DISCUSSION

On the Inherent Fragility of DeFi Lending

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CeFi, P2P/FinTech, and DeFi lending

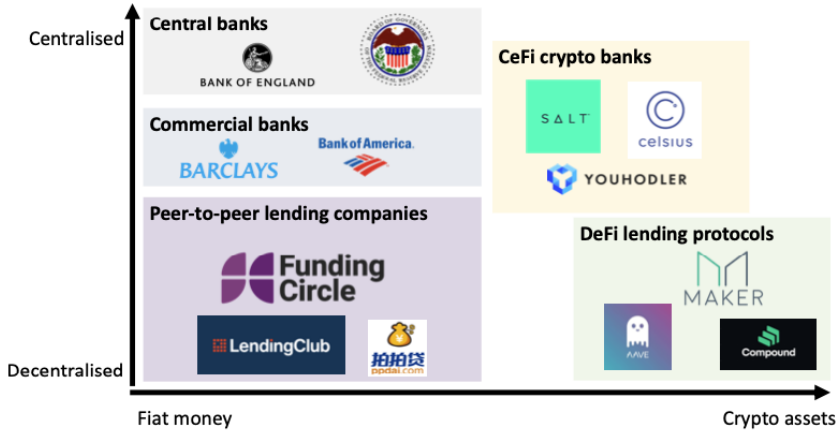


Figure 1: Taxonomy of lending markets

[1] Xu and Vadgama (2022)

The paper in a nutshell

What do we get from this paper?

- First model resembling features of DeFi lending protocols.
- Theoretical underpinning of why DeFi lending and crypto (collateral) prices are connected.

Strengths

- Links DeFi lending market equilibria with crypto (collateral) asset prices.
- Provides solution (flexible smart debt contracts) to restore uniqueness of equilibria.
- Provides some empirical evidence to underscore theoretical findings.

Weaknesses

- Quite general, stylized model of DeFi lending protocols.
  Discussion on current implementations falls short.
- Little discussion of blockchain-related features/complications (e.g., gas/transaction fees).

General comments

Nice paper with implications for DeFi lending protocol designs and market outcomes.

Guiding discussion questions

1. **"Is it new?"** – *Positioning of the paper in the context of blockchain/DeFi.*
2. **"Is it correct?"**
   a. *Is DeFi lending really fragile?* (intuition)
   b. *Are the model assumptions reasonable?* (theory)
   c. *Is the empirical analysis sound?* (empirics)
3. **"Is it important?"** – *Will DeFi lending stay relevant in the future?*

Comment 1: *Positioning of the paper in the context of blockchain/DeFi.*

Could be viewed as paper that models simple financial intermediation where . . .

- lenders have little say (only rigid debt contract with haircut rule and debt threshold) and nobody is screening of borrowers or collateral quality.
- borrowers exploit informational advantages (inaccurate price oracles for collateral).

Vulnerabilities that make these DeFi lending protocols fragile (e.g., price oracle exploits by borrowers) are studied in recent CS (Security & Privacy) literature.

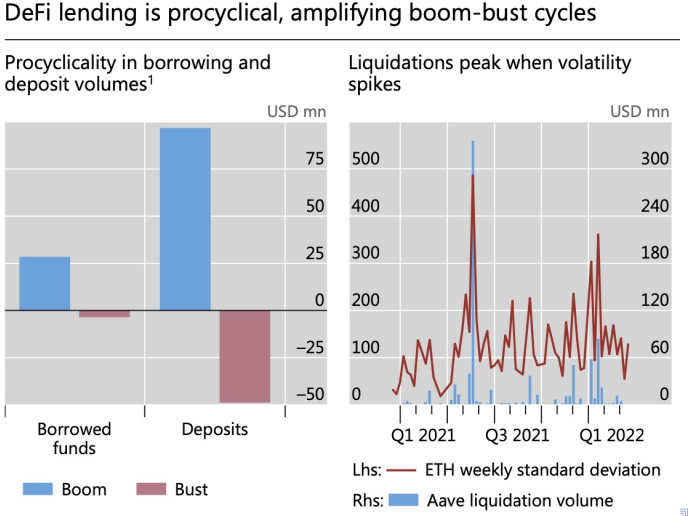
- Gudgeon et al. (2020,ACM-AFT). "**DeFi Protocols for Loanable Funds: Interest Rates, Liquidity and Market Efficiency.**" – Perez et al. (2021,FC'21): "**Liquidations: DeFi on a Knife-edge.**" – Qin et al. (2021a,FC'21): "**Attacking the DeFi Ecosystem with Flash Loans for Fun and Profit.**" – Qin et al. (2021b, ACM-IMC): "**An Empirical Study of DeFi Liquidations: Incentives, Risks, and Instabilities.**" . . .

Very few papers on DeFi lending from the finance/economics side of things.

