SYSTEMIC FRAGILITY IN DECENTRALIZED MARKETS

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OVERVIEW

- **DEFI SPACE IS A MYSTERY TO MOST OF ECONOMISTS**
  - A fast-rising body of literature from Computer Science side on the working of DeFi, but not always on the question that financial economists care
  - This is the right paper on the right topic by the right authors
- **IN THE FIRST PART: DEFI**
  - How does collateralized lending work in DeFi?
- **IN THE SECOND PART: LIQUIDATION**
  - Contagion effect of liquidation
  - Interesting empirical analysis

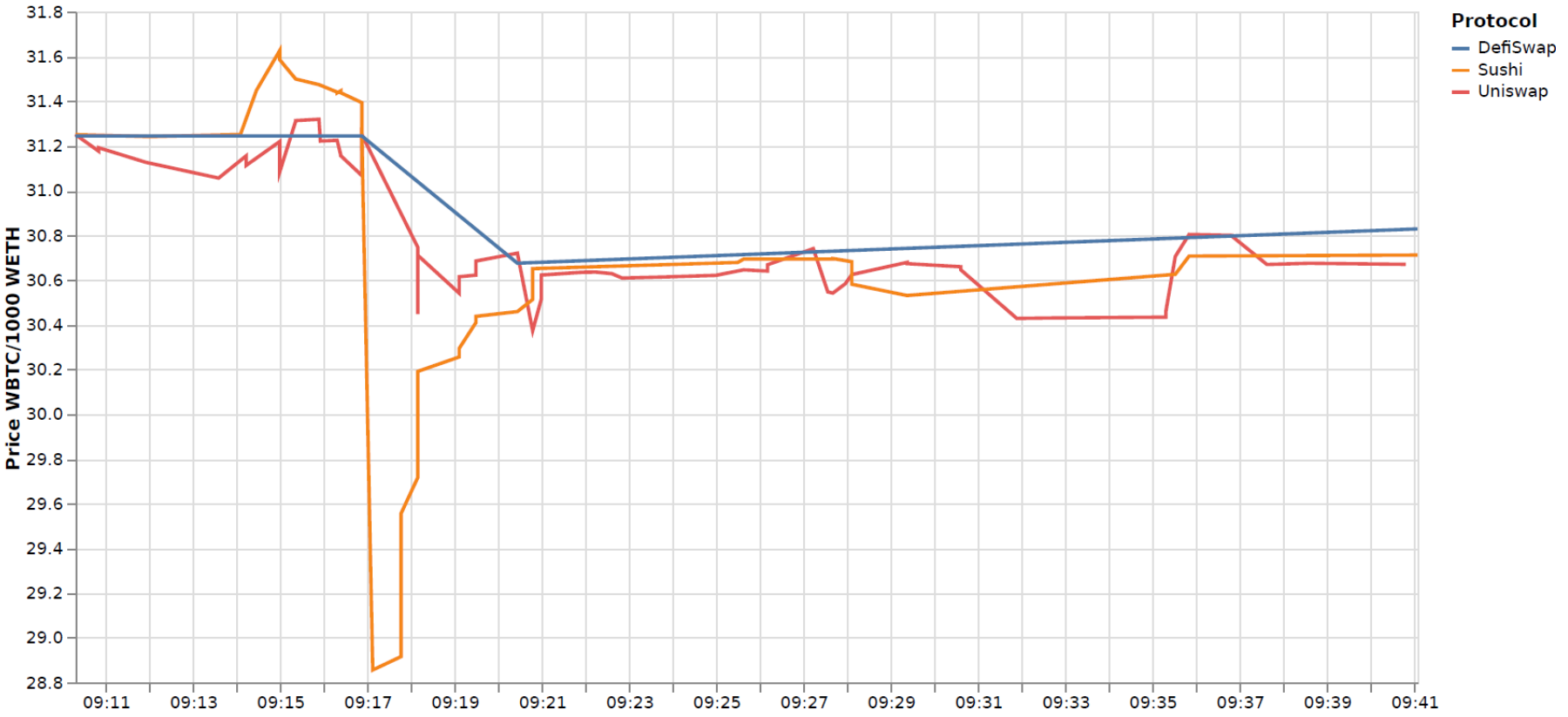
THE WORKING OF DEFI

- **LEADING PROTOCOLS IN THE DEFI MARKET**
  - Compound and Aave: largely similar. Aave pioneered in flash loans. The focus of the paper
  - MakerDAO, dYdX, and others (but exclude yield farming…)
- **ILLUSTRATING EXAMPLE**
  - Say ***savers*** lend 1500 DAI in a pool
    - DAI is the stable coin, so it represents ~$1,500 deposits
  - Say ***borrowers*** (including me) use one ETH ($1000) to borrow 750 DAI
    - ***Collateral factor*** 75%
  - Interest rate determination:
    - ***Utilization*** ratio: $U = \frac{Borrowing}{Lending} = \frac{750}{1500} = 0.5$
    - Borrowing rate is increasing in U. Say linear $r_b = \alpha + \beta U$ (can be designed)
