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(Dis-)Incentives in Proof-of-Stake Cryptocurrencies: Adherence to Protocols or Deviation for Self-Interest

Sascha Hägele
Saarland University, s.haegele@con.uni-saarland.de

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Adherence to Protocols or Deviation for Self-Interest

Sascha Hägele, Saarland University, s.haegele@con.uni-saarland.de

In the ever-evolving field of blockchain consensus mechanisms, Proof of Stake (PoS) has become a pivotal alternative to Proof of Work, with Ethereum's transition marking a key milestone. PoS networks depend on validators who secure the network by staking their cryptocurrency as collateral, earning rewards for validating transactions and proposing new blocks. To maintain network integrity, these systems rely on carefully crafted incentives, encouraging honest behavior through rewards and deterring malicious actions with penalties such as slashing. However, ensuring that these incentives are effective becomes increasingly challenging as validators are exposed to external financial opportunities, particularly within decentralized finance (DeFi) markets. This talk explores how internal and external forces shape validator behavior in PoS systems. On the one hand, PoS protocols are designed to align validator actions with the goals of the network, using rewards and penalties as levers to maintain security and decentralization. Yet, on the other hand, validators operate in a broader financial landscape, where DeFi offers high-yield opportunities that can draw attention away from network priorities. This external financial ecosystem introduces competing motivations, raising the question of whether validators may be tempted to prioritize personal profit over the long-term health of the network. By examining the intricate relationship between protocol incentives and these external financial forces, the talk will shed light on how validators navigate these competing interests. Drawing from economic principles such as principal-agent theory, it will investigate whether current PoS designs adequately account for these external pressures. A theoretical framework will be introduced to explore how validators might balance network participation with opportunities in DeFi markets, and whether existing penalties like slashing effectively discourage self-serving behavior. In addition, agent-based simulations will offer insights into how shifts in market conditions – such as volatility or the emergence of new financial instruments – can influence validator decisions. The complex interactions between validator incentives and external financial dynamics will be modeled to understand how they impact network resilience and security over time. This analysis will illustrate the vulnerabilities that arise when validators have access to external revenue streams that conflict with the network's incentives. Rather than viewing PoS networks as isolated systems, this talk positions them within the larger, interconnected world of decentralized finance. By exploring how internal incentives interact with external financial opportunities, it will provide a comprehensive understanding of the forces shaping validator behavior. Ultimately, this talk aims to stimulate discussion to identify strategies for strengthening PoS systems to ensure they can withstand the complexities of real-world financial ecosystems without compromising decentralization or security.

References

Chitra, T., & Evans, A. (2020). Why stake when you can borrow? https://arxiv.org/abs/2006.11156