Bonded.Finance

Business Logic Documentation

Version Control

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Abstract

The objective of this paper is to introduce the concept of an innovative decentralized protocol for modern money markets. Bonded Finance intends to utilize smart instruments that algorithmically determine interest rates, loan-to-value ratios ("LVR") and liquidity risk in order to autonomously manage the risk relationship between lender and borrower. We firmly believe that we can optimise capital utility in any digital asset environment to create a dynamic, money market ecosystem that offers exotic new products, reduces risk, while increasing yield and financial sustainability.

Introduction

The **"time value of money,"** in layman terms, means that the value of money today is worth more than the value of money tomorrow, e.g. the utility value of a dollar today is more than the utility value of a dollar one year from today. Today's financial markets are often driven by sophisticated corruptions of this concept; in an effort to exploit inefficiencies via the strategic deployment of capital.

Cryptocurrency and digital blockchain assets have slowly matured into a vibrant ecosystem for investors, speculators and traders — exchanging billions worth of assets on a daily basis. Despite this growth, the asset class has yet to apprehend the sophistication or efficiencies of traditional financial markets. Consider the following:

- There are billions worth of crypto assets that have yet to find utility value
- Many of the underlying crypto assets are withering

It is not unreasonable to assume that many of these cryptocurrencies will fail and their capital will slowly dissolve. However, were we to remove the variant brands, tickers and teams to focus exclusively on the liquidity and capital, a pool of value becomes identifiable. Were these hundreds, if not thousands of underutilised cryptocurrencies able to aggregate their collective liquidity and subsequently harvest it, billions in dormant capital would be unlocked.

The problem

In the current landscape, there are many marketplaces that match borrowers and lenders but they all inherently share a number of flaws:

1) Borrowing mechanisms are extremely limited, resulting in:
    a) Mispriced assets and interest rates

    b) An imperfect incentivisation model
    c) No natural interest rate to offset the risks involved with holding assets on or off-chain
2) Of the 6600 assets listed on Coinmarketcap:
    a) Only a handful are utilised in lending markets
    b) A sizable number of stable projects with volume history exist
3) APY is miscalculated:
    a) Deliberately inflated returns
    b) Front-loaded to short-term user migration
    c) Unsustainable business model
    d) Massive tail risk exposure
    e) Limited assurance against the risks of low liquidity
4) P2P facilitates collateralized and uncollateralized loans, but incurs:
    a) Significant costs and friction driven by decentralization
    b) Slow and asynchronous loan fulfillment
    c) A few select assets are forced to exhaustively create new incentives

The Bonded protocol addresses the aforementioned problems by utilizing real-time demand and supply matrices that incentivize borrowers and lenders to participate on our platform to earn yields based on quantifiable metrics.

The smart instrument

A smart contract is a program containing an auto-executable collection of instructions. Bonded has advanced on these features by writing algorithms that group digital assets into a composite index and manages them so they behave in a predictable manner. This particular smart agency is effectively a new investment-grade product, purposed as a high-yield, reduced risk lending instrument.

Essentially, Bonded's mission is to leverage the dormant capital in individual, relatively illiquid altcoins and extract the risk. Our smart instruments optimise the utility value by harvesting dormant capital and rededicating that value more productively. This creation of greater utility value is the driving force for the platform along with its' suite of smart products.

Accelerated Crypto Loan

Bonded's maiden protocol is the Accelerated Crypto Loan ("ACL")— a protocol on the ethereum blockchain that establishes a dynamic borrow and lending market where the interest rates are driven by the supply and demand for the underlying asset.

- Lenders and Borrowers of an asset interact directly with the protocol and earn a floating interest rate
- Zero negotiation on maturity, interest rates and collateral
- Mirroring traditional markets, interest rates differ by available assets

In crypto, interest rates are highly correlated to the asset being put up as collateral. Each money market is unique to an Ethereum asset—such as ERC-20 stable coins like Dai, or utility tokens such as Augur— that contains a transparent and public ledger; providing an immutable record of all transactions and historical interest rates.

When a lender supplies an asset, the ACL protocol aggregates the supply from each user and it becomes part of a liquidity pool; creating a fungible asset that can be borrowed against at any time. This approach significantly motivates both borrowers and lenders to participate in the platform; thereby improving liquidity.