    - Lending (saving) rate then is determined by budget constraint: $r_l \cdot Lending = r_b \cdot Borrowing \Rightarrow r_l = r_b U$
  - But, ETH price may be volatile. Say ETH price drops to 900
    - Any liquidator can pay 750 DAI (on behalf of me), get collateral at a price = market price * (1-10%). 10%: ***liquidation spread***, or 1/9 profit margin
    - Here, liquidator gets $\frac{750}{900*0.9} = 0.9259$ ETH
    - The liquidator can sell this collateral immediately at $900 without price impact, his profit is 0.9259*900-750=83=75*1/9

THE ROLE OF FLASH LOANS

- **THE LIQUIDATION SPREAD IS TO INCENTIVIZE LIQUIDATORS**
  - The whole trading strategy could be risky
  - Limits to arbitrage
- **SOPHISTICATED TRADING STRATEGY**
  - Borrow DAI, pay back loans, get the collateral, and sell the collateral, and repay DAI
  - But with flash loans, could be done in a riskless way
- **FLASH LOANS**
  - Executed in one block (either all or none); small contract, with contingent execution to ensure profit
- **IMPLICATIONS OF FLASH LOANS**
  - Reduces the arbitrage risk improves financial market efficiency
  - But also contagion worse given non-negligible price impact (on ETH)
    - Especially if the oracle price feed can be manipulated
    - Technology cannot overturn the fundamental economic force

