

Automated Liquidator Management Protocol: ALPs

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On the Terra blockchain, the main Decentralised app is a DeFi lending platform called Anchor, holding assets collectively worth 9.8 billion UST (60% of Terra’s total TVL). Anchor protects lenders assets by over-collateralizing loans. If the ability to repay a loan becomes at-risk, Anchor submits these unsafe loans to a liquidation orderbook. Community members can bid on unsafe loans from this orderbook and request a premium of the collateral. This premium can range from 0% – 30%, translating into an equivalent percentage of the profits from liquidations. In this whitepaper, we describe a new class of decentralised automated liquidation protocols, which we call ALPs. As Anchor has an orderbook liquidation system, in contrast to the fixed rate liquidation premium on Aave and Compound, ALPs’ value comes from dynamically submitting bids to the Anchor liquidation orderbook at the most competitive rate. This ensures that users of ALPs obtain the best rate from liquidations. Broadly, ALPs i) has users stake UST into the liquidity provider (LP) pool, ii) uses this UST to perform liquidations and receive collateral at a premium, iii) swaps the collateral for UST yielding the premium as profit, iv) shares the profit between the protocol and LPs, v) and distributes protocol revenue and liquidity mining revenue to LPs. The key feature which makes this protocol novel is the fact that Anchor has an orderbook for liquidations, and as a consequence ALPs can dynamically submit bids at the most competitive price and absorb the majority of the liquidation premiums.

From an LP perspective, users stake UST into the ALPs pool, and later remove their liquidity with profits from liquidations. Moreover, LPs benefit from the start and the end of the liquidation loop being in the UST stablecoin, removing a large fraction of risk from price volatility. This makes ALPs a first-of-its-kind DeFi protocol where stablecoin returns are generated in a crypto deleveraging scenario. As such, users can add ALPs to their portfolio in order to hedge against large downside risk.

I. INTRODUCTION

Decentralized finance (DeFi) has undergone an exponential growth from 2020 to 2022, from a marketcap of approximately 3 billion USD to 150 billion USD. An important aspect of DeFi growth has originated from new decentralized financial instruments maturing from proof-of-concept to semi-reliable products. Decentralized lending platforms have grown in parallel to the overall DeFi ecosystem growth. On Ethereum the leading lending platforms are Aave and Compound, which have 13 billion USD and 12 billion USD respectively. On the Terra blockchain, the main Dapp is called Anchor, which holds assets collectively worth 9.8 billion UST. In fact, Anchor accounts for 60% of Terra’s total TVL.

DeFi lending platforms need to protect the lenders assets. Without over-collateralization of the borrowers liability, malicious borrowers could not return the liability and consequently the lenders would lose a proportion of their assets. However, with a sufficient over-collateralization value, called the loan-to-value ratio, lenders assets are protected against both malicious borrowers and a slow devaluation of the collateral [1]. A loan can be deemed unsafe if the collateral’s price decreases sufficiently, in which case (part of) the collateral is put up for liquidation by the lending protocol. Community members, called liquidators, can then provide the

liability into the lending protocol for a premium of the collateral, resulting in a profit for the liquidator. Consequently, lenders receive their assets back and liquidators are provided a premium for their service.

While Aave and Compound are built on Ethereum, and Anchor is built on Terra, the main distinction between them is how at-risk loans are liquidated. On Aave and Compound, at-risk loans are put up for liquidation for a fixed 5% premium of the collateral. However, on Anchor, at-risk loans are put up for liquidation in a method that resembles an exchange orderbook. For example, on Anchor, liquidators first choose the loan which they want to (partially) liquidate. Secondly, liquidators choose a premium value which can range from 0 – 30%. The premium value corresponds to the additional percentage of collateral which the liquidator desires for removing the liability from Anchor and holding the collateral. The Anchor protocol takes all the liquidation requests and ranks the requests from lowest premium to highest premium, and executes the liquidations starting from lowest premium to highest premium. This Anchor liquidation process is what is commonly referred to as the orderbook liquidation system.

This DeFi orderbook liquidation system makes a decentralized automated liquidation protocol (called ALP) possible, which dynamically bids for liquidations at the most competitive premium. The protocol will place bids at optimised values of the premium based on the volume of competitor bids. For example, if most of the bids in the orderbook have volume at the 10% premium, ALPs will post its volume at the 9% premium, and dynamically rebalance bids as the orderbook changes. The protocol

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will in effect bid down external competitors until it is minimally profitable for both entities. Since the ALPs protocol will have a war chest of liquidity from multiple users, other single-user competitors will be forced to exit the bidding war or join the protocol.

