

Memo re: impact of market panics on DeFi

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This is a memo that I sent to my team to debrief re: the impact of the events on March 12 on DeFi projects. As it might be useful for others, I'm making it public. It was put together quickly, so please excuse any inaccuracies or misunderstandings (and please let me know so I can fix - DMs open [on twitter](#) or comment here). Comments/feedback appreciated -- I will try to keep the doc up to date to reflect them.

I. Background

On March 12 ETH saw a 30% drop in price in a 24-hour period. This, in combination with a rapid increase in gas prices due to network congestion, put stress on DeFi protocols and served as a test of resilience in the face of a black swan event. The overall impact was mixed – some protocols saw high levels of activity that boosted their usage, and others saw problems exposed. MakerDAO was the most adversely affected. Compound saw high utilization rates, Uniswap saw record volumes on its DEX, and dYdX saw big price dislocations against centralized exchanges due to delays in Maker oracles (which are widely used in DeFi).

II. Impact on key DeFi systems

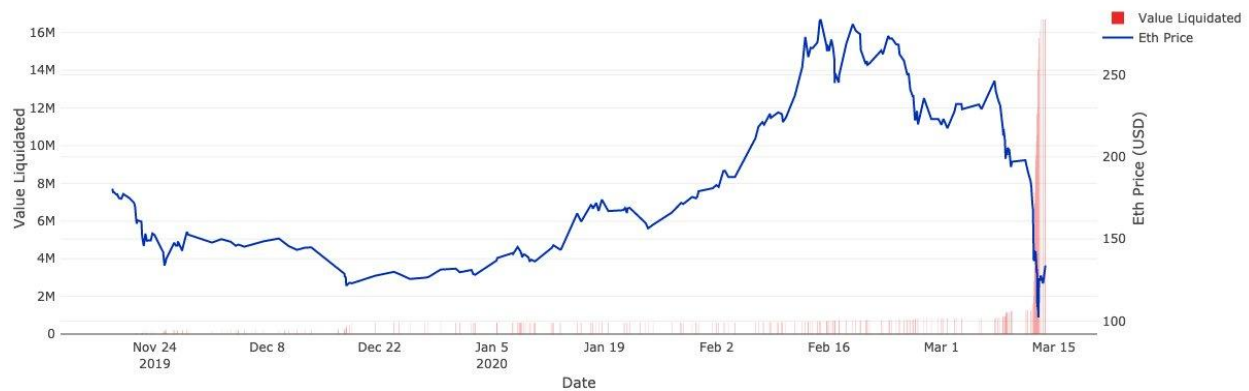
Maker

MakerDAO allows users to deposit crypto assets like ETH and BAT and take out DAI-denominated loans. Each debt position is called a “vault”, and these vaults are collateralized by at least 150% of their DAI value. When the collateralization ratio falls below 150% (as determined by the Maker oracles), the system puts the collateral up for liquidation, where a 3rd party “keeper” can make a contract call that puts the collateral up for sale in an auction in exchange for DAI. The auction attempts to raise an amount of DAI that will cover the debt obligation + a liquidation penalty of 13%. The auction results in a discount on the collateral assets that are for sale, ultimately generating a loss of 13% + the impact of the discount. The Maker system earns the 13% and the keeper earns the value of the discount.

On March 12, roughly \$15m of vaults were triggered for liquidation but the keeper ecosystem did not respond as they were expected to. Keepers run bots that were not designed to adjust to unusually high gas prices, which caused some not to be competitive, and others shut down their keeper bots for fear of slippage (price dropping fast + txs taking a long time to validate) and due to a DAI liquidity crunch. This led to a situation where one keeper continued triggering liquidations, bidding 0 DAI for the ETH with no competition. **This left the system with around \$5.6m of “bad debt,” corresponding to losses for users in excess of the 13% penalty they were expecting upon liquidation.** These users get to keep their DAI, but cannot retrieve any collateral as there is none leftover.

