Contagion Risks

~~FANTASTIC BEASTS~~ and Where to Find Them

in Compound Lending Protocol

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Contagion Risks in Financial Network
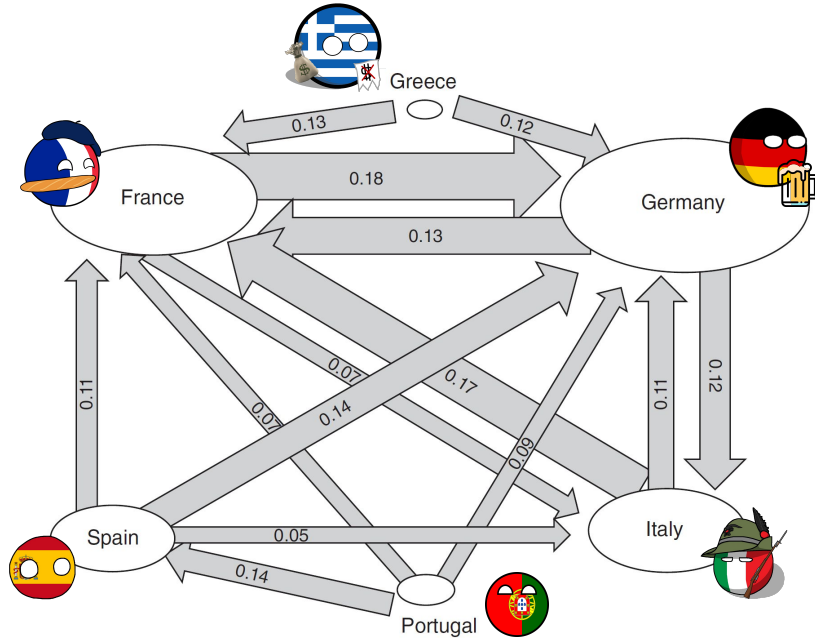

Figure 8. Interdependencies in Europe

Source: Elliott, M., Golub, B., & Jackson, M. O. (2014). Financial networks and contagion. American Economic Review, 104(10), 3115-3153.

- Financial institutions are interconnected and can be represented as a directed network. **"Bank A owes € 100M to Bank B"**
- The collapse of a financial institution can trigger cascading failure on the entire network: **"too connected to fail"**
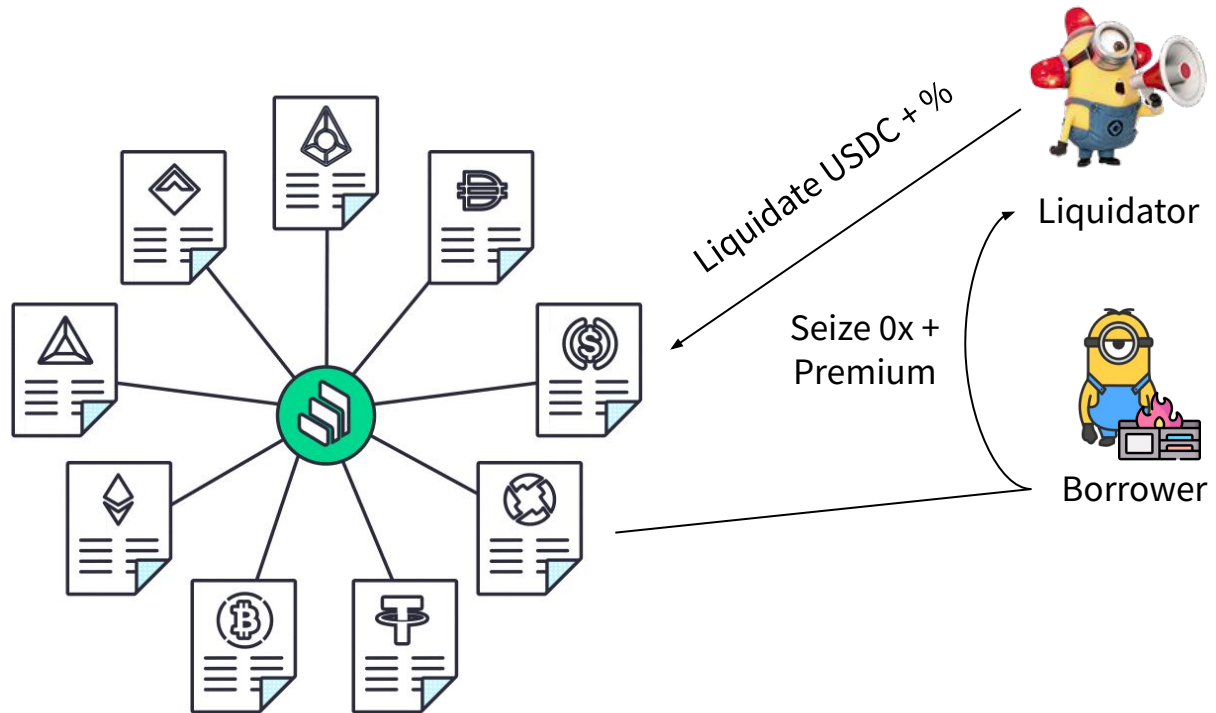
Research Questions

- Can systemic risks happen in DeFi? If so, in what way that it can happen?
- How can we evaluate that systemic risk?