Supply Side ACL

Supply side is where lenders provide ETH or USDT by connecting their Metamask account on Bonded. Assets deposited by the lender go directly into the liquidity pool while a collateral mapping system is maintained on the blockchain. On the basis of this mapping system, the smart contract accesses Supply-Demand matrices in order to calculate interest rates. The protocol primarily checks the "Interest Rate Number" via simple division: Times the asset is provided by A lender as Collateral/ Times the asset is accepted by a borrower.

$$\textit{Interest RateNumber} = \frac{\textit{Times the asset is provided by Lender as Collateral}}{\textit{Times the asset is accepted by borrower}}$$

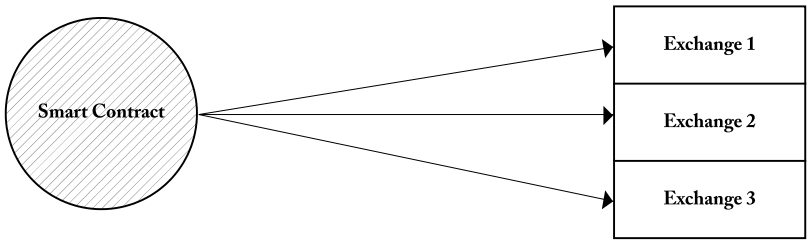
Higher interest rates are indicative of a borrower's willingness to put up an asset as collateral. Conversely, it also signals that a lower number of lenders are willing to accept the asset as collateral. As it pertains to collateral, the demand for USDT or ETH is high whereas the

supply of USDT or ETH is less with respect to collateral, ergo, lenders charging higher interest rates.

$$\textit{Interest Rate Number} \propto \textit{Interest rate charged}$$

The "Interest Rate Number" is determined on the basis of demand and supply, using an elastic demand and linear growth model built into the protocol.

Liquidity Management



1. Exchanges can be added/removed for liquidation via smart contract
2. Priority of choosing exchange can also be configured via smart contract (dynamically)
3. LVR liquidation ratio will be dynamic (configurable from smart contract)

Primary Use Cases

Individuals with investments in ETH or USDT can use the ACL money market as a source of additional returns on their investment.

For example, a user that owns USDT can supply their tokens to the ACL Protocol and earn interest (denominated in USDT) without having to worry about asset management, fulfillment of loan requests or speculative risks. dApps, machines, and exchanges with token balances can use the ACL protocol as a source of monetization by supplying the assets to generate a passive income on previously idle resources.

Borrowers Side

ACL protocol helps in frictionless borrowing from the protocol, using the Bond token ("bTokens") as collateral, for use anywhere in the Ethereum ecosystem. Initially, the bTokens will only be minted when the borrower issues collateral and can only be redeemed on the Bonded Finance platform. Unlike peer-to-peer protocols, borrowing from the ACL simply requires a user to specify a desired asset—there are no terms to negotiate such as maturity dates or funding periods. Similar to supplying an asset, each money market has a floating interest rate, set by market forces, which determines the borrowing cost for each asset.

Collateral Factor

Assets deposited by borrowers as collateral (locked bTokens) need to be accessed on the basis of the quality of the underlying asset. Each market of the ACL will have a dynamic LVR Number driven by the demand vs. the supply of a collateralized asset.

$$\textit{Dynamic LV R Number} = \frac{\textit{Time the asset is provided as collateral by borrower}}{\textit{Time the asset is accepted by Lender as collateral}}$$

A higher Dynamic LVR indicates more lenders are willing to accept an asset as collateral while less lenders are willing to give the asset as collateral. A higher dynamic LVR Number, the lower the LVR of the asset, which serves to incentivise borrowers.

Risk & Liquidation

Given the volatility of altcoins, provisions must be programmed to protect all parties. Should the borrowed value of an account exceed 100%, a portion of the outstanding balance must be repaid in exchange for the user's bToken collateral, at the current market price minus a liquidation discount. The Liquidation transpires when the collateral value become 142.28%. This scenario corresponds to an LVR of 7:1 and an initial borrow at an LVR of 10:1. Though these corresponding ratios are yet to be finalized, 10/7 is 142.28% and the current numbers we are working with. The current discounted liquidation amount of 20% is sent to the borrower and applied. This 20% discount acts as liquidation fees for the ACL Platform.

Collateral Burning Ratio

The proportion eligible to be closed, i.e. a close factor, is the portion of the borrowed asset that can be repaid. It is calculated so the collateral burning ratio i.e. the burning of bTokens is equivalent to the burning ratio until the initial LVR is achieved. The liquidation process continues until the user's borrowing capacity is restored. Below is an example of how the closing factor is calculated.