The sheer volume of liquidations compared with liquidation volumes during normal market conditions illustrates why keepers may have been unprepared:

Liquidation volume (source: Dune Analytics)

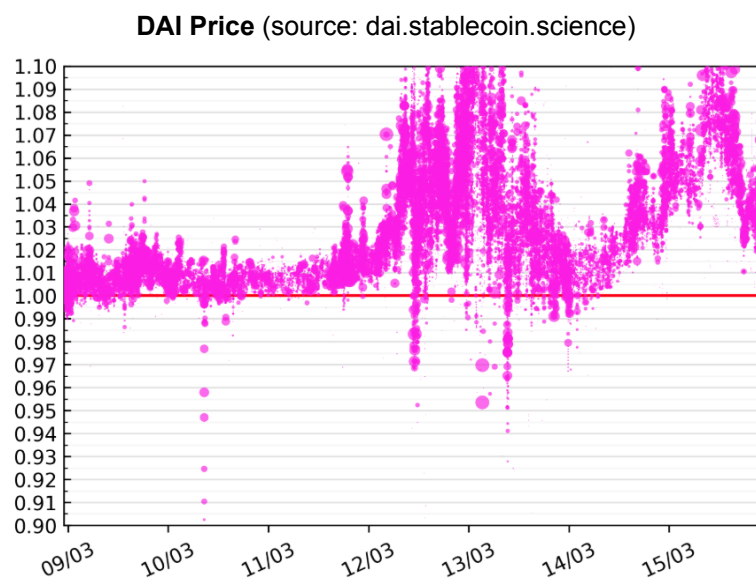


The Maker community responded by voting on a number of measures to pay down the bad debt as well as prevent this from happening again in the future. The changes include:

- Increasing the time for the collateral auctions from 10 minutes to 6 hours, to allow more competition and avoid \$0 bids winning.
- Increase the lot size for the collateral auctions from 50 ETH to 500 ETH, to minimize the amount of transactions required to execute liquidations.
- Push back the MKR auction from 48 hours to 6.5 days to allow the network to decongest and for community members to organize their MKR buying efforts.
- A number of other changes around interest rates, max system debt, etc.
- Another change has been proposed (but not yet accepted) to add a “circuit-breaker” that would allow MKR holders to freeze the liquidation process temporarily to slow it down further during times of network congestion.

Maker investors and community members signaled their intent to participate in the MKR auction to pay down the bad debt.

Maker’s woes don’t end with the liquidations – DAI’s peg broke above \$1 and has not stabilized:



There are a few reasons for this liquidity crunch:

- During March 12, users were buying DAI in order to pay down their debt to avoid liquidation.
- After March, people are buying DAI to participate in the upcoming MKR auction, as well as to prepare for future downturns in ETH.

This highlights a major risk for Maker: as the price of ETH goes down rapidly, demand for DAI increases, both from users of the system who want to avoid being liquidated AND by traders seeking a stablecoin. This pushes the price of DAI up rapidly, making it harder for liquidators to function.

The Maker community voted on a number of risk parameter changes to help restore liquidity in the days after March 12, including lowering the stability fee to 0.5% and lowering the Dai Savings Rate to 0% to incentivize more DAI minting. In light of the sustained dislocation of the DAI price from its target price, the MKR holders on March 16 approved adding USDC as a collateral type. The debt ceiling is 20m, liquidation ratio is 125% and stability fee is 20%. This was controversial in the community given that USDC is controlled by the CENTRE consortium, which means it is subject to regulatory controls on Coinbase and Circle, and thus susceptible to being frozen, potentially putting Maker at risk. It also means Maker is not purely backed by “trustless” assets anymore.

So far, these measures have helped push the price back down to 3-5% above \$1, but it remains unpegged as of March 18.

Overall, the past few days highlighted risks of Maker’s protocol that many of its users were not aware of. Users likely lost \$1-2m of collateral in excess of the liquidation penalty. This will not be paid back, and those with insurance at Nexus Mutual have seen their claims denied, as this was not a bug or a hack but extreme market conditions coupled with a liquidity crisis. This is a setback for Maker, but it won’t be fatal – if the MKR auction and additional changes to stimulate DAI liquidity and restore the peg work as expected, DAI will return to \$1 soon and the system will be recapitalized.

