Introduction

In March, article 5.3.2: Morpho overcollateralized sUSDe or USDe DDM was ratified for inclusion in the Stability Scope Bounded Mutable Alignment Artifact. As a result, @BA-Labs provided a USDe Morpho Lending Integration Risk Assessment, where we recommended launch parameters for the Morpho D3M (DIRECT-SPARK-MORPHO-DAI) and Morpho Spark DAI Vault, as well as an initial allocation of 100M DAI. The deployment was later executed on March 29, following the March 26 Executive Vote.

On April 1, @BA-Labs posted a Morpho Spark DAI Vault Update, where we reviewed early performance data from the Morpho Spark DAI Vault and provided updated parameter recommendations and allocation adjustments. In summary, we recommended increasing the DDM DC-IAM line

parameter to 1 billion DAI and the total allocation across all pools to 600 million DAI. However, it is worth noting that the recommendation to increase line

to 1 billion was primarily made to reduce the amount of governance overhead required to increase exposure in the future, if identified constraints would change. Furthermore, the 600 million DAI allocation should in our opinion scale up gradually in several steps. We mentioned that additional recommendations would only be posted if the risk/return is favorable and the overall exposure is sustainable.

The updated parameter recommendations were executed on April 8. As an initial allocation increase, we recommended the Stability Facilitator to propose an increase of 100 million DAI, reaching a total of 200 million DAI. At the time of writing, this is the current total supplied amount of DAI to the Morpho Spark DAI Vault. To review the vault data in further detail, we recommend visiting the Block Analitica Morpho Dashboard.

With this post, we aim to provide additional context and data which can be used to formulate a more sophisticated and transparent allocation strategy towards the Morpho Spark DAI Vault. In the analysis section below, we cover (i) an overview of markets in the Spark DAI Vault, (ii) an analysis of users, their position preferences, and position health, and (iii) a scenario analysis focusing on simulated liquidation curves for current state and potential new deposits.

Finally, we provide some insight into our plans going forward, and what we aim to achieve in the coming weeks.

Analysis Overview

The data in the analysis section below is updated through 9 April, 2024. The total debt exposure at the time of the analysis measured ~185 million DAI. Also note that users with less than 1,000 DAI debt have been omitted from the reviewed data. These users make up a significantly smaller share of the sample size (10M USD worth of collateral deposited by borrowers borrowing less than 1,000 DAI) and were excluded for the sake of analysis simplicity.

Markets

The Morpho Spark DAI Vault currently consists of eight markets, split into two collateral asset categories (USDe and sUSDe) across four different “liquidation loan-to-value” (LLTV) parameter values, respectively.

The chart below shows the total borrowed USD per market as of April 9, 2024. DAI debt exposure from USDe markets was ~122M, while sUSDe debt exposure measured ~63M Dai. This discrepancy is mainly driven by Maker’s current strategy of allocating a greater share of DAI towards USDe pools. However, by reviewing pool utilization levels, the USDe pools seem to attract more borrowing, which further supports our previous speculation – that users’ are currently prioritizing Ethena points and ENA tokens, and therefore opting for USDe pools with higher incentives.

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When looking at how median health rates differ across markets, we can see that the sUSDe 0.77 is the one exhibiting the highest health rate across its positions (1.26), while the USDe 0.945 is the one with the lowest health rate (1.03). It is interesting to point out that while the LLTV might play a role in determining the health factors (e.g. both health rates for 0.77 LLTV markets are above 1.15) it is important to monitor the variability of users’ positions across markets. Specifically, the health rates for the 0.945 LLTV markets differ significantly, since the sUSDe market has a health rate of 1.12. While their overall weight is not significant (both around $10M) it is still necessary to closely monitor the active positions in the market. This is also true for the median buffer over health rate, with 0.77 LLTV markets being more-than-well protected versus bad debt. Again, the USDe 0.945 market has a median buffer over bad debt of ~8%, requiring additional monitoring. What is very important to point out is that the largest market (USDe 0.86) is well protected against bad debt (22% buffer) and with relatively safe positions (1.11 health rate).

