LendBook
a Lending Limit Order Book
6-page lite paper

prevert *

January 12, 2024

Abstract

A lending limit order book is a non-custodial, peer to peer, permissionless lending protocol that enables users to borrow limit orders' assets collateralized by their own limit orders. This new financial primitive offers users multiple benefits: stop loss orders with guaranteed stop price, low liquidation penalty, high loan-to-value and leverage and interest-bearing limit orders. The protocol is immune to the risk of bad debt and can operate without the need for off-chain governance.

Current issues with lending protocols

To mitigate the risk of bad debt, lending protocols impose various constraints on the borrowers side, such as high collateral-to-debt ratios and high liquidation costs. They also limit lending markets to high-quality assets. These constraints

*contact: pr3vert. I thank Mathis Gontier Delaunay, Hamza El Khalloufi and Kirk Hutchison for very useful discussions and comments.

impair users' experience by making borrowing more expensive and riskier and by restricting the range of borrowable assets. Despite many innovative features introduced in the sector since its emergence in 2018, significant improvement of users experience is still awaiting a foolproof solution for the risk of bad debt.

LendBook, a lending limit order book, is a new financial primitive which eliminates the insolvency risk, achieve full decentralization and brings along the way a host of new benefits for lenders and borrowers.

1 What is a lending limit order book

A lending limit order book (LLOB) is a non-custodial, peer to peer and permissionless order book that enables users to borrow limit orders' assets. Borrowing positions are collateralized by limit orders posted on the other side of the order book. Borrowed assets from buy orders are collateralized by the assets deposited in sell orders, and reciprocally.

Fig. 1 shows how a lending primitive is attached to a limit order book. Makers allow traders to borrow their assets deposited in the book in exchange of an interest rate. The rectangles with a blue and orange background represent the assets borrowed from the orders at the same limit price.

2 Benefits of using LendBook

The benefits of a lending order book are multiple: stop loss orders with guaranteed stop price, low liquidation penalty, high leverage, programmability of leverage strategies, automated market making and minimized governance. Let's review them one by one.

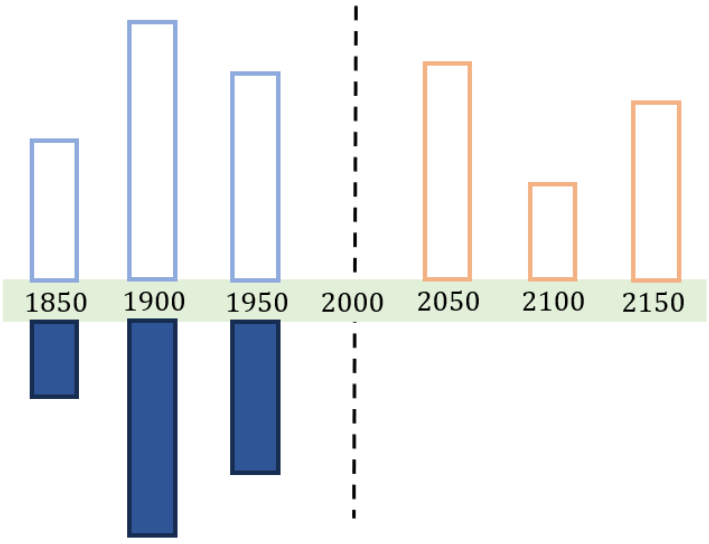

Figure 1: A central limit order book with lending functionalities. Rectangles with a blue background represent the assets borrowed from the buy orders at the same limit price.

2.1 Low liquidation cost

The prevalent liquidation mechanism in lending protocols allows a liquidator to repay a fraction of the borrower's debt and acquire its collateral at a discount. In LendBook, the closing of a borrowing position does not rely on the active monitoring of liquidators but on that of takers. Traders, by taking the non-borrowed part of the assets, initiate the internal transfer from the borrowers to the lenders.

Since lenders agree to receive the collateral as a payment, the protocol does not need to incentivize bots to liquidate unhealthy positions on time. The borrower only pays small liquidation costs (1%) as a result.