We will proceed to describe the outline of the ALPs protocol in Section II, the ALPs tokenomics in Section III, the value added and returns for various stakeholders in Sections IV and V, and then conclude in Section VI with our product-market fit and summary in VIII.

II. THE ALPS PROTOCOL

Before discussing ALPs, it is crucial to understand the specific mechanism of borrowing on Anchor. A borrower will provide collateral to Anchor. The currently accepted collateral on Anchor is LUNA or ETH. After inserting their collateral, the borrower can borrow a certain amount of UST - the terra stablecoin. The liability in the Anchor system is UST, and Anchor aims to minimize any loss of liability. Anchor plans to allow other assets to be used as collateral in the near future, notably those from Compound on Ethereum. Once additional assets can be used as collateral, Anchor will likely grow appreciably.

The main component of ALPs is a Dapp that is built on-top of Terra. As ALPs derives its value from dynamically optimising the liquidation bids, it is essential that ALPs contains a pool of liquidity that it can use to remove liability from Anchor (in exchange for the collateral at a premium). Therefore, the ALPs liquidity pool is a one-sided pool which contains UST only. This liquidity can come from liquidity providers who wish to stake their UST for a return from the ALPs protocol, with the additional benefit that they can diversify their portfolio against large downside risk. Alternatively, the liquidity in the pool can come from the Terra community pool. In either case, after inserting liquidity, an LP will receive an LP-token which represents their share of the liquidity in the pool. The LP can remove their liquidity (and any additional profits) at any time with their LP-token. The staking interface to ALPs will be similar to AMM's like Uniswap, where an LP can provide their liquidity for certain returns. In this way, LPs will be familiar with the ALPs interface and there will be less technological barrier-to-entry.

In practice, the ALPs liquidation system is a collection of smart contracts built on Terra that uses UST to provide as liquidity to bid on at-risk loans at a certain premium value.

A secondary component of ALPs is the monitoring system, which recreates the Anchor orderbook and optimises how much volume to place at each premium value for maximal returns. This monitoring system will be centralized for the initial version of ALPs, and then will be decentralised as the protocol expands. The monitoring system sends the calculated optimized volume per pre-

mium data to the ALPs Dapp. The Dapp will then send the liquidation requests to Anchor.

Anchor currently whitelists both LUNA and ETH as possible collateral. However, each of these assets need to be bonded to an Anchor native token in order to be used as collateral on Anchor. For example, ETH needs to be converted to bETH, and LUNA to bLUNA. We will collectively call the bonded assets 'bCollateral'. Once Anchor executes ALPs liquidation bids, the UST is taken and a bCollateral is returned at a premium. Once a bCollateral is received, the ALPs protocol will instantly convert the bCollateral back into its unbonded form, e.g., bETH will be converted to ETH.

With the unbonded collateral, ALPs will instantly swap the collateral back into UST on Terraswap (or whichever exchange provides the best swap rate). If a pool exists which swaps the bCollateral for UST at a better rate including all fees, then this workflow will be utilized. The start and the end of the ALPs liquidation loop is designed to be in UST - the terra stablecoin - which removes ALPs (profit) exposure to volatile non-stablecoin price fluctuations.

The final step in the ALPs liquidation loop is to distribute the UST profits. The liquidity from the pool that was used for liquidation will be returned to the pool. The UST profits from the liquidation will be split between the LPs and the protocol. This will be discussed in Section V.

The ALPs tech-stack consists of i) a front-end web app that allows users to deposit UST into the protocols smart contract, ii) the protocols Terra-based smart contract Dapp, and iii) the monitoring system which optimizes the most competitive liquidation values of volume per premium level.

The ALP protocol steps are summarised as:

1. ALPs UST liquidity is collected into a pool for use in liquidation.
2. The ALPs monitoring system sends the optimized volume per premium value bids to the ALPs Dapp.
3. The ALPs Dapp sends the optimized liquidation bids to Anchor with approved UST liquidity.
4. After a successful liquidation, bCollateral is returned to ALPs at a premium value.
5. bCollateral is swapped for UST.
6. UST profits are distributed to LPs and the protocol.

These steps are illustrated in Figure 1.