- Mueller (2022). "**DeFi Leveraged Trading: Inequitable Costs of Decentralization.**" $\Rightarrow$ "*Decentralized Lending and the existence of transaction fees necessitates a liquidation penalty (a.k.a. liquidation incentive) market mechanism.*"; no brokers to monitor and liquidate accounts s.t. cost is delegated to leveraged traders.

Comment 2a: *Is DeFi lending really fragile?* (intuition)

Aramonte et al. (2022, BIS): "*Due to the anonymity of borrowers, overcollateralisation is pervasive in DeFi lending, which generates procyclicality.*"



Comment 2b: *Are the model assumptions reasonable?* (theory)

Theory:
Argues that – due to (1) *asymmetric information* (borrowers know quality of collateral), and (2) *rigid smart debt contracts* – there exist multiple DeFi lending market outcomes:
(a) all borrowers ('pooling'); or (b) only low quality types ('separating') use the protocol.

Issue	**CeFi**	**DeFi**
Contract enforcement	legal systems	smart contract code
Risk mitigation	trust, credit checks, collateral	(over-)collateralization
Price oracle	exchanges, interbank rates	DEX, oracle protocols
Liquidation risk	lender	auction, keeper, pools

Model: Frictions within DeFi lending are:

- information asymmetry (e.g., borrowers monitor collateral quality) allows borrowers, e.g., to exploit inaccurate oracle price feeds;
- non-flexible (smart) debt contract terms $\rightarrow$ hard to react to non-quantifiable (off-chain) information (e.g., sentiment) by adjusting important parameters such as *haircuts & debt thresholds*.

Comment 2b: *Are the model assumptions reasonable?* (theory)

Assumption: Lenders cannot control collateral mix and borrowers monitor collateral prices to exploit opportunities (e.g., price oracle issues).

Exploits that make DeFi lending fragile do happen: defiyield.app/rekt-database.

1. **Compound (ETH) (26.11.2020)**

   "*Around $89 million was liquidated on the lending protocol Compound due to the oracle issue, as far as Compound's oracle uses Coinbase for pricing data. The price of DAI token spiked up to $1.3 on the Coinbase Pro exchange. Since many of the loans were undercollateralized, they were liquidated.*"

2. **Venus (BSC) (18.05.2021)**

   "*Due to market circumstances and oracle problems, the Venus Protocol experienced a massive liquidation event. [...] Due to unpredictable market fluctuations and the lack of deviation controls on oracles, the protocol lost about $77 million.*"

Comment 2b: *Are the model assumptions reasonable?* (theory)

How rigid are smart debt contract terms?

About 13 risk parameter changes in AAVE V2 from Sept 2021 to May 2022.

Historical AAVE V1 risk parameter changes

Date	Asset	LTV	Liquidation Threshold	Liquidation Bonus	Comment
10/21/20	MKR	**50%**	65%	10%	Decreased volatility
10/21/20	TUSD	**75%**	80%	5%	Following review of the smart contracts
7/22/20	LEND	**50%**	65%	10%	LEND can not be borrowed due to migration incoming
7/16/20	LEND	**50%**	65%	**10%**	Improved risk parameters
7/16/20	SNX	**15%**	**40%**	**10%**	New Collateral
7/16/20	ENJ	**55%**	**65%**	**10%**	New Asset
7/16/20	REN	**50%**	**65%**	**10%**	New Asset
6/19/20	TUSD	**1%**	80%	5%	Unaudited Update

Comment 2c: *Is the empirical analysis sound?* (empirics)

Some simple correlation analyses that are in line with theory.

- OLS: DeFi TVL is positively corelated to ETH price.
- OLS: USDT loan volume is correlated to crypto price index and liquidation intensity (risk).
- OLS: Collateral quality (rating) mix is positively correlated to sentiment index (high values = "greed")
- Terra-LUNA example of price oracle exploit.

$\longrightarrow$ Examples are hand-picked, but make sense.

Empirical analysis could be expanded to include:

- panel of loan volumes of assets explained by collateral prices, liquidation risk, etc.;
- event study using the REKT database on DeFi exploits. $\Rightarrow$ test impact of borrowers' informational advantages on collateral prices (not just ETH).

Comment 3: *Will DeFi lending stay relevant in the future?*

How to mitigate DeFi lending fragility?

- Improve price oracles? $\rightarrow$ more centralized, but timely and accurate price feeds.
- Less volatile collateral? (e.g., tokenized 'real' assets)
- Can decentralized risk governance help? (ala MakerDAO community)
- Reputation systems? (account scoring; risk-premia for under-collateralized positions?)

Summary

Very enjoyable read! Clearly written and easy-to-follow paper to learn about the space.

Discussion points:

- Comment 1: *Positioning of the paper in the context of blockchain/DeFi.*
- Comment 2a: *Is DeFi lending really fragile?* (intuition)
- Comment 2b: *Are the model assumptions reasonable?* (theory)
- Comment 2c: *Is the empirical analysis sound?* (empirics)
- Comment 3: *Will DeFi lending stay relevant in the future?*

Thank you very much!

References

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