Compound

Non-Maker lending platforms saw 2 main disruptions:

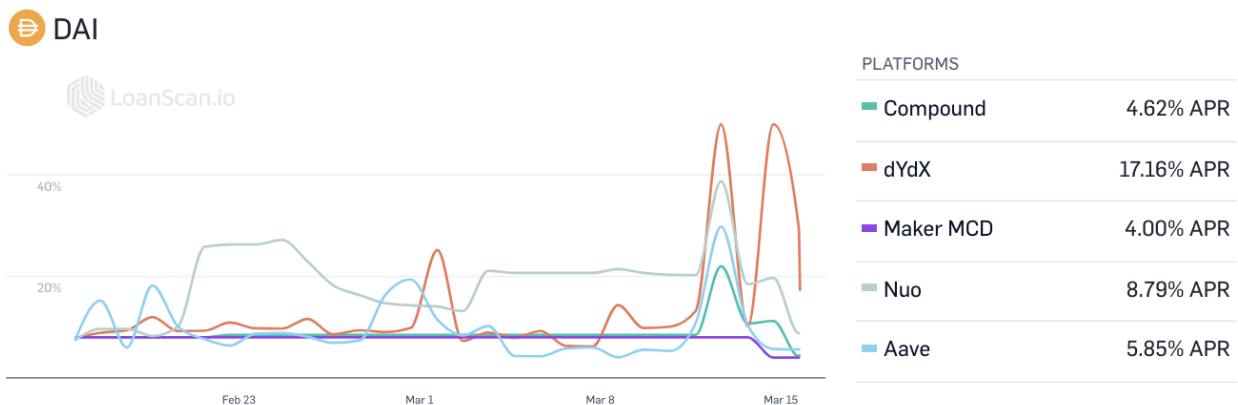
1. Abnormally high liquidations
2. Abnormally high rates on DAI

Compound liquidations (source: Dune Analytics)



Compound successfully liquidated collateral in its system, maintaining full solvency. In Compound, users deposit collateral and earn interest on that collateral. They are then able to borrow any asset the platform supports. Liquidators can monitor unsafe positions and liquidate *a portion* of them (not the entire position as in Maker), until the borrower is back above the safe collateralization ratio. This means liquidations are of a lower magnitude and are spread out across the tokens on the platform, mitigating a liquidity crunch on any individual asset. Compound does not face the same pressure as Maker, due also to the fact that closer to \$20m worth of loans are outstanding on the Compound platform, compared to over \$100m on Maker.

Interest rates across DeFi lending platforms (source: Loanscan)