Lending and Borrowing in Compound
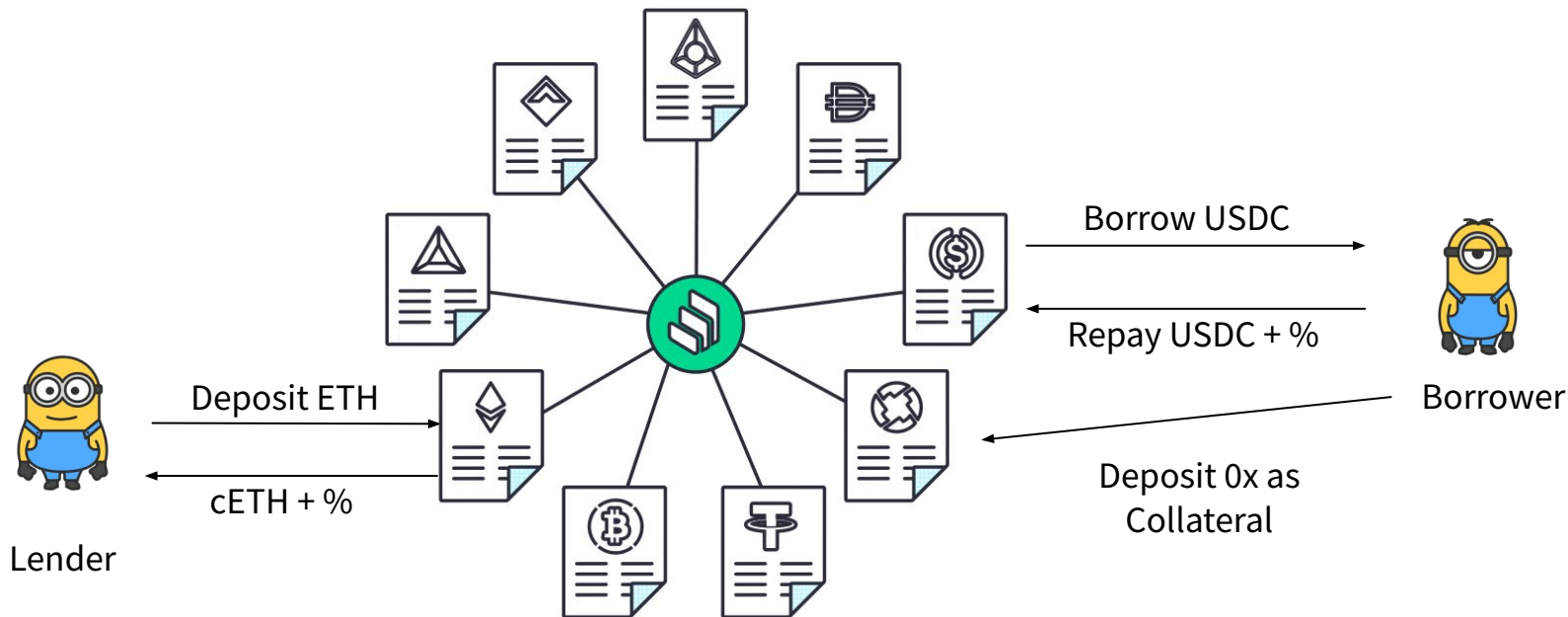
Liquidation in Compound

Liquidate USDC + %

Liquidator

Seize 0x + Premium

Borrower

Compound V2 | Ethereum

0x3d9819210A31b4961b30EF54bE2aeD79B9c9Cd3B

Total Collateral

$1.75B

Total Borrowing

$525.90M

Ether

Total Earning	Earn APR	Earn Distribution	Reserves	Utilization 4%
$454.54M	0.09%	0.00%	$1.42M	
Total Borrowing	Borrow APR	Borrow Distribution	Borrow Cap	Borrow APR 2.88%
$18.20M	2.88%	0.00%	$177.84M	
Collateral Factor	Reserve Factor	Oracle Price		Earn APR 0.09%
82.50%	20.00%	$1,778.39		

USD Coin

Total Earning	Earn APR	Earn Distribution	Reserves	Utilization 58.83%
$392.41M	1.99%	0.51%	$13.80M	
Total Borrowing	Borrow APR	Borrow Distribution	Borrow Cap	Borrow APR 3.66%
$230.85M	3.66%	0.88%	No Limit	
Collateral Factor	Reserve Factor	Oracle Price		Earn APR 1.99%
85.50%	7.50%	$1.00		