Due to the nature of the Terra block chain, each of the above steps would require either gas, Terra tax, or Terraswap fees. Further, the time delay between receiving the bCollateral and swapping it for UST could negatively or positively effect the price slippage. The average profits would need to cover these costs.

III. ALPS TOKENOMICS

ALPs will have a time-weighted volume-weighted tokenomics model, similar to Curve Finance. The native ALPs token will be called ALP. ALP can be locked up for a fixed time period (3 months, 6 months, or 1 year) for vote-escrowed ALP (veALP) tokens. The longer the ALP tokens are locked up, the more veALP a user receives. This is the origin of the time-weighted component of the tokenomics model. This ensures that users are incentivised with the health of the protocol for as long as their ALP tokens are locked. The volume-weighted aspect of the tokenomics model simply refers to the statement that the more ALPs tokens a user locks, the more veALP tokens a user receives. This ensures that users with more stake in the protocol have more incentive to be aligned with the health of the protocol.

veALP tokens are utilised in the following ways:

- As a governance token used to vote on protocol state changes.
- To determine the fraction of the protocol fees which are returned to the veALP holder.
- To determine how much of the liquidity mining rewards are returned to the veALP holder.

Notably, the more veALP tokens a holder has, the more liquidity mining rewards they will receive from boosted returns, with a maximum $2.5\times$ boost available.

The buy pressure of the ALP token comes from at least two directions. First, users will want to gain as much ALP in order to convert into veALP so to obtain the maximal boost from liquidity mining. Secondly, the protocol obtains fees in UST after a liquidation cycle. The protocol will buy ALP-token with the UST, and distribute ALP to LPs as a reward. This is conceptually similar to Curve tokenomics, which has generated a lot of interest as a state-of-the-art tokenomics model. The ALPs tokenomics model may evolve to contain attractive features such as being pegged to UST.

The initial supply of the ALP token will be is 300 million tokens. ALPs will have an inflation rate of 25%, and a total supply of 1 billion tokens. Inflationary tokens will be rewarded to liquidity providers for their service to the platform.

IV. STAKEHOLDERS OF ALPS

A. Liquidity Providers

From an LP perspective, an LP will insert UST into the Anchor Dapp and receive an NFT LP-token which represents their stake. After time, they will passively accumulate their percentage of the liquidation profits. LPs do not need to monitor their position, they can simply stake their liquidity and then passively leave it to accrue

yield. A unique aspect of ALPs compared to other DeFi systems is that the ALPs cycle is designed to start and end in UST. Consequently, if the bCollateral is swapped quickly, there is minimal price exposure to non-stable coins and LPs liquidity can only ever grow and have a positive APY, i.e., there is no impermanent loss on ALPs as there is for other Dapps.

Further, LPs who hold veALPs will be provided liquidity mining rewards in the ALP token (proportionally to how much veALP they hold). They will also be rewarded their fraction of the protocol fees (again proportionally to how much veALP they hold). See Section V for more information on LP rewards.

LPs can remove their stake and receive their rewards at any time by returning their LP-token to the Dapp, thereby removing their liquidity.

B. External Anchor Liquidators

Any intelligent external Anchor liquidator will also be competing for the most competitive price. Our algorithm will bid down the premium rate to get the best premium at the competitors volume, and then place the rest of the volume at the highest premium possible. Since ALPs is a protocol of many users which pools liquidity, ALPs has a war chest which can be used to out-compete competitors. In such a scenario, it will be more profitable for external liquidators to join ALPs than to compete.

V. OVERVIEW OF RETURNS

There are three classes of returns distributed within ALPs. They consist of:

1. The profits from each liquidation event.
2. The profits from the protocol fees.
3. Liquidity mining returns.

The profits from each liquidation event are in UST and are distributed to the LP's and protocol in a 90/10 split. Governance can change this ratio.

The protocol share of UST will be swapped for ALP token instantly, which supports buying pressure for the ALP token. The profits from the protocol fees, i.e., the ALP tokens derived from the liquidation profits, are distributed to veALP holders proportionally to their share of the total amount of veALPs.

Lastly, the distribution of ALP tokens to LPs for liquidity mining will have no vesting period, and will incentivise early LPs to join the protocol.