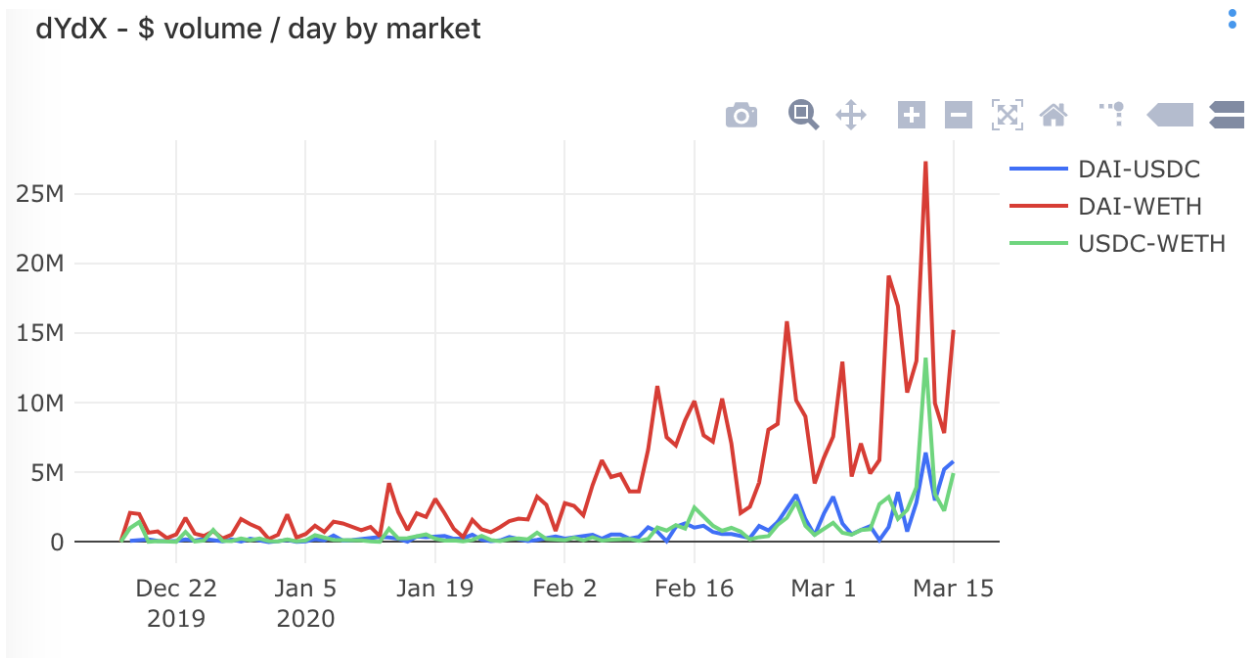
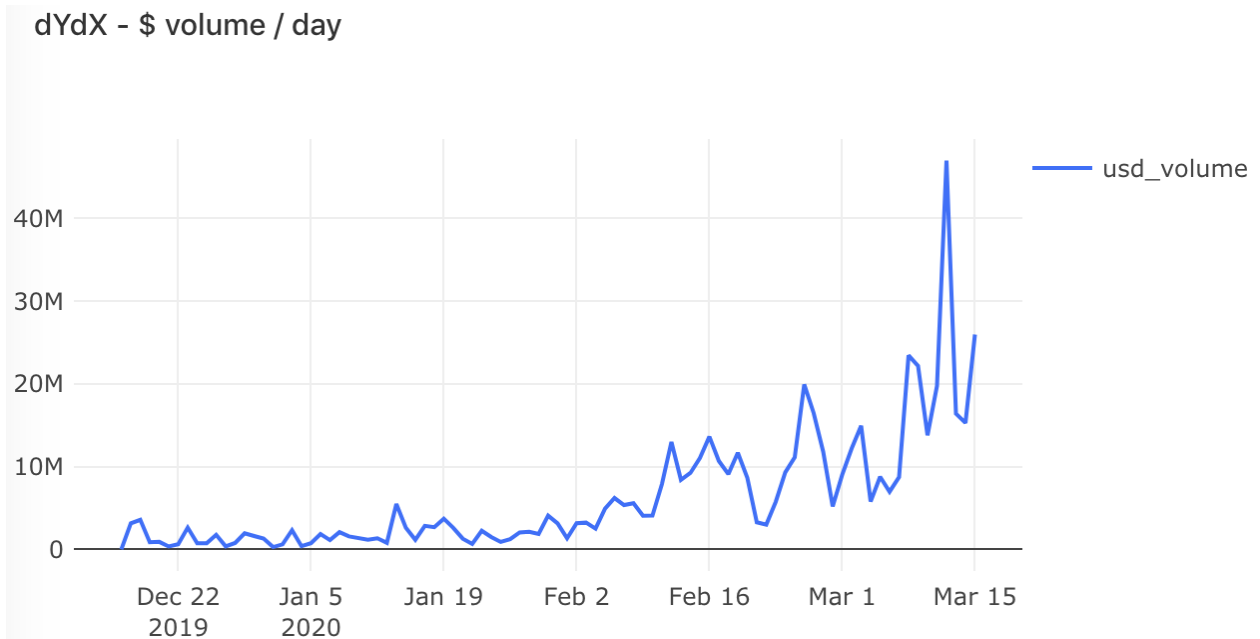


Interest rates surged for lenders of DAI. This was driven by demand for DAI, which caused high utilization rates on Compound. The utilization rate for DAI is >90%, meaning less than 10% of DAI is actually available for withdrawal by suppliers. This highlights a risk of Compound's model – Compound is susceptible to a “run on the bank” where if >10% of DAI suppliers demand a withdrawal, Compound will not have enough DAI to pay them back. When utilization is high, rates jump to incentivize more suppliers, but this will not always be enough to raise enough DAI to pay out withdrawals.

dYdX

dYdX maintained a safe collateralization ratio and saw record volumes on its exchange:

dYdX volumes (source: Dune Analytics)



However, dYdX pays gas fees on behalf of its users, so because of the spike in gas prices, dYdX decided to impose a temporary minimum trade size of 10 ETH. The Block reported that in February, dYdX paid over \$40,000 in gas fees and that in the last 30 days, that figure rose to \$186,000.