Balance Sheet of Lending Pools

Assets

Loaned
Tokens

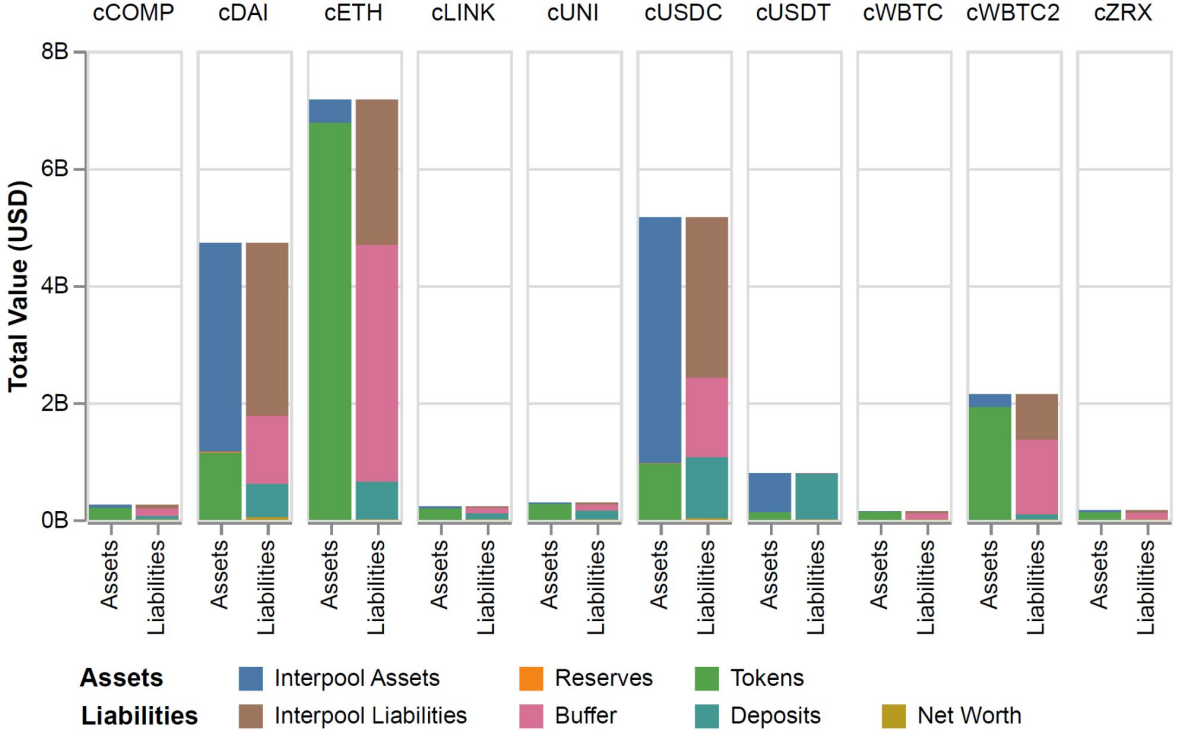Tokens

cETH

Balance Sheet of Lending Pools

Balance Sheet of Lending Pools

Balance sheets of the top 10 pools on September 7, 2021

Financial Network

Lending
Borrowing
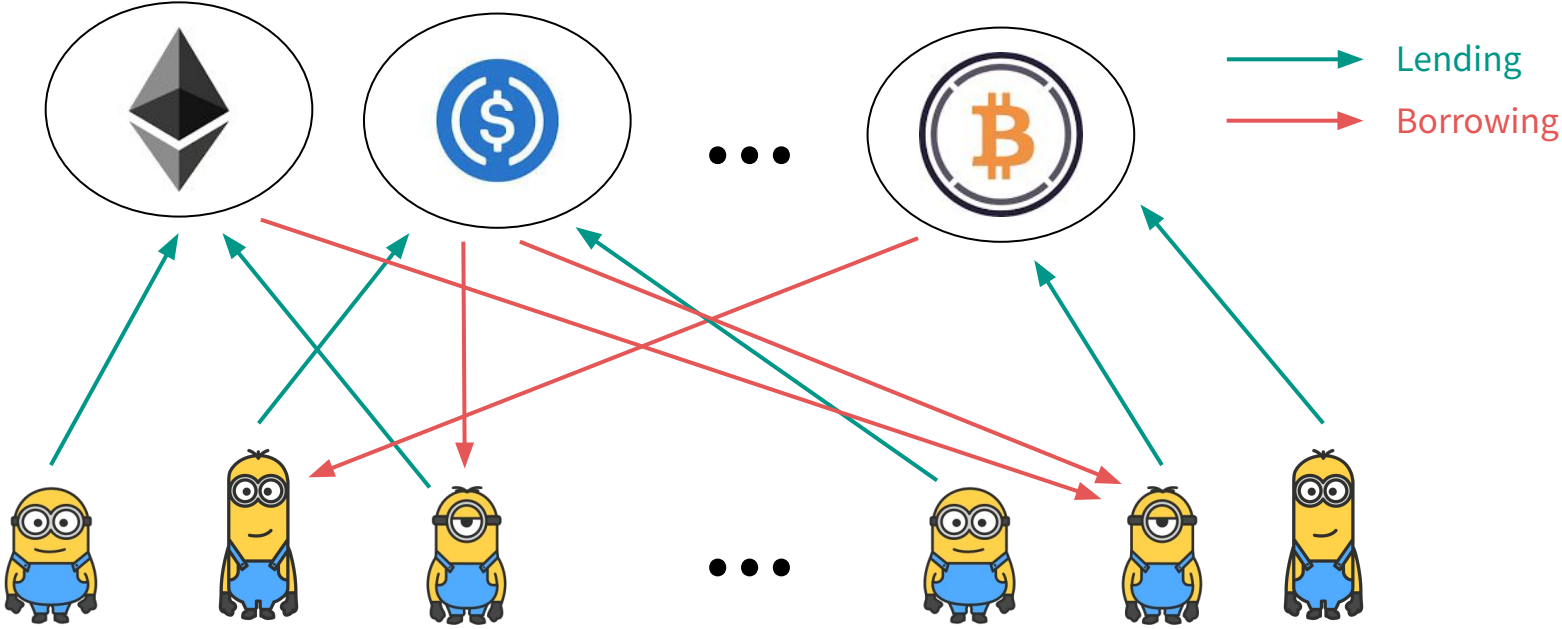
Bipartite Graph!

