

Analysis of Olympus DAO: a popular DeFi model

Ahyun Song*, Euseong Seo*, Heeyoul Kim**

* Department of Computer Science and Engineering, Sungkyunkwan University, Republic of Korea

**Division of Computer Science and Engineering, Kyonggi University, Republic of Korea

fialle@g.skku.edu, euseong@skku.edu, heeyoul.kim@kgu.ac.kr

Abstract— Recently interest in a Decentralized Finance (DeFi) based on blockchain technology is growing. Among them, Olympus DAO is attracting attention as an innovative model that first proposed the concept of Protocol Owned Liquidity and introduced bonding and staking mechanisms that are different from the existing Defi models. However, the unusually high APY and large price drops of OHM tokens have also raised suspicions of Ponzi scams. In this paper, we analyze the mechanism of Olympus DAO in detail and examine the system architecture based on deployed smart contract codes. In addition, after inspecting the market status related to Olympus DAO, we predict future prospects and suggest ways to improve it.

Keywords— Olympus DAO, Decentralized Finance, DeFi, Blockchain, OHM, Ethereum, Smart contract

I. INTRODUCTION

Blockchain is a distributed ledger technology that shares block data in a distributed environment via peer-to-peer network, so that anyone can read the data but cannot manipulate the data [1]. Nodes participating in the blockchain store and share the same transactions and reach consensus to make a new block. Therefore, as the number of nodes increases, decentralization which is the key characteristic of blockchain also increases. Blockchain has the potential to provide a variety of new types of services completely different from existing centralized services because data, services, and decision-making are decentralized in this way. Recently, Decentralized Finance (DeFi), Non-Fungible Token (NFT), and blockchain games are attracting attention.

In this paper, we analyze Olympus DAO [2], which is attracting attention as an innovative model of DeFi 2.0, in detail. Olympus DAO, an Ethereum-based decentralized reserve currency protocol, has been evaluated as having opened the horizon for DeFi 2.0 by proposing the concept of Protocol Owned Liquidity. Assets deposited in the Olympus DAO peaked at the end of 2021 at around \$880 million. However, as of October 2022, when the cryptocurrency market such as Bitcoin and Ethereum is stagnant, it has fallen sharply to about \$269 million. The OHM token price is also down 99% from its peak at \$10.14. Due to the large price drop of the OHM token and the unusually high APY, some are even raising suspicions that it is a Ponzi scam. Therefore, in this paper, we try to find meaningful answers to the

controversies surrounding Olympus DAO and predict the future prospects of Olympus DAO by analyzing the mechanism and market of Olympus DAO.

In section II of this paper, we look into blockchain and DeFi, which is the background knowledge for understanding Olympus DAO. Section III examines in detail Olympus DAO's first proposed Protocol Owned Liquidity, OHM tokens and Treasury that play an important role, and the main mechanisms, Bonding and Staking. In particular, we examine Olympus DAO architecture in depth by analyzing actual smart contracts related to Olympus DAO. Section IV analyzes the Olympus DAO market, predicts future prospects, and draws implications. Finally, Section 5 gives a conclusion.

II. BLOCKCHAIN AND DEFI

In a blockchain platform, the nodes store and share blocks containing various transactions such as transmission and exchange and are rewarded for mining new blocks. The blockchain platform adds new blocks by achieving consensus among nodes through a consensus algorithm such as Proof of Work (PoW) or Proof of Stake (PoS) [3]. Bitcoin [4] and Ethereum 1.0 use Proof of Work as their consensus algorithm, and Ethereum 2.0 uses Proof of Stake [5].

DeFi is a blockchain-based decentralized financial system that uses cryptocurrency [6]. In traditional finance, a centralized financial organization records and manages all transactions on a central server, but DeFi records and executes transactions in the blockchain using smart contract technology. DeFi is receiving attention as it can provide new alternatives to information asymmetry between financial companies and users, high transaction fees, and transaction delays, which have been considered structural problems that traditional financial system cannot solve.

For example, in a secured loan service, a centralized organization determines important matters such as the interest rate of a loan and the amount that can be borrowed in traditional financial systems, whereas in DeFi, the loan interest rate is set transparently by supply and demand on the blockchain. Users can borrow as much as they want with their cryptocurrency as collateral. At this time, the collateral is stored in the smart contract, and if the value of the collateralized cryptocurrency is lower than the value of the loan, the smart contract sells it to the market and repays the loan amount. In this case, the safety of the loan service is

supported by the secured cryptocurrency of the borrower and the smart contract technology.

