

Liquid Labs

The purpose of this paper is to highlight some of the basics around the Liquid token, the underlying protocol that developed the token and highlight economic security risks associated with the protocol. This is an educational and informative document developed by the Cardano Token Engineering Lab.

Token Analysis

Liquid is a Cardano DeFi Lending protocol that supports the lending and borrowing of assets in a peer-to-pool structure. Lenders can provide multiple assets to each respective lending pool and prospective borrowers can borrow said assets. On top of the Liquid protocol, governance has been designed to allow token holders to vote on proposals to modify the protocol. This case study will evaluate the Liquid Protocol and go into detail on:

- **Utility** - Explore all the various ways an end user can utilize tokens within the protocol.
- **Distribution/Emissions** - This will review the supply-side tokenomics around allocating tokens to various stakeholders. It will also encompass the different methods by which tokens are designed to be put into circulation.
- **Incentive Design** - A key principle to drive desired behaviors is through mechanism design. The perceived output should align with the desired response by aligning incentives with actions. A thorough review of all the mechanisms included in the protocol will be highlighted and detailed on how they are intended to work.
- **Economic Security** - A major factor in understanding the risk to a protocol is evaluating its economic security to ensure that incentives or actions do not have vectors that a bad actor could exploit.
- **Findings and Recommendations** - Upon review of the protocol documentation and diving into the particular design aspects above, conclusions and recommendations will be made and suggested to the protocols for improvements.

Project Founders and Entity:

Organization Name: Liqwid Labs LLC¹

Established: 2021 out of Sheridan, WY

Founders: Dewayne Cameron, Florian Volery

Funding Round on 3/17/2022: N/A

Funding Round Investor: Wave Digital Assets

Seed Round Funding on 12/1/2022: \$2.7MM

Seed Round Investors: Shima Capital, Optim, Genblock Capital, Double Peak Group, cFund (Lead Investor), Bittrue, Animoca Brands, Altonomy

Liqwid Token Overview (LQ)

Token Name: Liqwid DAO Token

Policy ID: da8c30857834c6ae7203935b89278c532b3995245295456f993e1d24

Asset Name: 4c51

Fingerprint: asset13epqecv5e2zqqzaxju0x4wqku0tka60wwpc52z

Max Supply: 21,000,000

Token Generation Event (TGE): Mar 1, 2021 3:47:37 PM

TGE Tx Hash: 344c26673b9256b10e215d86095d9eb3c63def4b5a31cf50f12d4a133024eabc

Token Utility

Participants	Objective	Interaction	Output
Lenders	Supply capital for monetary gain	Provide assets to the lending pool	Receive interest-based incentives for the duration of tokens in the lending pool
Borrowers	Withdraw capital to maximize output potential	Borrow assets from the lending pool	Receive assets to utilize outside of the protocol
Liquidators	Liquidate loans that fall below the liquidation threshold	Pay off the bad debt accrued from borrowers that are below the liquidation threshold	Receive a portion of the collateral that
DAO Governance	Improve and grow DAO functionality and operations	LQ Stakers voting on DAO proposals	Impact changes to the governance and functionality of the protocol
Aquafarmer NFT Holders	Rewards Enhancements	Hold NFT while interacting with the protocol	Higher rewards yield (boosted rate)
LQ Stakers	Long-term value holders of LQ token	Deposit tokens in a liquid staking contract	Receive LQ staking rewards
Traders/ Speculators	Short-term speculation on LQ price	Swapping token on DEXES	Extract value from price movements

¹ [Crunchbase Info on Liqwid Labs](#)

Token Distribution:

LQ Allocation	% of Supply	LQ Distribution
User Distribution	47.5%	9,975,000
DAO Treasury	16.0%	3,360,000
Safety Pool	10.0%	2,100,000
Airdrop	1.5%	315,000
Core Team, Founders, Advisors	25.0%	5,250,000
Total	100.0%	21,000,000

The token allocation for the Liqwid protocol is broken down in the graphic above. 49% of the tokens are allocated to the community via incentives to use the protocol and through the initial Discord Airdrop. The Core Team is allocated 25% of the total supply and is held by a smart contract that releases the tokens on a linear per-epoch basis for two years, starting at the launch of v1. The Core Team includes the founding team, advisors, and technology partners. Lastly, the DAO was initially funded with 16% of the total tokens generated.