Financial Network
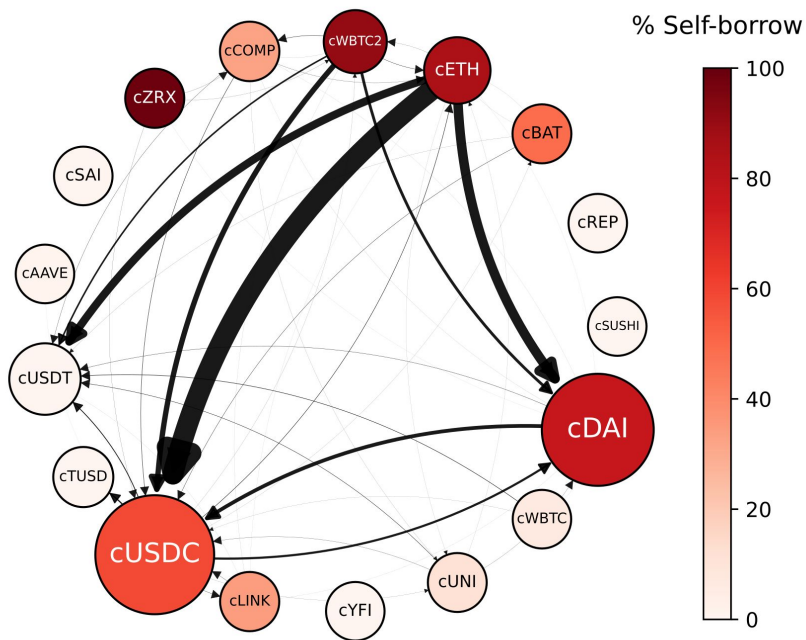
Interpool liability network on September 7, 2021
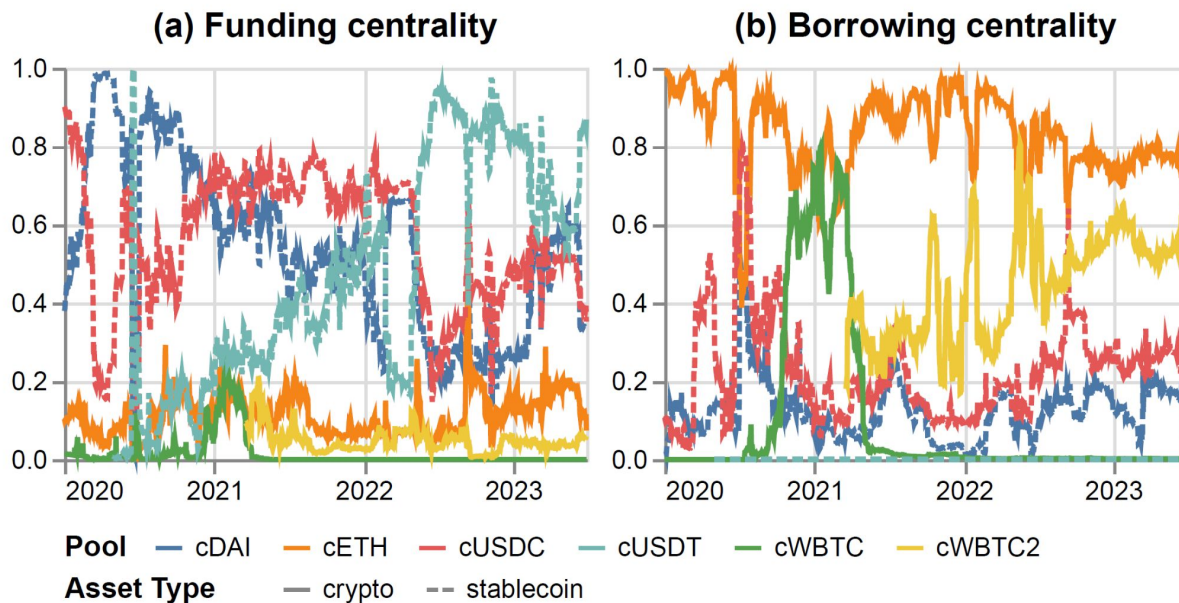
Two main functions of Compound **:**

1. **Repo issuance:** Main interpool links originate from crypto-pools and connect to stablecoin-pools.