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Reference	**Assumption**		
A	1 Augur	10	USDT
B	1 ETH	100	USDT
C	1 Augur	0.02	cAugur
D	LVR	10:1	10
Case 1			
D1	Borrowers wants to borrow 1 ETH		Formula Used
E	Nominal Amount of Collateral to be deposited	1000	B x D
F	Augur coins put up as collateral	100	E/A
G	cAugurs given to Borrower	2	F x C
H	Client borrows 1 ETH	100%	
Case 2			
I	Price of ETH Increases	142	
J	Worth of collateral Deposited	1000	Remains same as 'E'
K	New LVR	7	J/I
	Liquidation Mechanism		
	Close the borrowing to achieve 10:1 LVR		We need to sell cAugur to close ETH Borrow
L	Difference to achieve 10:1 LVR	46.667	Note we will burn 20% more then this to pay
M	Number of Borrowed ETH's to be closed	0.3286408451	L/I
N	Hence new Borrowing Amount	0.671359	D1—M

Reference	Assumption		
O	Collateral burned cAugar	0.093334	{(M x I)/A} x C
P	cAugar Balance	1.906666	G-O
Q	Collateral Balance Nominal Amount	953.333	{P/C}*A
R	Nominal Amount of Borrow (USD)	95.333	N*I
S	New LVR	10	10:1
T	**Collateral Burning Ratio**	**4.67%**	**(G-P)/G**

The ability to seamlessly hold new assets, without selling or rearranging a portfolio, offers flexibility and opportunity to dApp consumers, traders and developers:

- No off-chain activity
- No waiting for orders to fill
- dApps can borrow tokens to use in the Ethereum ecosystem
- Traders can borrow Ether— using their existing portfolio as collateral
- Traders can short a token by borrowing it, and sell the token on an exchange

Interest Rate Model

A significant benefit of the ACL Protocol is that it effectively removes the negotiations for borrowing and lending. The ACL Protocol utilizes an interest rate model that helps to achieve an interest rate equilibrium solely on the basis of the supply and demand of given crypto assets. Following the simplest of economic principles, interest rates are high when borrowers are willing to give crypto asset A as collateral and where a lesser number of lenders are willing to accept the crypto asset A as collateral.

The interest rates in the ACL protocol are linked to the interest rate number for each of the Money Markets. Bonded has a base rate set and an incremental step function codified in the interest rate formula. Both the base rate and the step increment function can be changed by passing proposals, using the governance function of the Bond token.

$$Interest\ Rate\ Market^{a} = Base\ interest\ Rate^{a} + Step\ Increment\ Interest\ Rate^{a}$$

$$Base\ interest\ Rate^{a} = Interest\ Rate\ at\ Interest\ Rate\ Number\ 0.1$$

$$Step\ Increment\ Interest\ Rate^{a} = Additional\ interest\ rate\ charged\ at\ every\ increment\ of\ .1\ interest\ rate\ number$$

This interest rate formula helps in making the ACL protocol a self-regulating platform that incentives liquidity. In periods of extreme demand, the liquidity of the protocol (the tokens available to withdraw or borrow) will decline. When this occurs, interest rates rise, incentivizing supply and disincentivizing borrowing.

bToken Contracts

Each market is structured as a smart contract that implements to ERC-20 specifications. User balances are represented as bToken balances; users can **mint (uint amountUnderlying)** bTokens by supplying assets to the market, or **redeem(uint amount)** bTokens for the underlying asset. The price (exchange rate) between bTokens and the underlying asset increases over time, as interest is accrued by borrowers of the asset. Bonded will commence with a hardcoded initial supply at the exchange rate.

.0200 Underlying asset token = 1 bToken-----> Year 2020

On the basis of daily yield that each token earns, given the supply and demand, differing markets shall accrue different interest rates. This will be duly incorporated into the exchange rate at dynamic/ cut-off time. For example, an asset accrues a 5% annual premium yield, then the new exchange rate shall be:

.0210 Underlying asset token = 1 bToken-----> Year 2021

Lenders that supplied an underlying asset to the protocol who owned 1 bToken in the year 2020 can now redeem bToken for 1.05 underlying asset token.

As the market's total borrowing balance increases, the interest rate number increases which linearly impacts the interest rate. Naturally, the higher the interest rate, the stronger the underlying token becomes.

Functions	*Description*
mint(unit256 amount Underlying)	*Transfers an underlying asset into the market, updates msg.sender's bToken balance*
redeem(uint256 amount) redeemUnderlying(uint256 amountUnderlying)	*Transfers an underlying asset out of the market, updates msg.sender's bToken balance.*
borrow(uint amount)	*Checks msg.sender collateral value, and if sufficient, transfers the underlying asset out of the market to msg.sender, and updates msg.sender's borrow balance.*
repayBorrow(uint amount) repayBorrowBehalf(address account, uint amount)	*Transfers the underlying asset into the market, updates the borrower's borrow balance.*

Functions	*Description*
liquidate(address borrower, address collateralAsset, uint closeAmount)	*Transfers the underlying asset into the market, updates the borrower's borrow balance, then transfers bToken collateral from the borrower to msg.sender*

Interest Rate Index

When a transaction occurs, the interest rates are updated, using the base interest rate + the step increment interest rate assigned to the interest rate number. The history for each interest rate for each market is calculated and captured in the Interest Rate index.