Recent creation of the POL (protocol-owned liquidity) pool has allowed the team to utilize the DAO Treasury for operations while the protocol pays back the loan over time. This provides the team additional runway and places some additional risks on the token being utilized as a loan to the team.

To maintain transparency around the project's token allocation, adahandles were utilized for each token allocation²:

Liquid DAO Treasury: `$liqwid.treasury`

`addr1xx0cj23c0mhfht6uj74x6ytr6c3jr3gnxd3tthdemcxdulrw7xjpplgp0lahw2u869nn77avyd3vw96p4jhtdrykyt4safjps8`

LQ Staking rewards: `$liqwid.staking`

`addr1x8t020h8h56wrlvs68zee7gps608txntmtxshst0fn0jj8x4nnkuvxxnky367gpfnja0efspn5zlx7a6wvu9wava0l2qwlvsz5`

User Distribution LQ rewards: `$liqwid.userdist`

`addr1xx48fc6r9tl7du7mjx4m6l52a9up2l2gk0vjkdix5fytlf9eskpm0zchx4z54zlk38w0y7sls2djt9gtmfyef2c4h47snfqcs9`

Core Team: `$liqwid.team`

`addr1x8hnww9fyqjq076cqq48qhklyn849daytat3kcxtydhcqvqg247jylz4mwn5d7fgjrr70v5wvyz9el7dt5jjswekhuvzq0dmfjq`

² [@liqwidfinance X Post](#): Regarding @adahandles used for treasury wallets

Token Emissions:

The token emissions for Liqwid have seen many updates since the launch of the v1 protocol³⁴⁵⁶⁷⁸. The main ways that the LQ token is distributed each epoch are the following mechanisms.

User Distribution (Lending/Borrowing Incentives)

LQ token distributions are made with a 4-year time horizon to support user distribution rewards. This was originally written to incentivize lenders and borrowers, but more recently catering to lenders⁵. The changes in the user distribution rewards have originally been implemented to provide healthy incentives to bootstrap the protocol and then focused on improving liquidity of stablecoin markets (primarily iUSD and DJED markets). More recently user distribution rewards have been scaled back to reduce token velocity via emissions and to create a more sustainable market for the LQ token.

The current breakdown of the user distribution reward emissions is 25,000 LQ tokens monthly distributed across all lending markets. The distribution of the rewards is now completely based on the utilization of each market based on interest accrued (50% of total rewards) and interest paid (remaining 50% of total rewards).

Safety Pool (LQ Staking)

The Agora staking contract is designed to accept users' tokens as a safety pool and an insurance policy against bad debt and loans. The emissions connected to the LQ Staking rewards have seen modifications through the life of the protocol, with boosts enabled by holding the project's Aquafarmer NFT and rate adjustments. Similar to the user distribution rewards, the initial high emission rewards for LQ stakers have been reduced to mitigate the side effects of high inflation as more tokens are released into the circulating supply and token velocity.

The current breakdown of LQ Staking rewards is a flat, annualized base rate of 5% for all stakes. Additionally, Aquafarmer boosting rates are still available. While transitioning to the new emissions, a temporary rate boost will be applied for all stakes older than 6 and 12 months. The boost will give a staked credit for 300% of the stakes older than 6 months and a credit of 500% for stakes older than 12 months. These boosted rewards will apply to all stakes from the beginning of July 2024 to the end of Dec 2024.