Uniswap

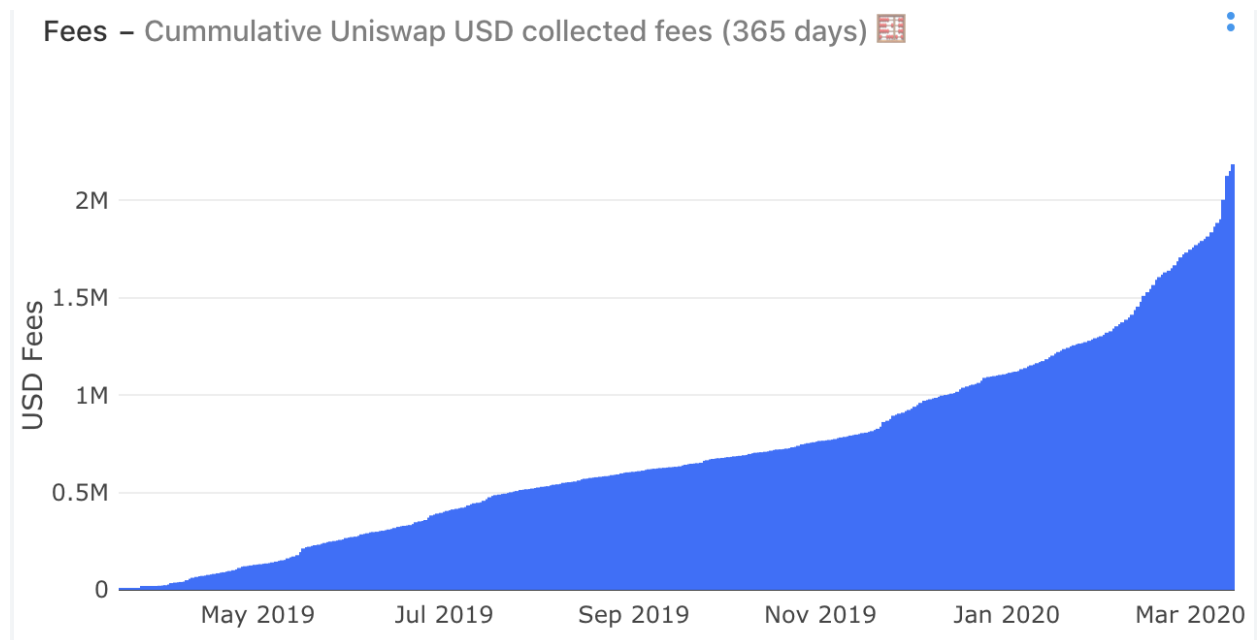
Uniswap, which facilitates simple swaps with no leverage and no need for any oracles, saw a record day on its exchanges:

Uniswap volume (source: CoinGecko)



This resulted in a big fee day for Liquidity Providers on Uniswap, who post equal parts of both sides of a trade and earn 30 basis points per swap facilitated between them.

Cumulative fees (source: Dune Analytics)