2.2 High Loan-To-Value

The Loan to Value (LTV) ratio defines the maximum amount of assets that can be borrowed with a specific collateral. For example, a maximum LTV of 80% in

the ETH/USDC market means that users can borrow at most 0.80 USDC worth of ETH for every USDC deposited as collateral.

In LendBook, borrowers risk liquidation if the value of their collateral falls below 101% of their debt. To prevent early liquidation, users are allowed to borrow up to 98% of their collateral value.

2.3 Stop loss and take profit orders

A stop-loss order allows traders to close long positions by selling the assets or a short position by buying the assets. In LendBook, users open stop-loss orders by borrowing assets from limit orders. The stop price in case of price decrease (or increase) is the limit price of the buy (sell) order from which they borrow.

In traditional or crypto finance, once the stop price is met, the stop loss order becomes a market order and is executed at the next available price. The obtained price can be significantly less favorable than the specified price when markets move fast. Here the stop price is guaranteed by the filling of the sell order at the limit price.

In addition, by posting their collateral in the order book, borrowers can program in advance the price at which exit their strategy, which is the limit price of their collateral order. A take-profit option is an integral part of risk management in case of leveraged position.

2.4 Automated market making

Orders which assets are filled are automatically replaced in the order book (Rule 4). Lenders choose in which pool and at which limit price their assets are replaced. By default, their liquidity is replaced in the nearer pool on the other side of order book.

This feature allows makers (or protocols built on LendBook) to program in

advance at which price they are willing to sell back the assets after a buy or buy back them after a sell. The default strategy with automatic replacing in the nearer opposite pool is similar to what liquidity providers do in Uniswap-type Automated Market Makers (AMMs), except that instead of earning a fee rate, makers earn the spread on top of the interest rate paid by borrowers.

2.5 Absence of bad debt

A major implication of borrowing assets from limit orders is the dramatic simplification and high safety of the liquidation process. Borrowing positions cannot go under-collateralized even in case of strong and rapid price action, gas fee spike, or blockchain congestion/downtime. While the risk of rapid price variation persists, it is borne by the maker of the limit order, creating an opportunity cost for them. Although this cost is inherent in all limit order books, in LendBook, makers are compensated through an interest rate and liquidation fees.

2.6 Governance minimization

The governance activity of lending protocols has significantly grown and become more complex over time. Managing the risks of pools has been progressively delegated to experts, whose mission is to monitor the pools' risk and update their risk parameters. This involves assessing multiple risk factors, such as the on-chain liquidity of assets, price volatility, and market capitalization.

In contrast, the functioning of a LLOB is fully algorithmic and automated. As pools' solvency does not rely on team's interventions or governance by a DAO, full decentralization becomes a credible objective which LendBook will actively pursue. The protocol will ultimately be governance free with non-upgradeable smart contracts and parameters set at the time of contract deployment.

No governance process will be needed to whitelist approved tokens. Markets will be created permissionlessly by calling a factory contract. The number of

assets that could be listed is only limited by the existence of a reliable price feed in the V1.[1] The V2 will expand to long-tail assets by getting rid of price oracles.

3 Conclusion

Lending protocols are an essential building block for blockchains' applications. They have grown to represent tens of billions of dollars in value. However, the vast majority of this value is held in smart contracts which management is still partially centralized. A complete decentralization process has failed so far, due to a persistent risk of insolvency, which management creates points of centralization.

LendBook's immunity to insolvency risk marks a significant advancement in the space. There is no concept of bad debt that might need to be absorbed by a DAO treasury / insurance fund or socialized across lenders. There is no trade-off in case of liquidation between the costs incurred by borrowers, liquidators' incentives and lenders' safety. The radically innovative design unlocks many new features like high LTV and leverage, borrowing programmability and interest-bearing limit orders. This also makes possible the protocol to operate in a fully decentralized way.

[1] Aave V3 currently lists 20 or so assets on Ethereum. The additional list of admissible tokens with a Chainlink feed includes SHIB, GRT, SAND, APE, CVX, ANKR, SUSHI, RDNT, BADGER and PERP.