³ [Liqwid Governance Proposal 0](#): Increase LQ Staking APR and Update REwards Calculation Model

⁴ [Liqwid Governance Proposal 4](#): Transition to Dynamic Rewards Emissions

⁵ [Liqwid Governance Proposal 6](#): Increasing Yield Boosting Percentage for Aquafarmers NFTs

⁶ [Liqwid Governance Proposal 29](#): Update LQ Market Participation Rewards

⁷ [Liqwid Governance Proposal 45](#): Update Market Participation Rewards: Remove Borrower Rewards

⁸ [Liqwid Governance Proposal 46](#): Update Market Participation Rewards: Reduce Supplier Rewards

DAO-based incentives (funded via DAO treasury if any incentive program is approved via Governance)

Throughout the protocol's life, no meaningful DAO-based incentives can be proposed through the governance framework of the Liqwid DAO. The DAO treasury has had proposals passed or up to vote (as of writing this review) to utilize the DAO treasury for liquidity or funding purposes. One instance where the DAO treasury was successfully leveraged in governance was through the creation of the POL loan to the team. This enabled the team to leverage the DAO treasury for operational flexibility and the ability to pay off the loan through protocol usage and growth.

Incentives Designs

Lending and Borrowing Protocol Design

The key value proposition of the Liqwid protocol is its lending and borrowing mechanism. Incentives allow agents to lend or borrow assets from the protocol to maximize their self-interest. The two key agents are lenders and borrowers, where lenders collect rewards for supplying assets to the protocol and borrowers get access to assets to use outside of the protocol. Within this protocol design, various mechanisms work together to incentivize agents, provide security to the assets in the protocol, and generate value for the protocol. One thing to note is that the design and the implementation of Oracles are embedded across different mechanisms as a sub-mechanism. The protocol mechanisms are detailed below highlighting how value flows through the mechanism and risks and mitigations to each mechanism that are in place.

- Lending Mechanism
 - **Process for Lending⁹:**
 - A lender supplies an asset into a lending market and is sent qTokens for that asset. qTokens represent a claim to the supplied underlying token and a dynamic exchange rate to the asset. The dynamic exchange rate is a function of the interest accrued from the market for that asset and the volume of the supplied asset.
 - After supplying assets, the lender claims underlying tokens and interest accrued via the qTokens value and burns them through the smart contract interaction.
 - **Value Creation and Accrual:**
 - **Protocol Side:** As a facilitator in the lending/borrowing process, the protocol collects fees from the interest collected. A loan origination fee is also utilized to provide value for the DAO treasury at 50% of the origination fee.
 - **End User Side:** The lender collects a majority of the interest collected by supplying assets to a lending market. Similarly to the DAO treasury, LQ stakers are rewarded with 50% of the origination fee.
 - **Internal (Protocol) Risks & Mitigations**

⁹ [Liqwid FAQ](#)