Stable tokens and decentralized exchanges have important meanings in the DeFi ecosystem [7], so it is necessary to investigate them. First, stable tokens are tokens whose price does not change. Most cryptocurrencies such as Bitcoin and Ethereum have very high price volatility, so there has been a demand for stable tokens in the DeFi ecosystem. The representative stable tokens are USDT and DAI. USDT is a centralized solution for stable tokens, and the company issuing USDT converts it to 1 USD for 1 USDT, so 1 USDT is always worth \$1. DAI is a stable token created by the DeFi project merging loan and stable token on the Ethereum blockchain, and 1 DAI is worth \$1. This DAI project enables users to create DAI when they put ETH into the smart contract and allows users to return the ETH they originally put whenever they put DAI into the smart contract.

Uniswap [8] is the most representative and successful decentralized exchange, and it provides liquidity using the Automated Market Maker (AMM) system. In the AMM system, the liquidity provider provides two tokens to the liquidity pool, and these two tokens are tied to smart contracts. Users utilize the liquidity of this pool to exchange tokens and pay a fee of 0.3%, which goes back to the liquidity provider.

Following the success of Uniswap, various protocols have emerged that give out self-issuing tokens to hold long-term liquidity providers in the liquidity pool. However, as the token price falls due to an increase in token circulation, the profits of liquidity providers also fall. Thus, liquidity providers seek alternative liquidity pools that provide higher interest rates and withdraw liquidity from the pool after only a short period of time. This has led to the critical risk of exhausted liquidity, so there have been concerns about how to lock liquidity in the liquidity pool for a longer period of time.

III. ANALYSIS OF OLYMPUS DAO MECHANISM

A. OHM Token and Treasury

Olympus DAO first introduced the concept of Protocol Owned Liquidity (POL), and the treasury operated by a Decentralized Autonomous Organization (DAO) guarantees the value of its own token, OHM. Since OHM tokens must be backed by at least \$1 in value, no new tokens will be issued unless the assets owned by the treasury increase. If the price of OHM tokens drops below \$1, the protocol buys and burns OHM to hit \$1.

Olympus DAO's treasury is run by DAO, a decentralized autonomous organization. Governance of the DAO, including policies related to the treasury, is done by voting by OHM token holders. Since DAO is managed based on smart contract, it can be operated transparently and is not affected by external factors. In addition, the treasury is protected from hacking with 4-of-7 multi-signature.

Assets in the treasury are not sold and are used to back the value of OHM tokens. The treasury can increase the assets in the treasury through the following activities: First, Olympus DAO owns liquidity directly, so if the volume of OHM token trading in the DEX increases, it will be compensated for

providing liquidity. Next, the difference between the sale price and the issue price is added to the treasury through new bonding. In addition, by applying the bonding process through Olympus Pro, it helps other DeFi protocols acquire their own protocol liquidity and receives a fee of 3.3%.

B. Bonding and Staking

Staking and bonding designed based on game theory are the core mechanisms of Olympus DAO. Olympus DAO participants can earn interest income by staking and purchase OHM tokens at a discounted price through bonding. In addition, the Olympus DAO protocol can ensure the stability of the protocol by directly owning the treasury assets and liquidity through staking and bonding. The detailed operation method of bonding and staking is as follows.

Bonding plays an important role in increasing the assets owned by the treasury. Bonders can purchase OHM tokens at a discount from the market price. The bonder can hold the OHM token and participate in staking or sell it after a certain period of time, which is about 5 days by default, to get a profit. The protocol will increase the treasury assets by receiving the payment for purchasing tokens from the bonder. Whenever OHM tokens are newly issued, the same amount of OHM tokens is also issued to the DAO fund used for protocol operation. For example, if the market price of OHM tokens is \$1,000 and the discount rate is 5%, the bonder will pay the discounted price of \$950 virtual assets to purchase 1 OHM token. The protocol deposits \$950 virtual assets in the treasury and issues two OHM tokens for \$2, one to the bonder and one to the DAO fund. This results in the treasury of \$948 in revenue, which can be distributed to the stakers.

Through staking, the staker locks the OHM token and receives rebase rewards accordingly. Olympus DAO drives demand for OHM tokens by offering high APY to stackers. When OHM tokens are staked, the staker will receive the same amount of sOHM. And the quantity of sOHM tokens increases by once every 8 hours according to the APY, the yield given by the smart contract. The staker will receive the same amount of OHM tokens as sOHM when unstaking.