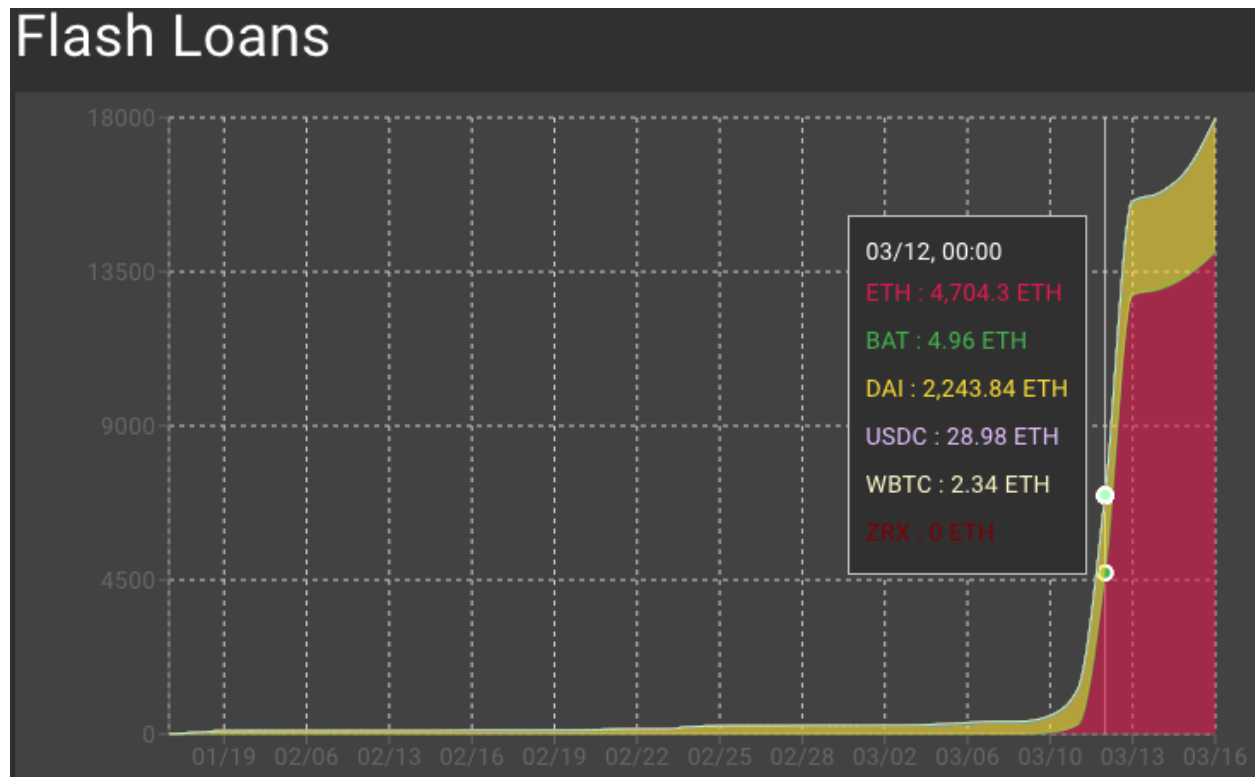
The downside is impermanent loss which is experienced when large price dislocations happen between Uniswap and centralized exchanges. Arbitrageurs step in and earn the difference, but Uniswap LP's still tend to outperform a portfolio of equal-weight ETH and DAI.

Uniswap continues to be an example of a smart contract system that is simple, free of single points of failure or freeze buttons, and provides a very useful service.

Aave

Aave's flash lending product saw an all-time high usage, as keepers in Maker struggled to get DAI liquidity to execute liquidations.

Flash loans (source: Aavewatch)



III. What are the main pain points for DeFi systems in a market panic?

Network congestion

During times of extreme price volatility, Ethereum sees up to >5x increase in activity across the network as traders scramble to close levered positions or take advantage of the volatility. Fees spiked by 10x. Some users paid as much as \$20 to get a trade through.