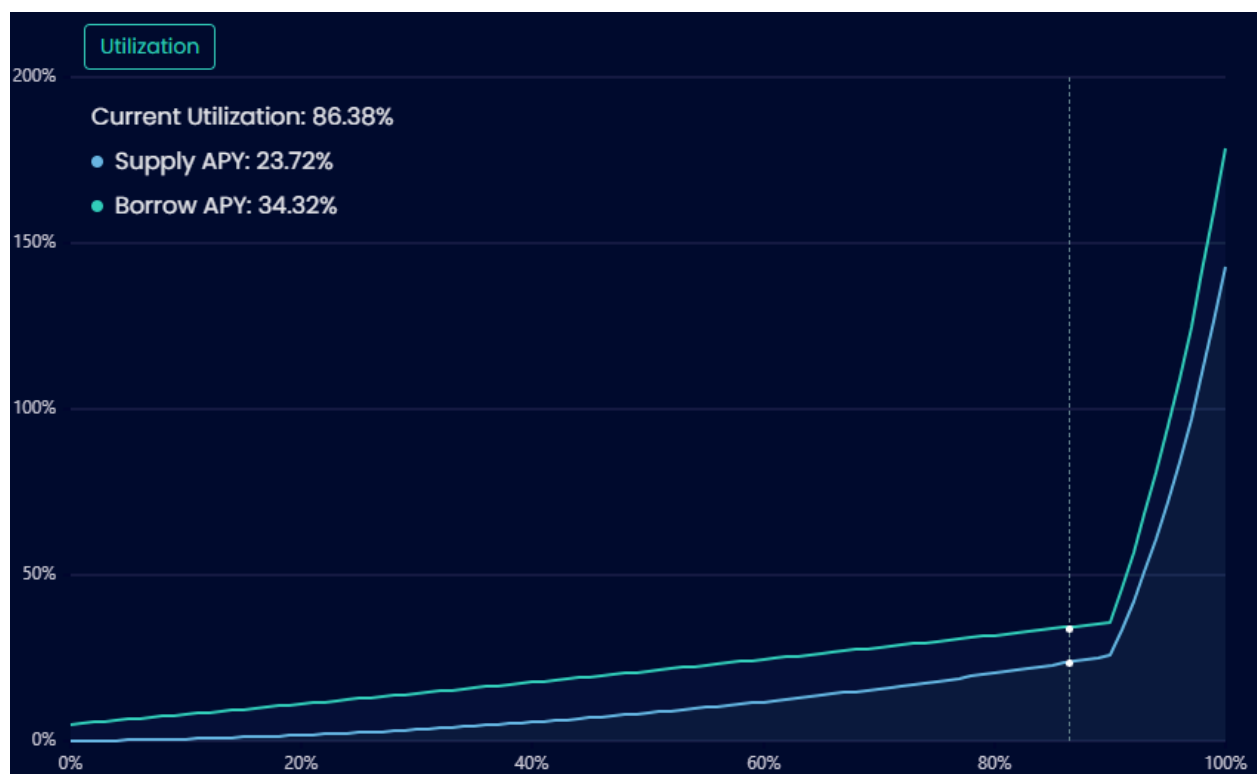
- **Bad Debt (Risk of Default):** Borrowers that default on their debt place the supplied assets at risk. If assets have defaulted this could create a scenario that lenders cannot access their supplied assets. Overcollateralization helps provide a cushion for loans to enable a threshold and an incentive to liquidate the loan preserving the assets before they default.
- **External (Market) Risks & Mitigations**
 - Market Volatility: All DeFi products have macro-risks associated with economics outside the protocol. This could lead to collateral losing value, increasing the risk of default. Liqwid has implemented a Guardian system that allows a core team member to kill the protocol if something goes wrong.
- **Borrowing Mechanism**
 - **Process for Borrowing¹⁰:**
 - The ability to borrow assets from Liqwid is a two-step process where the user supplies collateral to the protocol and subsequently borrows a different asset. There are many variables and dynamics that a borrower must be aware of before accepting the risks of borrowing. The variables in play are:
 - Loan Health - The value of the collateral posted must be higher than the amount of the loan. The loan and collateral value, depending on the assets, is time-dependent and asset volatility can add more risk.
 - Loan parameters—When borrowers take out a loan, they pay a 1% loan origination fee and a dynamic interest rate that is based on utilizing the borrowed asset in the protocol.
 - Liquidation Threshold - The minimum ratio of value for borrowed assets to collateral, falling below this threshold will trigger a liquidation of the loan.
 - **Value Creation and Accrual:**
 - **Protocol Side:** As a facilitator in the lending/borrowing process, the protocol collects fees from the interest collected.
 - **End User Side:** The lender collects a majority of the interest collected by supplying assets to a lending market
 - **Internal (Protocol) Risks & Mitigations**
 - Collateral Risks - If the collateral begins to fall below the borrowed amount, it can pose a risk that exposes the protocol to bad debt. The liquidation mechanism will ensure the protocol stays sound by selling off collateral to pay off the loan before it becomes undercollateralized.
 - Interest Rate Risks - Utilization of the markets across the platform is dynamic and could impose volatility on the interest rate. Ceiling and limits

¹⁰ [Liqwid FAQ](#)

on markets can help ensure that markets are not fully utilized to limit dramatic interest rate changes.

- **Dynamic Interest Rate Model**

- **Process of the Interest Rate Model:** The interest rate model consists of various parameters that make it a two-mode model. The initial interest rate is the risk-free borrowing rate, typically modeled after US T-Bills, and is ~5% currently. The interest rate scales at a set slope until it hits a “kink” rate based on market utilization. At the kink rate, the interest rate increase is faster and becomes a deterrent to borrowers. The kink rate and steeper interest rate increases are in place to discourage borrowing in overutilized markets to prevent volatility and loans from being undercollateralized.
- **Value Creation and Accrual:**
 - **Protocol Side:** Capital is dispersed to borrowers allowing them to maximize its value through external means while bringing fees to the protocol via an origination fee and interest.
 - **End User Side:** Accessible capital for a programmatic rate tied to utilization.
- **Internal (Protocol) Risks & Mitigations**
 - Rate Volatility is a key concern for large market movements in which suppliers are moving assets out of the protocol. In a young DeFi environment like in Cardano, this is a risk during large price movements of Ada. Mitigations include allowing Guardians or core members of the protocol to shut down markets approaching unsafe limits.