Bonding and staking can affect OHM token price as follows: An increase in bonding increases the treasury assets and increases the stability of the protocol. This induces users to stake OHM tokens, and as the number of tokens in the market decreases, the OHM token price rises. When the market price of OHM tokens rises, the demand for liquidity increases and bond discount rate rises, which further increases bonding. On the other hand, if bonding decreases, the growth of the treasury asset will stagnate, and the stability of the protocol will decrease. As a result, users will not be staking, and the OHM token price will fall as the token circulation volume increases. When the market price of tokens decreases, the demand for liquidity decreases and the bond discount rate also decreases, so bonding is further reduced.

Olympus DAO uses (3,3) memes to explain Olympus DAO game theory strategies. Olympus DAO participants can take three actions: staking, bonding, and selling. Staking and bonding, which increase the value of OHM tokens, are positive actions for the protocol, but selling can cause the

protocol's value to decline. The following table quantifies the profit and loss according to the actions of Olympus DAO participants. First, +2 points, +1 points, and -2 points are given as basic points for each action of staking, bonding, and selling. In addition, +1 point or -1 point is given in consideration of the profit or loss caused by the actions of others. That is, the staker gets additional OHM and there is a price increase due to a decrease in circulation, so +2 points are given. The bonder gets OHM but does not affect the price, so gets +1. The seller loses the OHM and suffers a loss from the price drop, so he receives -2 points. According to Olympus DAO game theory, it can be said that it is reasonable for participants to choose bonding or staking to maximize their respective interests.

TABLE 1. OLYMPUS DAO GAME THEORY

	Stake	Bond	Sell
Stake	(3, 3)	(1, 3)	(-1, 1)
Bond	(3, 1)	(1, 1)	(-1, 1)
Sell	(1, -1)	(1, -1)	(-3, -3)

C. Architecture and Smart Contract

Currently Olympus DAO is running on the Ethereum mainnet. We analysed the deployed smart contract codes in [9] which can be also seen in Etherscan and figured out the system architecture of Olympus DAO as shown in Figure 1. Specifically, we derived the overall flow of the model by identifying the roles and functions of smart contracts and analysing the relationships between smart contracts. The role of each smart contract is as follows.

- **OlympusERC20** is an implementation for OHM token as reserve currency issued by Olympus DAO, and it complies with ERC20 standard. In Olympus DAO, both SafeMath and SafeERC20 libraries are applied to enhance security for all tokens including OHM.
- **sOlympusERC20** is an implementation for sOHM token that OHM owners receive at a 1:1 ratio when staking, and it also complies with ERC20 standard.
- **gOHM** is a token implementation that wraps the existing sOHM, which was introduced to increase transaction flexibility.
- **OlympusAuthority** acts as the owner of OlympusERC20 contract, and multi-signature of Gnosis safe is applied for security improvement.
- **Treasury** acts as a vault for storing the collected assets and is protected by 4-of-7 multi-signature. Only this Treasury contract can mint new OHM.
- **OlympusBondDepositoryV2** manages various bonds such as OHM-DAI LP bond and FRAX bond. The user can purchase bonds by calling *deposit()* function and exercise the bond by calling *redeem()* function.
- **OlympusStaking** is a smart contract that manages users to stake their OHM and receive rewards. When a user stakes his or her OHM, an equal amount of sOHM is paid. Conversely, when the user unstakes, this contract receives sOHM and pays the corresponding

OHM. For user compensation, it requests a rebase from sOHM to make rewards every 8 hours. After that, the Distributor contract is called to distribute the rewards to the stakers.

- **Distributor** takes the newly issued OHM from Treasury and distributes it to the stakers to provide rewards.