2. **Liquidity mining:** Distribution of governance token (COMP) incentivize self-borrowing and borrowing across stablecoin-pools.

Centrality Measures

Left (right) eigenvalues capture funding (borrowing) centrality

$$\lambda v_j^L = \sum_{i=1}^{k} v_j^L \bar{L}_{ij} \text{ and } \lambda v_j^R = \sum_{i=1}^{k} \bar{L}_{ij} v_j^R,$$

(a) Funding centrality   **(b) Borrowing centrality**

Pool — cDAI — cETH — cUSDC — cUSDT — cWBTC — cWBTC2
Asset Type — crypto -- stablecoin

Main Findings

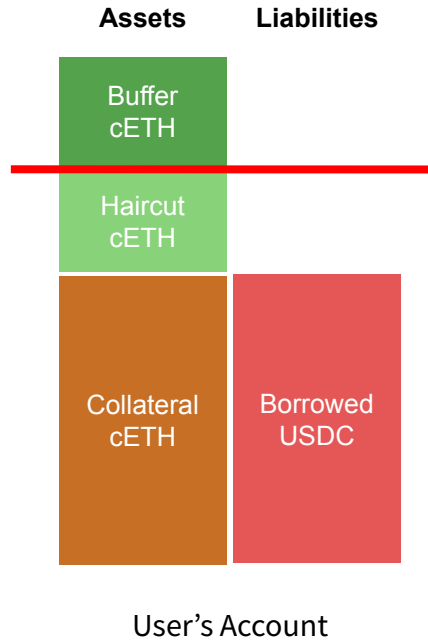Compound's serves two primary purposes:

1. **Enables users to issue repurchase agreements of cryptoassets against stablecoins.**

    ⇒ **Main systemic risk is a decline in the value of ETH and BTC.**

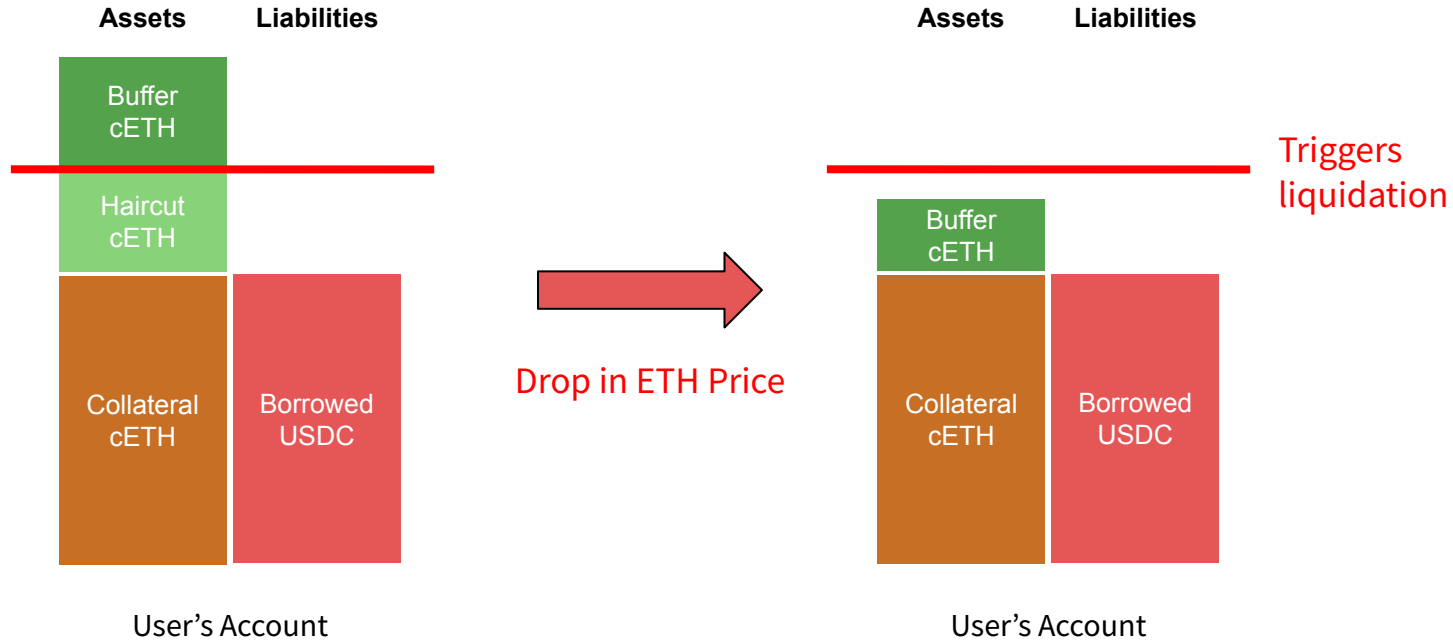2. **Allows users to engage in liquidity mining.**