An example of the bi-modal interest rate where a kink point at 90% loan utilization is in place to dramatically increase the interest rate at higher utilizations

- Collateralization Mechanism
 - **Process for Collateralizing Borrowing:** A critical piece to ensure that the suppliers of loans are protected against rogue borrowers is enforcing loans to be overcollateralized. It is also important that an asset meets the criteria as collateral to ensure that it is liquid enough to liquidate loans quickly and without much slippage.
 - **Value Creation and Accrual:**
 - **Protocol Side:** Overcollateralization protects the protocol and by proxy lenders from having funds siphoned off by bad actors since they must supply more value for a loan to occur.
 - **End User Side:** Collateralization in a lending protocol allows a user to maintain exposure to the collateralized asset while getting exposure to the lent asset.
 - **Internal (Protocol) Risks & Mitigations**
 - Depreciating assets could cause loans to be undercollateralized, making it difficult to liquidate them promptly. Allowing the liquidation process to be accessible to external parties and automated by liquidation bots helps to incentivize others to manage the liquidation process.
- Liquidation Mechanism
 - **Process for Liquidation:** Liquidation of loans occurs once the loan value falls below the liquidation threshold. Protocol governance has the power to modify the liquidation threshold.
 - **Value Creation and Accrual:**
 - **Protocol Side:** Protection of supplied assets in a loan.
 - **End User Side:** Users can run liquidation bots to profit from underwater loans.
 - **Internal (Protocol) Risks & Mitigations**
 - External market fluctuations can cause the liquidation process to be inadequate to protect the assets in the protocol. Decentralizing the process by allowing bots to run and be managed by external parties helps to mitigate the risks and incentivize others to secure loans.

Economic Security Risks

Price Oracle Manipulation Risks

The Liqwid dApp has already been exposed to two critical events connected to Oracle price failures. In both incidents, the Liqwid core team has responded by implementing various risk mitigation practices to limit the probability of incidents occurring. Oracle Price and Oracle Manipulations are two risks that are common failure mechanisms that occur in DeFi across all

chains. For this reason, a solid basis behind how a protocol utilizes oracles are one of the most important pieces of a modular DeFi stack. Given the limited solutions currently live in Cardano and many notable Oracle-based projects not participating (ie Chainlink, Pyth, etc..) in the Cardano ecosystem, it introduces potential weak points through non-battle-tested Oracle network solutions. Work within Liqid, other DeFi protocols, and the governing infrastructure body (IOG, CF, Intersect, etc...) should work to improve the situation to provide a robust and stable Oracle solution.

Emissions/Token Velocity Risks

The Liqid protocol has implemented many changes to the emission schedule of the LQ token since TGE. In this process, incentives were rapidly increased from the original protocol emissions schedule getting more LQ tokens into circulation. The increased transactional activity prompted when incentives are drastically increased introduces higher token velocities.

$$\text{Token Velocity} = \frac{\text{Total Transaction Volume}}{\text{Average Token Supply}} \text{ for a given time period}$$

As a governance and staking token, increased token velocities aren't necessarily a good thing as the incentives behind governance- or staking-based tokens are that the tokens are held to be used for voting or locking into a protocol. At higher token velocities, the implied volatility of a token's price comes into effect as more speculative buyers/owners of the token. This increased price volatility will have net negative effects on the incentives to hold the token for governance or staking for a long time. Utilizing the Quantity Theory of Money¹¹ (QTM) as a proxy, token velocity is a factor in the relationship between token supply (M), velocity (V), price (P), and transactional volume (T).

$$M \times V = P \times T$$

The QTM is a novel concept that explains how the price of "money" is an emergent property of the system that it is designed around. Given the price volatility and velocity that are byproducts of the constantly evolving LQ token emissions, this is an area that needs to be explored to ensure that the incentives and behaviors are aligned with how LQ should be used.

