, during which they are unable to access their tokens. Validators or delegators are able to withdraw their staked tokens after the wind down period ends.

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