VI. COMPETITION AND PRODUCT-MARKET FIT

The closest and only ALPs competitor is Orca-Kujira. Orca provides a fully centralized GUI for users to deposit UST into fixed premium slots. However, the vision of ALPs is generally much larger than Orca. First, ALPs is a decentralized protocol by conception with a robust tokenomics and rewards model. Orca is fully centralized. Second, Orca only allows users to insert their UST into static premium slots, and if a users bid is hit, then the user receives bCollateral. Orca does not swap the bCollateral for UST, and consequently the user is left with the risky asset. However, ALPs performs the bCollateral to UST swap, and as such the start and end of the ALPs cycle is in the UST stable coin. This ensures there is no impermanent loss for the user. Third, ALPs dynamically places optimized liquidation bids for users so that they get the most competitive rate (instead of never getting hit because their static premium slot was too large).

In regards to product-market fit, Orca illustrates that there is a large appetite for a liquidation GUI. ALPs goes much further than this. Orca currently has 78 million UST TVL in their system. Anchor has 9.8 billion UST TVL, and plans to expand it's allowed collateral to other cross-chain assets. With 60% of the Terra chain's TVL, Anchor is at the heart of Terra and will continue to be as the network evolves. As such, the growth of Anchor looks very promising. As Anchor grows, so will the volume of at-risk loans, and consequently, the amount of profit, users, and TVL that ALPs can absorb.

Additionally, there has been a multitude of new DeFi protocols within the crypto ecosystem which aim to manage users risk. This illustrates a greater desire for DeFi instruments which reduce users risk exposure. ALPs is a new and unique protocol which profits massively during periods of large downturns or the deleveraging of crypto. Consequently, users can add ALPs to their portfolio in order to protect against a large downside risk of the collateral (currently ETH and LUNA). Furthermore, ALPs can profit from being the first market mover in this space.

There exists another Terra protocol, named White Whale, which is a decentralised arbitrage Dapp. White Whale allows users to insert their liquidity, and whenever UST loses its peg to USD, then White Whale will arbitrage UST back to the peg. In the process, White Whale accrues profit which is redistributed to users. White Whale has 62 million UST TVL, despite only existing for a few months. ALPs and White Whale can be thought of as decentralised liquidation and arbitrage protocols on Terra which aim to be low-risk and accrue profits in UST. The success of White Whale shows the appetite for ALPs.

VII. FUTURE UPGRADES

The initial version of ALPs outlined above will provide a minimal viable product. Future versions, if voted for

by governance, will invest excess UST from the ALPs liquidity pool in order to increase the APY for LPs. For example, excess liquidity in the ALPs UST pool could be invested into the Anchor lending and earn pools for an additional yield. Additional safe strategies can optimise the yield.

Further, future versions will monitor the Anchor health-ratio distribution of assets, and determine if a large liquidation event is likely. If so, all excess capital will be removed from Anchor in preparation of a cascade of liquidations.

Ultimately a fully decentralized protocol is envisioned, and the monitoring system will become decentralized.

VIII. SUMMARY

The growth of the DeFi ecosystem has been exponential and its future looks promising. New financial instruments continue to be created, and stakeholders are eager to participate. Notably, there has been an increased appetite for DeFi products (insurance, default swaps, etc) which allow a reduction of risk from crypto exposure.

The leading Dapp on the Terra blockchain, a lending protocol called Anchor, has 9.8 billion UST and 60% of Terra's overall TVL. As Anchor is adding the ability to use different assets as collateral, Anchor's future growth also looks promising. An important aspect of Anchor is that at-risk loans are put up for liquidation in an orderbook style system, where liquidators requesting the lowest premium are executed first.

In this whitepaper we have described a unique and novel automated liquidity protocol (ALPs). ALPs automatically optimizes liquidation bids whenever there is a liquidation orderbook platform, as is the case for Anchor. ALPs ensures that liquidators receive the most competitive premium possible by computing the optimal volume to place at each premium value. ALPs is a Dapp built on the Terra blockchain, and has an exciting tokenomics structure reminiscent of Curve Finance.

ALPs is designed so that it has a single UST liquidity pool. LPs will be allowed to stake their UST into the ALPs UST pool. ALPs will use its UST pool when liquidating at-risk loans. From the liquidation process, ALPs will provide UST to Anchor and receive collateral at a premium. ALPs will automatically swap this collateral for UST, where the premium ensures that there will be a profit. The profits are distributed to both LPs and the protocol. The protocol will convert its share of the UST profits into ALP-tokens, which ensures that the ALP-token has buy pressure. LPs receive additional returns from both the protocol fees being distributed to them, as well as from liquidity mining rewards. A unique benefit of ALPs is that the start and end of the profit cycle is in UST - the Terra stablecoin - which removes significant exposure to crypto price volatility. In this sense, ALPs can be thought of as a low-risk protocol with a loose peg to a stablecoin, with no impermanent loss for LPs (unlike

in AMMs).