Interest Rate Risks

The interest rate model is dependent on many parameters for each asset class and is largely a function of utilization. Parameterization in practice allows flexibility for optimizations and improvements, but the more complex a model is with parameters, the harder it is to understand the implications of changing a single parameter relative to the complete system design. This is not always a possibility, but standardizing parameters based on new assets introduced can help mitigate some risks by intentionally being conservative. This can allow the protocol to "remove

¹¹ [A quantum theory of money and value - David Orrell](#)

the training wheels” once things like liquidity, market utilization, and price volatility risks are well understood.

Leverage Long Loops

Particular lending strategies can create highly leveraged positions for borrowers which under the right circumstances (black swan-like event) could prompt massive liquidations and place assets at risk. Seen throughout other DeFi protocols in the Cardano Ecosystem, a particularly common strategy is to take on debt positions from other assets to swap into ADA, effectively giving a leveraged-long position in ADA to the user. Understanding this trend and performing second-order analysis on loaned assets can help identify what users are doing with lent assets. There is always a balancing act between incentivizing usage and mitigating risks, but understanding how and what users are doing and their tendencies with assets will minimize the risk impact of particular DeFi strategies going afoul.

Governance Risks Towards Protocol Parameters

Given that the protocol is designed to be run through the Liquid DAO, factors, and token distribution need to be well thought through to ensure that tokens are sufficiently decentralized, ensuring that governance risks are not introduced. Protocol lending parameters and governance decisions are wholly enacted by staked LQ votes or delegated votes. This introduces an attack vector of bad actors paying for delegation for votes and/or assuming a large amount of LQ simply for voting purposes. This is especially magnified through low governance token prices and low voter turnout.

Centralization Risks

Another aspect of centralization risks exists around the loan made to the core team. The POL loan to the team allows for the team to leverage funds locked in DAO treasury to enable operational stability. This also can place the token in a precarious position should a black swan event occur or the protocol is unable to pay off the loan through its operation, effectively defaulting on the loan.

In 2023 and 2024, Curve Finance entered into positions where their founder had loans of over \$100MM backed by the CRV governance token liquidated. This put the Curve protocol in a precarious position but was fortunately bailed out by repayments by Justin Sun (in 2023) and the founder (Michael Egorov in 2024).

Findings and Recommendations

Oracle Strategy

The team has already begun implementing Oracle risk mitigation strategies, but continued efforts should be made with the broader Cardano DeFi ecosystem and Cardano-native Oracle providers to develop, test, and implement a robust Oracle solution. Strongly suggest having a team member be a part of the Intersect MBO Oracles working group to help ensure that the needs of the Liqwid protocol are included in any work or outputs from the group. It's also important to note that the Liqwid team has taken very strong actions to try and strengthen its exposure to oracles by leveraging Charli3 oracles and CoinGecko APIs.

Having oracle feeds from a DEX should be avoided as conceivably possible, as this introduces liveness risks associated with the feed and manipulation for a particular pool. TWAP solutions that are currently in use (mentioned as letting price lag over time in governance proposal 42) can be used for solutions that are less mature as an additional safeguard. TWAP on mature assets should be avoided as any activity around it will introduce “fuzziness” to the price with the time dimension being a function of the price feed.

Ossify Emissions Strategy

As the emissions of the protocol have changed numerous times since TGE, ensuring that the protocol stays at the current, more conservative emissions strategy for an ample amount of time will help to understand its efficacy. Ensuring that enough data points are captured on a long time horizon will allow for analysis to determine if the desired behaviors of end users have been witnessed. Key metrics should be measured throughout this time and only if there is a deviation from the metrics should a new emissions model and proposal be considered.

Ossification of the emissions strategy will also help build confidence in the community that the project is operating stably and that any emission changes in the future will be based on objective monitoring of the protocol from the aforementioned metrics.