In this work, we investigate whether these two sources of risks are likely to propagate.
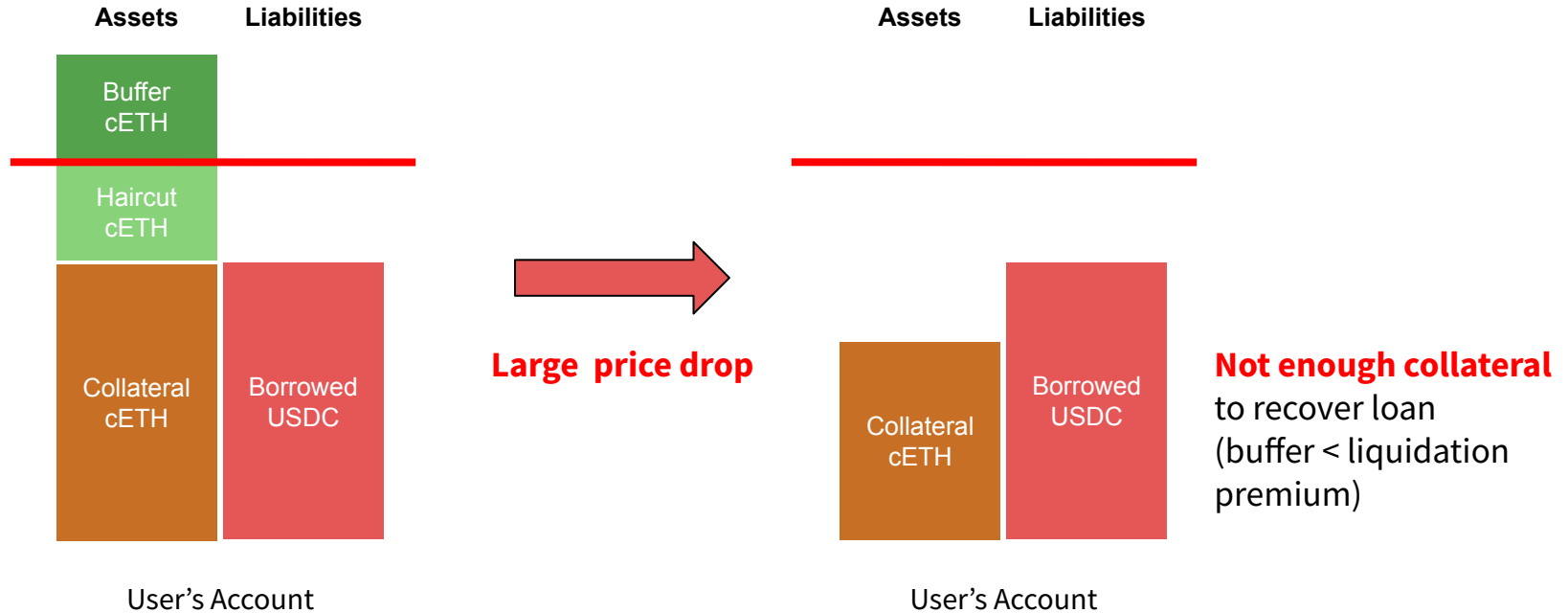
Liquidation on User's Account

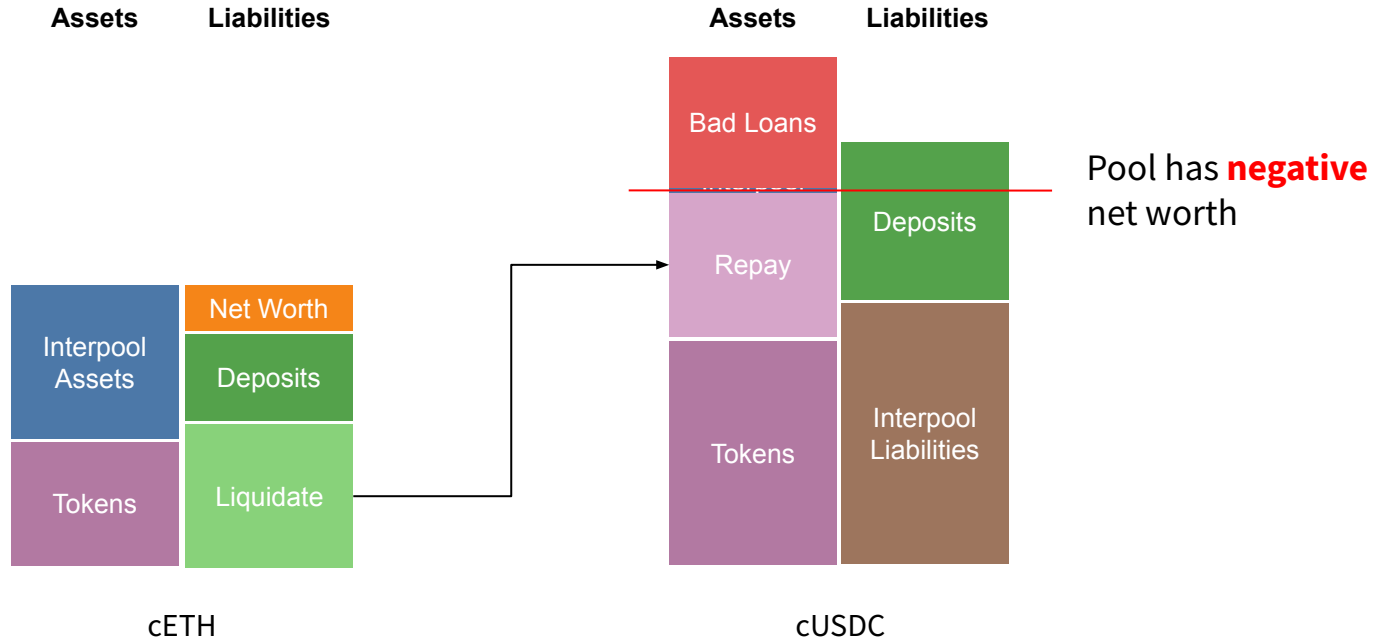The lines of credit of users have to remain *over-collateralized* at all time.