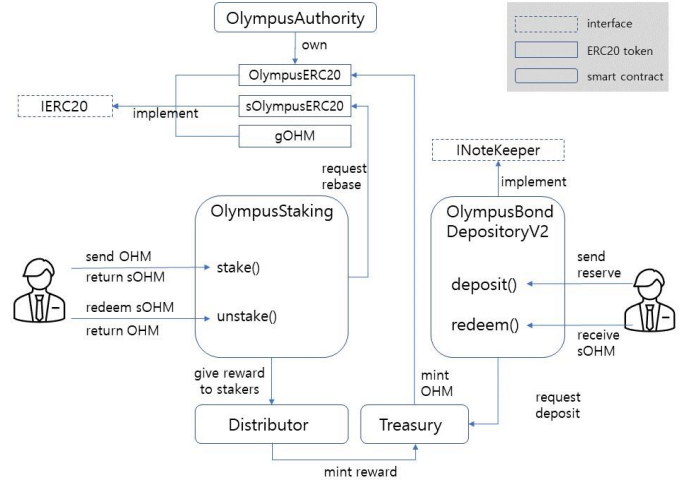


Figure 1. Olympus DAO System Architecture

IV. ANALYSIS OF OLYMPUS DAO MARKET

A. Participants and Market of Olympus DAO

Protocol Controlled Value (PCV) is the total amount of assets deposited in Olympus DAO. This is used as one of the indicators of how successfully the Olympus DAO is attracting attention to active market participants. After Olympus DAO launched in March 2021, the PCV peaked at \$880 million at the end of 2021, but has since dropped sharply and is now at \$269 million. The recent decline is not only due to the overall slump in the cryptocurrency market, but also due to the reduced market interest in Olympus DAO and fewer new participants.

The market price of OHM tokens is \$10.14 as of October 2022, which is a 99% drop from the peak of \$1,415 in April 2021 (the second peak is \$1,334 in October 2021). In addition, the value of the assets owned by the treasury divided by the number of OHM tokens currently in circulation is called the backing per OHM, and it is an objective numerical expression of the value of OHM tokens currently in circulation. As of October 2022, the backing per OHM is \$10.34, which is similar to the market price.

With the declining trend of the cryptocurrency market from the end of 2021, most DeFi services that issue their own tokens are experiencing a rapid decline in token prices, and Olympus DAO is no exception. Moreover, as Olympus DAO has claimed that POL can solve this problem, negative opinions about Olympus DAO are increasing due to the sharp drop in token price. For reference, the POL, which represents the amount of liquidity owned by Olympus DAO's Treasury, is maintained at about \$66 million as of October 2022.

The number of holders of OHM tokens, commonly called Ohmie, is 77,000 as of October 2022, and has been declining since the peak of 88,000 in early 2022. OHM token holders can be seen as participants in the Olympus DAO after all. Like most Defi models, Olympus DAO is a model that can maintain high APY only when new capital is continuously inflowed by new participants. Therefore, the fact that the number of new participants is not increasing and the number of token holders is rather decreasing indicates that the current situation is not good. Olympus DAO's APY has been continuously declining from the initial tens of thousands of percent, and as of October 2022, it is at 212.6 percent.

Risk Free Value(RFV) refers to the minimum backing asset to guarantee the value of OHM token among PCV. Since PCV can fluctuate in value according to market volatility, RFV is only conservatively calculated with stable coins. RFV is used to calculate the runway, the remaining period for which new OHM tokens can be paid with a specific staking APY, and to assume the worst-case scenario. If the RFV increases due to an increase in assets owned by the treasury, or if the APY is adjusted low, the runway value increases. Due to the recent decline in APY, the runway has increased to 759 days.

B. Prospects of Olympus DAO

Existing Defi 1.0 models usually use a strategy of setting the APY high to quickly increase the PCV of the liquidity pool at the beginning, and then lowering the APY when the PCV grows sufficiently. As a result, most liquidity providers benefit from the initial high interest rates and then move to another new pools, which often lead to bank runs and project failure.

Olympus DAO has argued that POL would solve this problem because it controls liquidity by allowing the protocol to own most of the liquidity. However, in the end, the price itself is determined by the market, and the price of OHM is very unstable. Olympus DAO has inflation risk if token issuance is continued due to high APY, and there is also a risk of price decline due to unstaking if APY is lowered. In particular, if all participants panic in a bear market, there is a risk that the market value of the Treasury assets and OHM token price will decrease. Actually, after the end of 2021, PCV, OHM token price, and APY has been declining significantly from the peak. Especially, when a large-scale sale of 82,526 OHM occurred on January 17, 2022, this event triggered a major price drop in OHM. Since then, the price has continued to decline, and as Olympus DAO claims, the protocol purchased OHM by using of the assets in the Treasury to defend the price, but it has not been able to stop the downward trend so far. As a result, the criticism that Olympus DAO cannot withstand the downtrend like other Defi models is growing.