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Users

USDe currently makes up a larger amount of total debt exposure. However, wallet distribution is split in almost equal portions. At the time of the analysis, we identified 180 unique wallets. USDe 86% LLTV (18.1% of total wallets) and sUSDe 91.5% LLTV (22.6% of total wallets) made up the largest amount of wallet positions. The USDe 86% LLTV pool currently has a vault target debt of 80 million, which may in part explain the larger amount of wallets in that pool. The sUSDe 91.5% LLTV pool, on the other hand, currently has a vault target debt of 30 million Dai. The average borrow amount is 1.2M for USDe 86% LLTV and 522K for sUSDe 91.5% LLTV. Furthermore, the median borrow amount is 325K for USDe 86% LLTV and 104K for sUSDe 91.5% LLTV. This may indicate that a larger number of small sUSDe holders are prioritizing higher leverage.

As illustrated in the chart below, the vast majority of debt positions since inception have been less than 1 million DAI. The median debt at the time of the analysis was approximately 100K. The average debt was circa 840K. The top 10 positions represent ~40% of debt with an average health factor of ~1.14. At the time of the analysis, the largest position debt size was 16.7 million Dai within the USDe 91.5% LLTV market, with a health factor of 1.16.

The Morpho Spark DAI Vault is currently made up of a wide distribution of users across markets. With the prevalence of whales participating in yield farming strategies, the current user and debt distribution of the Morpho Spark DAI Vault is less concentrated than what would perhaps normally be expected.

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In the four charts below, we have categorized two groups of participants in the Morpho Spark DAI Vault, (i) old users: borrowers who first partook in the Morpho Spark DAI Vault during the first 100 million Dai allocation between March 28 - April 7, and (ii) new users: borrowers who joined after the second 100 million Dai allocation after April 8.

During the period of the first 100 million Dai allocation, 162 wallets participated. Following the second 100 million Dai allocation, 59 new positions were created by new wallets. The total debt amounted to 117 million Dai for old users, and 68 million Dai for new users.

It is also worth noting that both old and new users are on average well protected against bad debt (chart in bottom left corner). New users have a slightly higher debt weighted buffer over bad debt (-23.63%) compared to old users (-21.20%). Furthermore, both user cohorts have relatively safe positions on average, with a debt weighted health rate (chart in bottom right corner) of 1.15 for old users, and 1.161 for new users.

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Positions

On average, debt positions are well collateralized. The median health factor across all markets is equal to 1.13, while the debt weighted protection buffer before bad debt across all positions is ~22%. This means users effectively maintain 0.78 LTV with an average liquidation threshold of 0.878. Across positions, the median debt weighted leverage is equal to 8.17x.

Furthermore, the cumulative amount borrowed across markets, equal to ~$185M, is unevenly distributed across positions. Specifically, 25% of positions are holding $172M of debt, with the remaining 75% holding $13M.

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Scenario Analysis

Current liquidation curve

The following liquidation curve illustrates how much debt would be liquidated in case of some simulated haircuts. It is important to note that Maker is using a fixed price oracle, where USDe is assumed to equal 1 DAI and sUSDe equals 1 DAI * the sUSDe/USDe conversion rate. This means that the simulated liquidations would not occur instantly in practice. In reality, the primary market (minting/redeeming directly with Ethena) is currently the deepest and most important source of liquidity. Nevertheless, this is an important indicator to assess the rate at which cumulative debt exposures approach liquidation threshold levels. These scenarios assume that additional deposits are spread across current positions at their current weight in the overall market and suppose that they keep the same level of collateralization (which is not necessarily true). A more thorough analysis can be seen at the end of the document.

We can see that in theory the majority of individual positions would be liquidated at 20% haircuts and that many of the largest positions are able to withstand 10% haircuts without incurring in a theoretical liquidation.