Liquidation on User's Account

Toxic Liquidation

Assets   Liabilities

Buffer cETH

Haircut cETH

Collateral cETH

Borrowed USDC

User's Account

Large price drop

Assets   Liabilities

Collateral cETH

Borrowed USDC

User's Account

Not enough collateral to recover loan (buffer < liquidation premium)

Aggregate Impact of Large Price

Assets **Liabilities**

Assets **Liabilities**

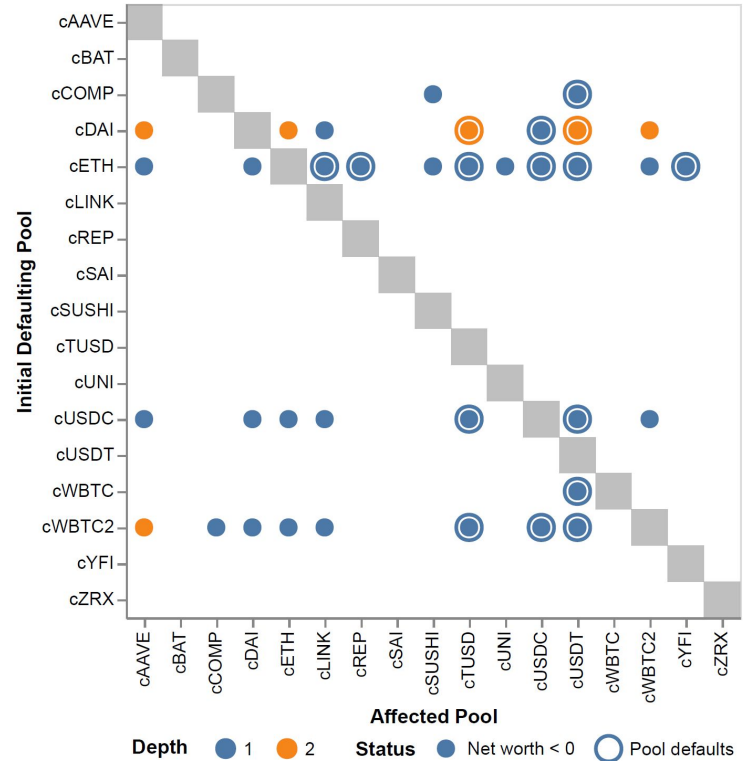Pool has **negative** net worth

cETH

cUSDC
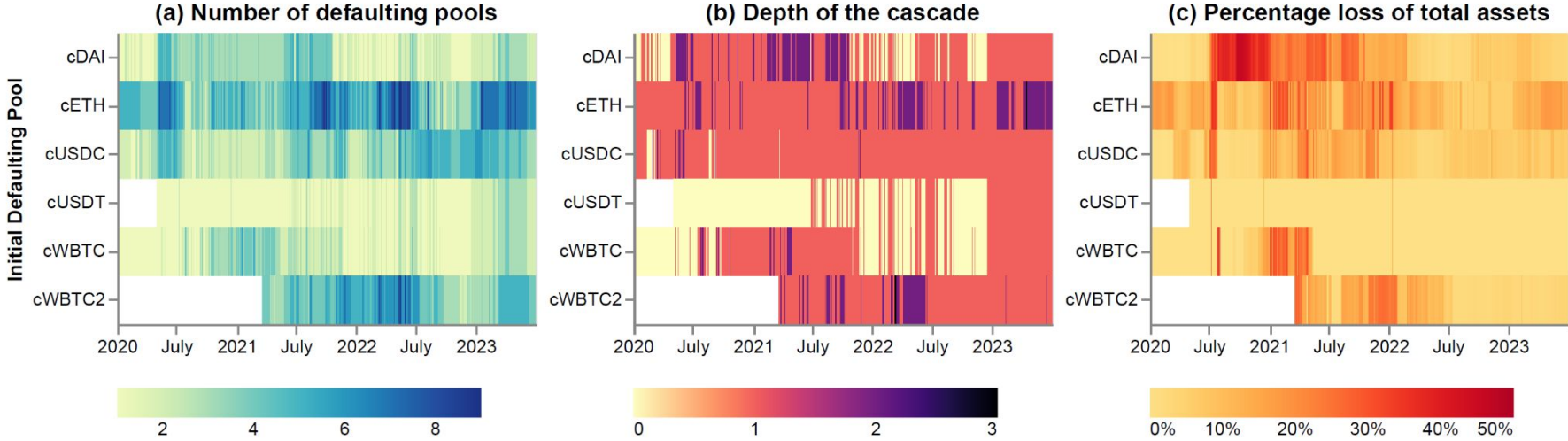
Contagion in the Compound Network
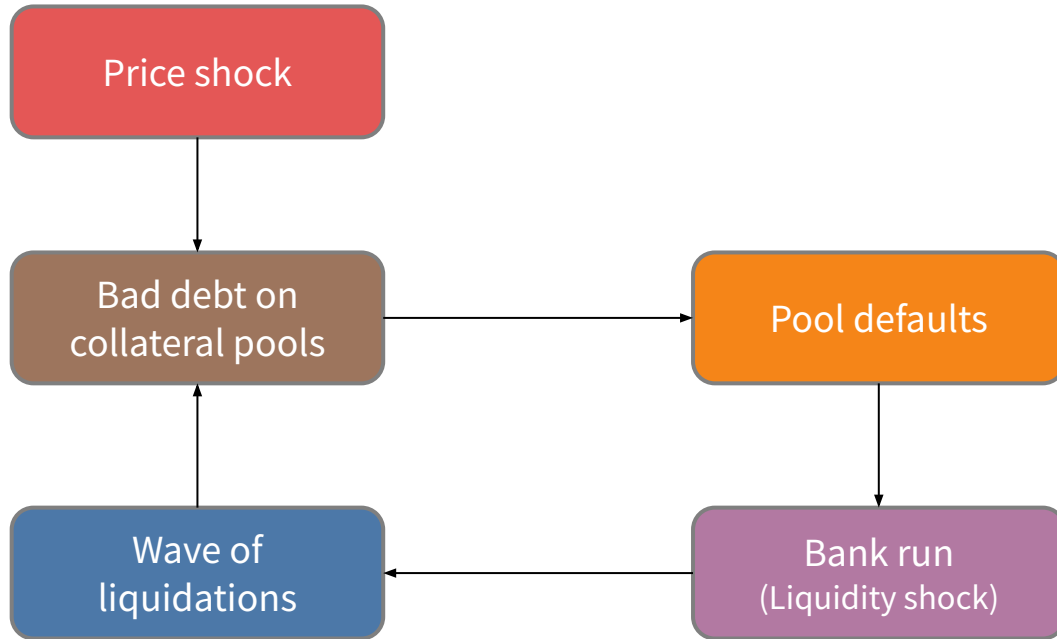
Default Cascades

- Negative net worth triggers a run on pools' deposits.

- Pool defaults when it cannot redeem the value of its cTokens held as deposits.

Default cascades simulation on September 7, 2021

Default Cascades

Daily snapshots of default cascades for the top six pools

Systemic Shock

- Previous simulations do not explain why initial pool default.