To solve the above problem, Olympus DAO started to provide inverse bonds introduced in OIP-76 from March 2022. An inverse bond is a bond in which OHM holders can sell their OHM back to the Treasury for slightly more than the market price if the OHM market price falls below the backing price. This is exactly the opposite of the process in which the Treasury issues OHM after selling bonds and purchasing

assets. Olympus DAO explains that through these inverse bonds, the Treasury absorbs OHM and reduces the market circulation, thereby increasing the backing price. However, the market price of OHM still has continued to decline since the adoption of inverse bonds. Until now the effect of inverse bonds is not yet visible, and it remains questionable whether it will be helpful in defending price.

Olympus DAO's APY has decreased a lot compared to the initial period, and the overall cryptocurrency market is stagnant. Thus, it is difficult to expect an increase in OHM price in the short term. And one of the factors that obscures the future of Olympus DAO is that there is no real use case of OHM tokens. OHM tokens are only used to obtain profits through staking, and it is necessary to find various use cases such as linking with other Defi models or other blockchain-based services.

V. CONCLUSIONS

In this paper, we analyzed the mechanism and system architecture of Olympus DAO, a representative DeFi 2.0 model, and provided analysis and prospects for the relevant market. Olympus DAO tried to solve the liquidity problem of existing DeFi models with a new POL concept and succeeded in attracting public attention. However, along with the overall recession in the cryptocurrency market, Olympus DAO is also experiencing difficulties such as price drop. Olympus DAO must overcome the current difficult situation and show that it can operate stably and continuously, and only then will prove that it can perform its role as a reserve currency as they claim.

ACKNOWLEDGMENT

This research was supported by Basic Science Research Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Education(No. 2020R1A6A1A03040583)

REFERENCES

- [1] A. A. Monrat, O. Schelén and K. Andersson, "A Survey of Blockchain From the Perspectives of Applications, Challenges, and Opportunities," *IEEE Access*, vol. 7, pp. 117134-117151, 2019.
- [2] (2022) Olympus DAO official site. [Online]. Available: <https://www.olympusdao.finance/>
- [3] W. Wang, D. T. Hoang, P. Hu, Z. Xiong, D. Niyato, P. Wang, Y. Wen, and D. I. Kim, "A survey on consensus mechanisms and mining strategy management in blockchain networks," *IEEE Access*, vol. 7, pp. 22328-22370, 2019.
- [4] S. Nakamoto, "Bitcoin: A peer-to-peer electronic cash system," *Decentralized Business Review*, Oct. 2008.
- [5] (2022) Ethereum site. [Online]. Available: <https://ethereum.org/en/developers/docs/consensus-mechanisms/pos/>
- [6] C. R. Harvey, A. Ramachandran and J. Santoro, "DeFi and the future of finance", Wiley, 2021.
- [7] B. Lim, "Understanding of Decentralized Finance(DeFi) and Its Implications", *Global Financial Review*, Vol.2, No.1, March 2021.
- [8] (2022) Uniswap official site. [Online]. Available: <https://uniswap.org/>
- [9] (2022) Olympus DAO Github site. [Online]. Available: <https://github.com/OlympusDAO/olympus-contracts>



Ahyun Song received the M.S. degree in Computer Science from KAIST, Korea, in 2005. From 2005 to 2015 she was a manager at Korea Financial Telecommunications & Clearings Institute. Since 2015 she has been a senior manager at Financial Security Institute in Korea. She is pursuing the Ph.D. degree in Computer Science and Engineering at Sungkyunkwan University. Her major research interests include security, blockchain, and DeFi.



Euiseong Seo received his B.S., M.S., and Ph.D. degree in computer science from Korea Advanced Institute of Science and Technology (KAIST) in 2000, 2002, and 2007, respectively. He is currently a professor in Department of Computer Science and Engineering at Sungkyunkwan University, Rep. of Korea. Before joining Sungkyunkwan University in 2012, he had been an assistant professor at Ulsan National Institute of Science and Technology (UNIST), Rep. of Korea from 2009 to 2012, and a research associate at the Pennsylvania State University from 2007 to 2009. His research interests are system software, embedded systems, and cloud computing.



Heeyoul Kim received the B.E. degree in Computer Science from KAIST, Korea, in 2000, the M.S. degree in Computer Science from KAIST in 2002, and the Ph.D. degree in computer science from KAIST in 2007. From 2007 to 2008, with the Samsung Electronics as a senior engineer. Since 2009 he has been a faculty member of Department of Computer Science at Kyonggi University. His major research interests include cryptography, security and blockchain.