Lastly, ALPs is designed to perform well if a market-crash or a crypto deleveraging scenario occurs. In such a scenario, ALPs generates massive returns in the UST stablecoin. As such, users can stake in ALPs (or hold

the ALP-token) as a position in their portfolio in order to diversify against a (large) crypto downturn. In this capacity, ALPs is a new financial instrument in the crypto ecosystem which reduces risk while generating returns in UST.

[1] In contrast, if the collateral price decreases instantaneously to approximately 0% then there will not be enough

collateral to protect the lenders assets.

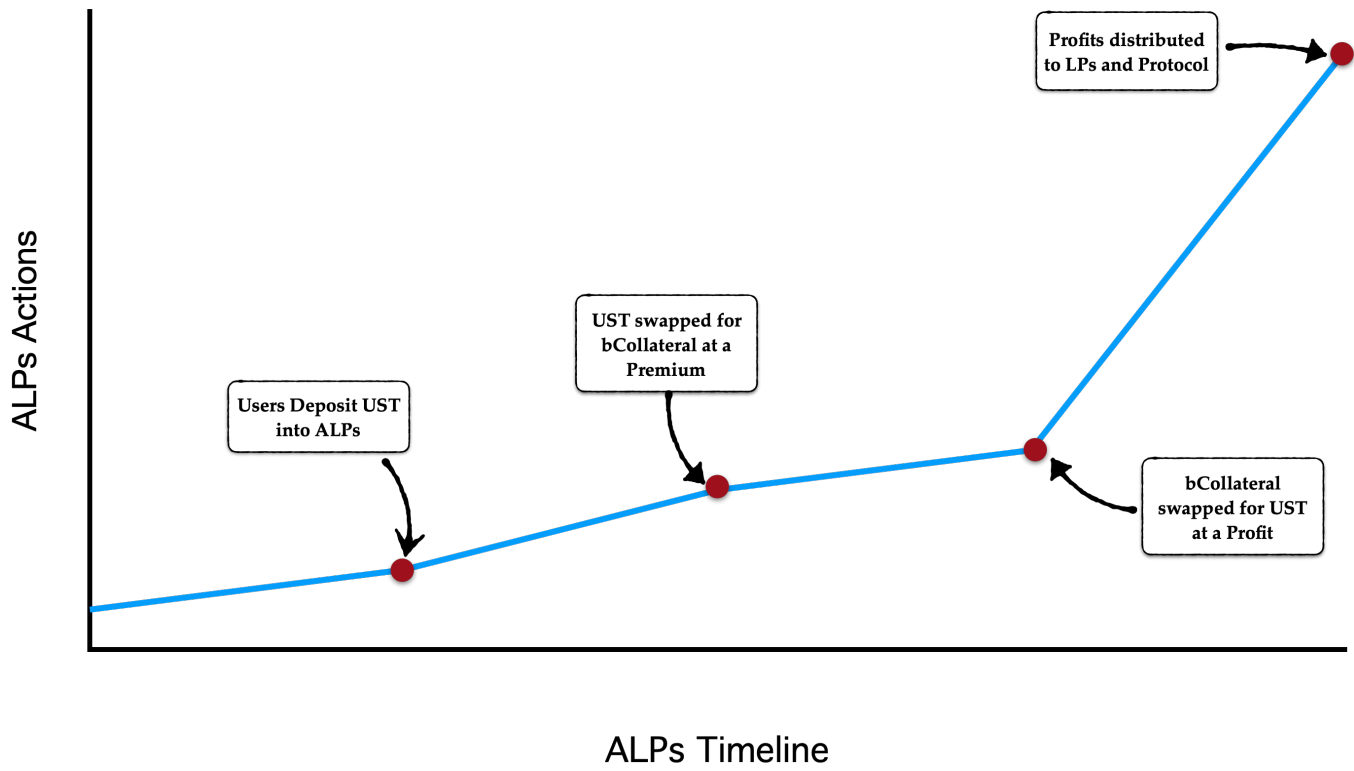


FIG. 1. Back-end flowchart of the protocols entire liquidation process.