Reserves

In consideration of the additional functionality of keeping reserves, there are two proposed scenarios:

- Keep some portion of the interest accrued as reserves OR
- Keep some portion of the assets of Borrowers and Lenders as reserves

In the former scenario, Bonded can assign a percentage to the reserves to be set aside from the interest accrued. The reserves ratio can be changed by passing a proposal using the Bond token's governance functionality.

In the latter scenario, Bonded can assign a percentage to the reserves to be set aside from the assets received as a part of a borrow and lending Mechanism. This reserve ratio can be changed by passing a proposal using the Bond token's governance functionality.

Ideally, this approach decreases liquidity in the market for assets which affect the interest rate number, thereby impacting the interest rates as well.

How Borrowing Happens

- A borrower deposits collateral
- Upon deposit, borrower receives tokens based on the current exchange rate

- Borrower selects the asset(s) she wants to borrow.
- ACL Protocol ensures sufficient balances are stored
- The protocol calls the ***borrow(uint amount) on the relevant cToken contract***

This function checks the account value, and given sufficient collateral, will update the user's borrow balance before transferring the tokens to the user's Ethereum address and updating the money market's floating interest rate.

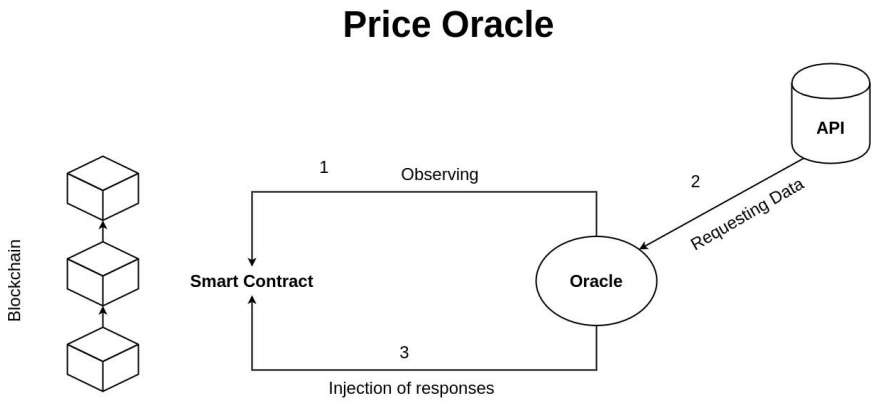
Borrowers accrue interest as calculated by the interest rate formula. A borrower has the right to repay an outstanding loan at any time, by calling ***repayBorrow(uint amount)*** which repays the outstanding balance.

Liquidation

In cases where the outstanding borrowed balance surpasses the borrowing capacity, the liquidation event occurs equivalent to the collateral burning ratio, the public function ***liquidate(address target, address collateralAsset, address borrowAsset, uint closeAmount)*** can be called, which exchanges the user's asset for the borrower's collateral, at a slightly better than market price.

Price Oracle

An oracle aids the smart contract in communicating real-time exchange rates. Bonded intends to use the Chainlink price oracle which will source prices from ten exchanges. The exchange rates help smart contracts calculate the borrowing capacity and collateral requirements.



Token Support by Governor

The ACL Protocol does not immediately support all tokens but will open with a range of offerings greater than incumbent platforms. The markets must be whitelisted which can be achieved by using function ***supportMarket(address market, address interest rate model).*** This allows users to start interacting with the new assets, however, in order to begin borrowing and lending, there must be a price obtained via the price oracles. Simultaneously, the smart contract should be calculating interest rate number, dynamic LVR number and collateral burn ratios.

Each function call is validated through a policy layer, referred to as the Governor. This contract validates collateral and liquidity, before allowing a user action to proceed.

Governance

ACL will begin with centralized control, choosing interest rate models for assets and making the proverbial "executive decisions." Over time, the protocol will transition to complete community and stakeholder control. The following will initially rest with administrators before the system is completely decentralized and becomes community-driven.

- Listing new bTokens
- Update formula for calculating interest rate number and dynamic LVR
- Update base interest rate and step increment interest rate for each market
- The ability to update the oracle address

Summary

- The ACL Protocol removes many imperfections in lending markets
- Creates properly functioning money markets for Ethereum assets
- Each market has interest rates determined by supply and demand
- Decentralized—Smart Contract, Trust-Based System
- Users borrow token to use, sell, or re-lend with balances in the protocol

Proposed Technology Stack

Technology Stack		
1	Front end	React Js
2	Backend	Node JS
3	Smart contract	Solidity (ethereum based)
4	Database	MySQL or Mongo
5	Deployment on	AWS Elastic bean stock

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