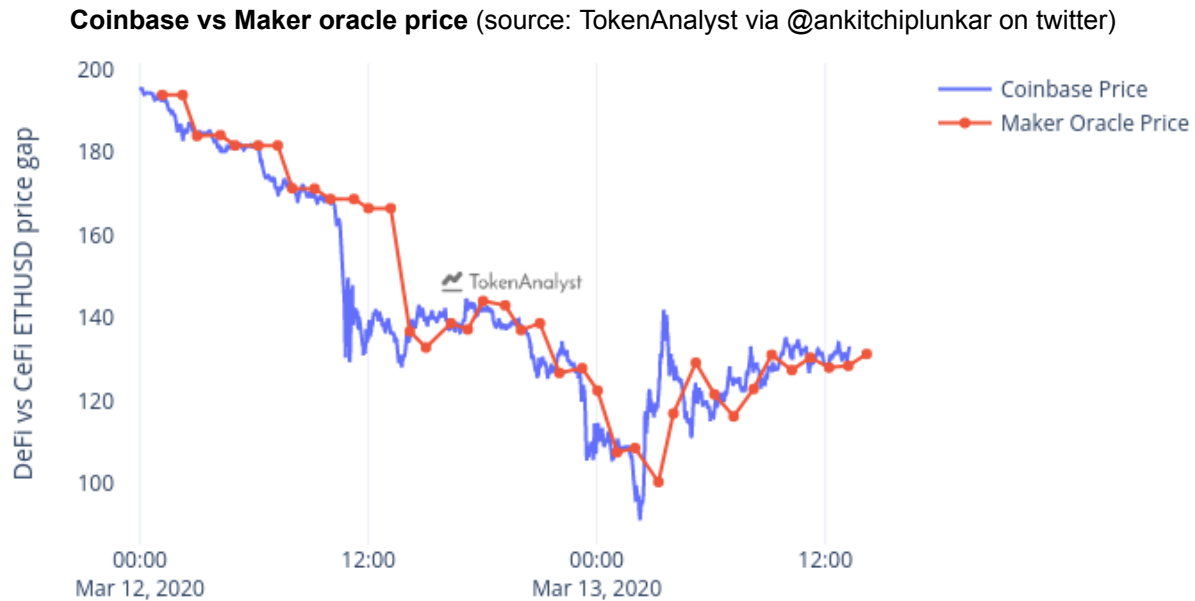
Liquidity crunches

Small cap coins can experience liquidity crunches, in particular when they are needed for liquidation mechanisms. We saw this with DAI and it highlights a challenge that is faced by a number of DeFi systems: if illiquid coins are a part of an integral system mechanic, that mechanic may break down in a market panic.

Oracle delays

Many systems, including dYdX, Gnosis, Set, 0x, and others, use the Maker oracles for ETH prices. The oracles are updated via on-chain transactions, meaning the blockchain is not aware of the price change

until the price updates are included in a block. During times of congestion, this can cause material price dislocations:



Oracles are currently mostly used in DeFi to value collateral behind loans. Thus, the oracle delays served mostly to protect users from being liquidated, or put a delay on when their loan positions would be at risk. While delays might present arbitrage opportunities, they are not necessarily taken advantage of, as traders would risk that the gas fee is high and that the ETH price moves a lot more before the trade is mined.

Systemic risk

The composability of DeFi protocols shows its vulnerability during market panics. There were 2 categories where this was problematic: 1) for systems that use DAI as a stablecoin, and 2) for systems that use the same Maker oracles. When DAI breaks its peg, all those applications are affected. This is mitigated by having other stablecoins like USDC as well, but it highlights that any “truly decentralized” application (think Augur) that requires DAI may not function as intended during times of aggressive market volatility. Similarly, having many systems rely on the same oracle means that if the oracle breaks for some reason, all of those systems will fail as well, possibly resulting in unintended user losses. dYdX uses a number of oracle solutions, with Maker’s being an input, along with fail-safe measures, to protect against the corruption or malfunctioning of any one of them.

IV. Which of the highlighted challenges can be easily mitigated with better parameter choices vs pose long-term structural challenges?

Maker’s bad debt problem can be mitigated through parameter changes. It is unlikely we will ever see \$0 bids again due to the changes that Maker governance has enacted. However, users lost funds and probably confidence in the Maker system. Those users will probably not be made whole, and many were unaware that this was a possibility.

Network congestion can be mitigated through using layer 2 solutions like optimistic roll ups. A handful of DeFi projects are considering optimistic roll ups which will help on that front, although there will still be friction going on and off between the rollup contract and the main chain.

Liquidity crunches are an unavoidable problem faced by systems that use small cap coins. This highlights the importance of designing mechanisms that mitigate this risk. E.g. using illiquid tokens for critical system mechanisms like liquidations is risky, and should be avoided if it can be. There could be alternative ways to facilitate liquidations and retro-actively burn DAI in Maker, for instance, perhaps allowing liquidations to be executed via USDC which could be put in an escrow that slowly purchases DAI as it becomes available. (That may run counter to the ideals of the system, but it might have served Maker well during this crisis...?)

Systemic risk in DeFi is unavoidable, as long as systems use each other as “building blocks.” It is clear today that DAI is systemically important to the DeFi ecosystem. If it were to fail, I suspect the activity would migrate to USDC and Tether, but it would be a big setback.

V. Final Thoughts

DeFi was tested in a big way. Overall, most systems worked as intended, with the exception of Maker’s keeper ecosystem. In particular, the event highlighted that simple contracts without oracles and many moving parts, like Uniswap, are quite powerful and resilient. However, some big risks were exposed in more complex contract systems and it is clear there is a lot of work to do before DeFi is appropriate for mainstream users.

Some questions to consider:

- Is it okay if most DeFi systems work fine during “normal” conditions, and pause or halt up during extreme volatility? What does this mean for the types of applications that DeFi can serve?
- As more of these systems transition towards having an on-chain governance mechanism, this is both an opportunity and a challenge. During normal times, governance decisions can be delayed and the community has an opportunity to have say and ownership over their financial systems. However, during panics, governance delays mean potential temporary service outages, or if decisions are made quickly, potential attack vectors. Where is the optimal balance between user control and ability to deal with crises?