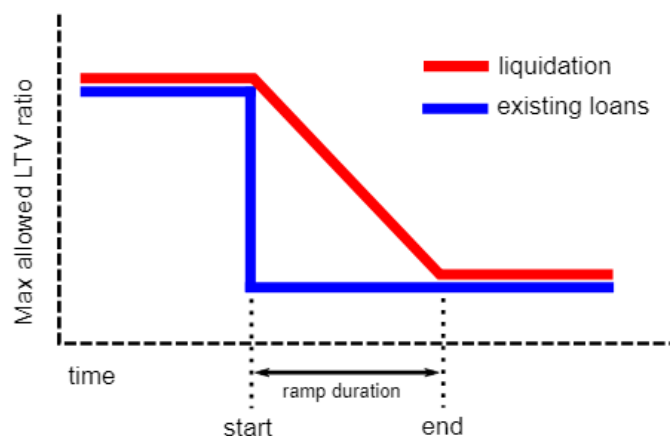
Determine Risk Strategy of Multi-Collateral Backed Loans

The availability of loans backed by multi-collateral assets is widely used across DeFi but introduces increased risk vectors. The challenge would be to ensure that risk parameters for multi-collateral-backed loans are sufficient. An example would be a \$1000 loan backed by \$500 of Asset A and \$500 of Asset B. A loan of ADA with a health factor of 1.5 is taken out, yielding \$667 worth of ADA. The instability of Asset A could be enough to liquidate the loan, although Asset B has maintained its value. Given the nature and volatility of crypto assets, this is a feasible risk that could occur.

Liquidation Mechanism Upgrades (LTV Ramping)

One key feature of liquidation mechanisms is that the liquidation mechanism will kick in and liquidate positions with health factors below the max allowed loan-to-value ratio. If the protocol needs to adjust the max allowed health factor of loan existing loans could be liquidated. The

Euler v2 protocol leverages an LTV ramping solution that allows the governor of a vault to adjust the health factor of a particular market and in doing so could cause liquidation of certain loans. To prevent this instant liquidation, the ramping time duration can be set so that existing loans have time to collateralize their loan before the ramp duration closes. Once the health factor changes and the ramp window starts all new loans will need to meet the new max allowed health factor. This helps protect existing assets on the protocol by providing a time-based buffer and minimizing volatility in the case of black swan events.



Risk Management SubDAO

The conversation of a risk management subDAO has been brought up in the past, but the concept of working with an independent party helps to ensure bias and objectivity are controlled in reviewing the protocol. Although the governance forum allows for anyone to post things, a concentrated group to do research, analytics, and review proposals to push forward helps to decentralize the decision-making and ensure that people with qualified understandings of risk management are driving those decisions.

Creation of KPI/Metrics for tracking Protocol Health

Along the same lines as the Risk Management subDAO, there should be health metrics that the protocol is tracking to gauge whenever protocol parameters need to be updated. For any parameter updates, there should be a signpost in the form of KPIs/metrics indicating that the current parameters used across the protocol are insufficient. To help ensure protocol stability through incentives/emissions, loan/borrowing parameters, or other variable changes that determine how Liqwid operates

Lending Integrations with Other Protocols

As the Cardano DeFi ecosystem develops, first-mover advantages across blockchain do have a noticeable impact on the success of protocols. Liqwid already is the premier lending and borrowing platform based on LTV-based metrics and a move towards additional growth would be allowing yield aggregating protocols or any other DeFi protocols to leverage the lending strengths that Liqwid offers through an API. These efforts have already started with select

partners, but more emphasis and dedicated resources should be shifted toward this effort. This depends on the remaining v2 items left on the roadmap or future v3 efforts.

Documentation for Protocol

Updating the protocol's documentation will help new and experienced users understand the project's current state. Leveraging Notion as a documentation hub has limited UX in the current format. There is no content sidebar to navigate across multiple articles easily, much of the documentation is outdated, and understanding which article/page has the information the user is looking for isn't clear. Utilizing something similar to GitBook or other similar resources for documentation, where the whole contents of the documentation can be navigable easily, will improve the user experience.

In addition, as governance proposals are passed that affect the parameters or functionality of the protocol, the final part of implementing the management of change should be to ensure that documentation matches the protocol's current implementation.