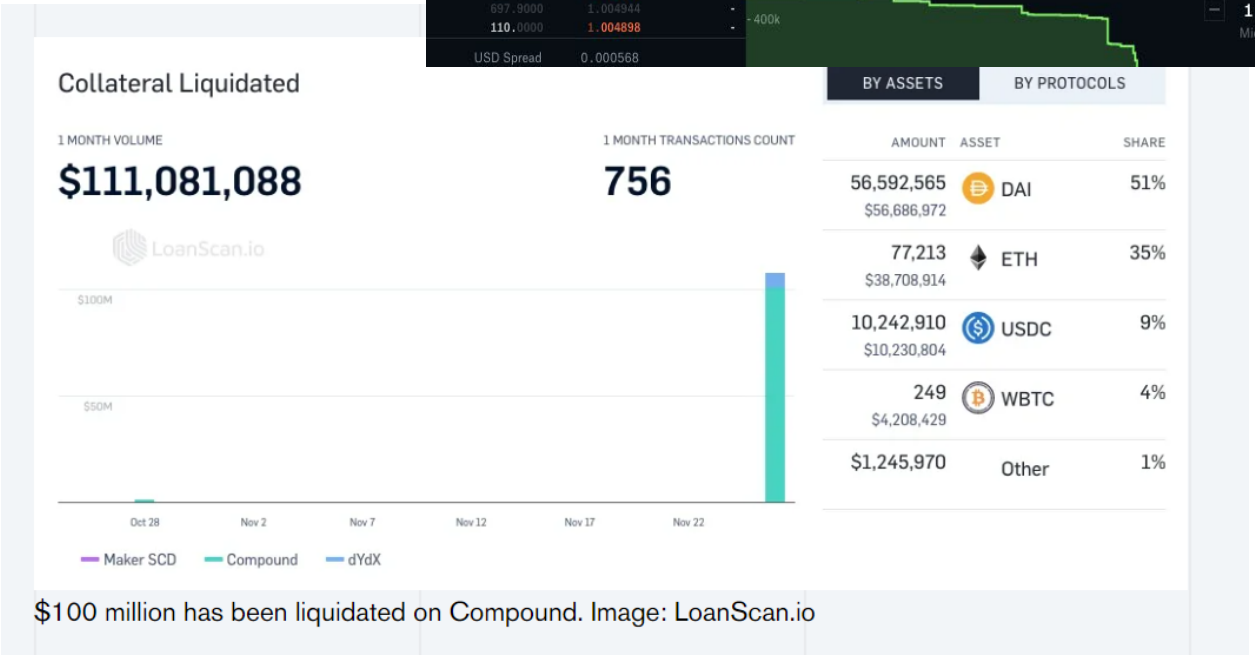
CONTAGION


Price WBTC/1000 WETH
31.8
31.6
31.4
31.2
31.0
30.8
30.6
30.4
30.2
30.0
29.8
29.6
29.4
29.2
29.0
28.8
09:11
09:13
09:15
09:17
09:19
09:21
09:23
09:25
09:27
09:29
09:31
09:33
09:35
09:37
09:39
09:41
Protocol
DefiSwap
Sushi
Uniswap

THE DAI INCIDENT

- **THE BIGGEST CHALLENGE TO IDENTIFY "CONTAGION:"**
  - Fundamental vs. Liquidity. What triggers liquidation?
  - A great economic setting here, but could be sharpened
- **ONE IDEAL EVENT**
  - Positive shock to DAI on November 2020
  - Likely an idiosyncratic event
    - Intentional manipulation? Or BTC drop by 10% temporarily that time?
    - Only on Coinbase and Uniswap
    - But, Compound is using Coinbase's DAI/USDC oracle
  - Interestingly, loans taking out DAI become underwater not because of deteriorating value of the collateral
    - Say you borrowed a $100 loan when DAI is $1. The spike caused the debt value to spike to $130….. Under-collateralized if the collateral value does not change
  - Very unique to crypto space, as there typically it is collateral value drops (which might be caused by many fundamental reasons)