- Simulate size of crypto market crash (ETH and WBTC) that triggers the default of a specific pool.

Finding: Default cascades are more likely to originate from stablecoins-pools.

Minimal price shocks triggering default
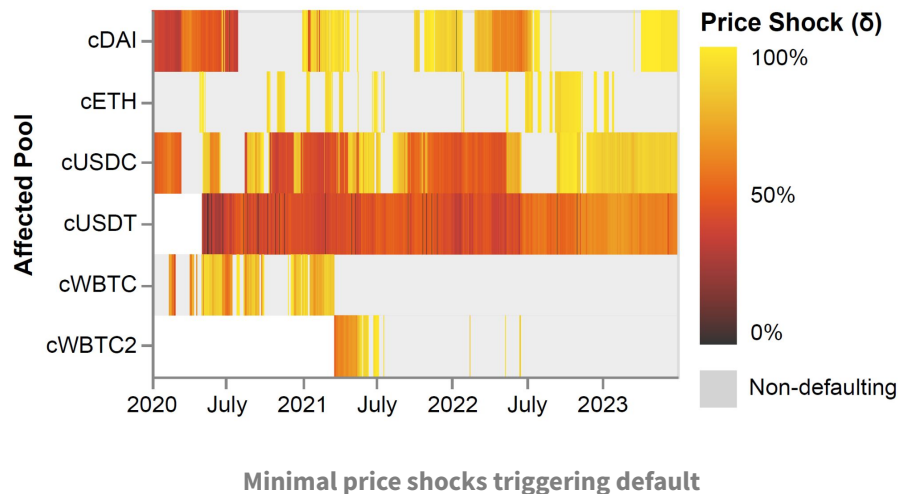
Conclusion

- **Outline methodology for the description of financial networks in DeFi**

- **Identify the two main functions of Compound:** repo issuance and liquidity mining

- **Show how to stress test the lending protocol**
  - Stablecoin-pools are the most likely to default in the event of a market crash
  - Crypto-pools are the most likely to set off a domino effect
  - Compound appears to be resilient to fairly large shocks

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<u>Future works</u>
- More realistic contgation process, e.g., incorporate user behaviors and further price decline after liquidation
- Study bipartite structure to identify central (i.e., critical) users

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