DAI PRICE CHART AND LIQUIDATION



$100 million has been liquidated on Compound. Image: LoanScan.io

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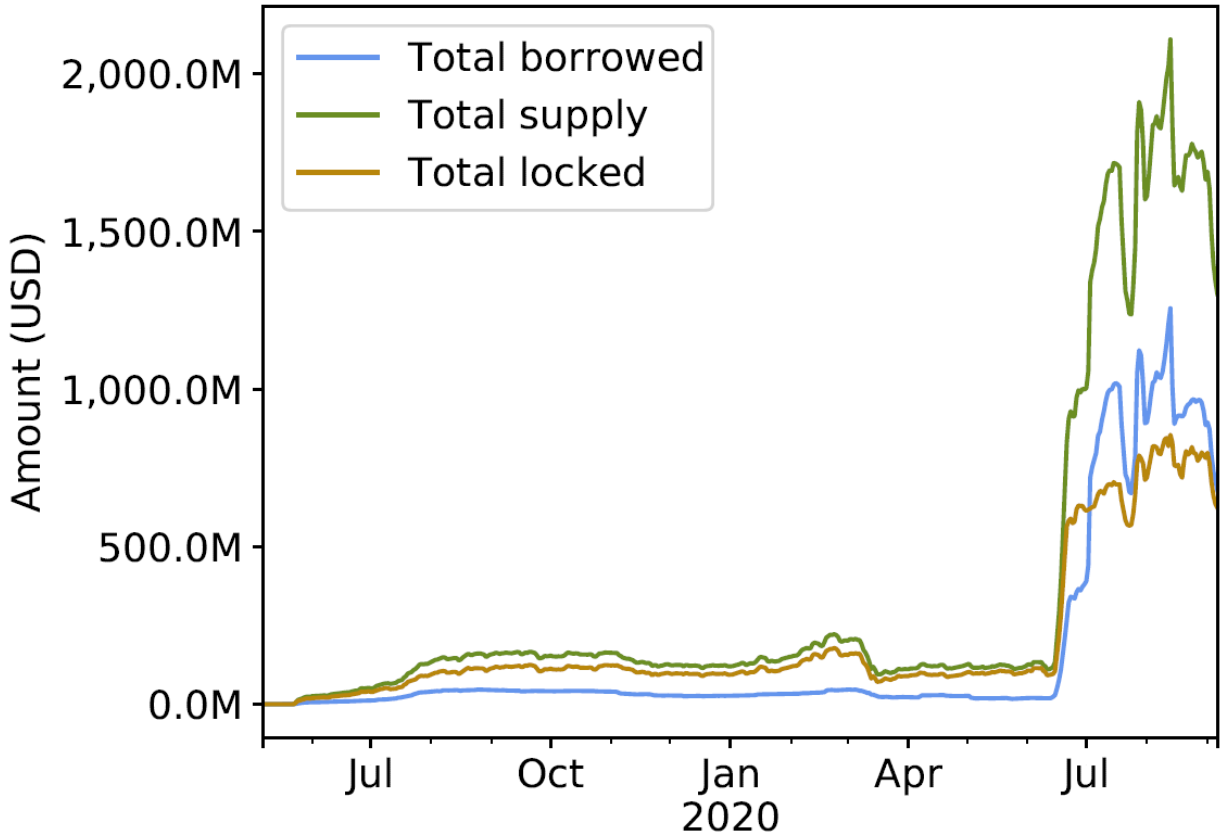
INCENTIVES OF LIQUIDATORS

- **SOME OBVIOUS DIFFERENCES FROM TRADITIONAL FINANCIAL MARKETS**
  - Liquidation spread is set by protocol (can be optimized)
  - Gas fee should be independent of dollar size, bias toward liquidations with bigger value ticket
- **A KEY DIFFERENCE IN MY VIEW**
  - Right now, all positions (including the distance to liquidation threshold) are observable!
  - Facilitates "predatory trading," (Brunnermeier & Pederson 2005)
    - In traditional world, rational economic agents "guess" others' positions (rightly)
  - Remedy?
    - Zero-Knowledge-Proof encryption, so not necessarily reveal certain important information like the distance to liquidation

BORROWING INCENTIVES



- June 2020, Compound introduced Governance Tokens,
  - Initially distributed to accrued interest (so savers)
  - 7/2/2020, borrowers & savers/lenders get Governance Tokens
  - Recall the market is driven by borrowers…

CONCLUDING REMARKS

- **OTHER IMPORTANT FACTORS THAT MATTERS FOR SYSTEMIC FRAGILITY**
  - High Concentration of liquidators
    - The top 20 liquidators performing 48.50% of the liquidations and liquidating 75.01% of the collateral
  - Increasing correlation of crypto-asset prices and main-stream Financial market
    - A trend maybe due in part to the increased involvement of institutional investors
  - Heavy participation of low-income retail investors (ECB report, due to lack of regulation)

- **A LOT TO LEARN IN THIS NASCENT MARKET (WILD, WILD WEST)**