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The bad debt chart below is, indeed, more significant, as it shows how much bad debt would be generated at simulated haircuts. What is very interesting to see is that at a 10% haircut there would be nearly 0 bad debt, hence implying that under this threshold, positions are safe. At 20% haircut, the bad debt would equal $6M, an amount which is significantly large given the scale of the DDM. At 50% haircut, the bad debt would equal $64M, which even if large could be sustainably covered by Maker's surplus buffer and protocol owned liquidity.

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Simulated liquidation curves for new deposits

We then proceed with analyzing some additional scenarios simulating what would happen in case of additional deposits in the DDM. This time too, these scenarios assume that additional deposits are spread across current positions at their current weight in the overall market and suppose that they keep the same level of collateralization (which is not necessarily true).

Supposing a new large deposit equal to $115M (which would bring total debt to ~300M), there would be a $64M bad debt generated at 40% haircut. As pointed out earlier, this is still an amount that could be sustainably covered by the surplus buffer even in case of a catastrophic scenario where (s)USDe price would drop by 40%.

Another simulation (in the chart below) shows that with an additional deposit of 400M (bringing total exposure to roughly $600M), there could be $67M bad debt generated at a 30% haircut. This is a slightly more likely scenario compared to a 40% drop, but still a condition that is hard to be met.

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Furthermore, we can analyze what would happen in case of increasingly larger deposits, in the order of $800M to achieve $1B total exposure. Assuming that positions maintain equal buffers, the maximum realized bad debt at 20% haircut would be equal to $27M for an overall exposure of $1B. This is important to assess what is the critical level at which haircuts would make it unfeasible for Maker to cover bad debt sustainably through the surplus buffer and protocol owned liquidity. Supposing the buffer is at historically high levels and additional protocol owned liquidity ($100M), Maker would be able to sustainably cover bad debt up to 1B exposure at a haircut of 30%.

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The steepness of the curves describing the impact of new deposits on bad debt across different haircuts, shows that scenarios with 20% haircuts with maximum exposures of $1B would be sustainable for any given exposure up to that. Supposing a 20% haircut for any given exposure level, we can see that the exposure does not significantly impact the generation of bad debt, while in case of more extreme drops lower deposits would ensure the protocol's sustainability.

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It is interesting to see that the average sensitivity of bad debt to haircuts for given exposure levels increases at a decreasing rate. This means that, on average, any additional $100M deposited in the DDM for any given haircut (from 0% to 100%) would result in bad debt increasing by on average six times. This figure is significantly lower when considering more likely haircuts (up to 50%), where for any additional $100M deposited bad debt would increase twice.

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Simulation liquidation curves for new deposits - worst case user behavior

The simulations above assume that users maintain their overcollateralization buffers despite potential USDe/sUSDe haircuts. In reality, certain users would want to maximize their yield and abandon positions by withdrawing available collateral up to the LLTV threshold. This holds true whenever the haircut is larger than 1 - LLTV.

This analysis with more likely user behavior shows that at 20% haircut the bad debt would be slightly higher ($96M) while at 30% haircut the bad debt would be equal to $200M for exposures of $1B. Supposing the same $100M theoretical threshold, Maker would be able to sustainably cover all realized bad debt for $1B exposure at 20% haircut. For a $600M overall exposure, bad debt would be covered up to a ~25% haircut.

However, this scenario is more likely for users in markets with higher LLTVs, but it is not a universal behavior for all users. Since MakerDAO would decrease its position in the market, interest rates would likely skyrocket. Consequently, the accrual of higher rates should begin to liquidate users or reduce their collateralization levels, also potentially making them unable to withdraw the remaining available collateral.

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Conclusion

The analysis has assessed the status of the Morpho Spark DAI Vault as of April 9, 2024, emphasizing individual user and market metrics, while also providing some additional insights into possible future scenarios.

In general, it seems that users prefer USDe over sUSDe exposure. This is likely driven by higher incentives directed towards USDe. However, it may still be too early to definitively judge, since perhaps more time and liquidity is needed before a stable equilibrium can be reached. Furthermore, the analysis may be biased as a result of Maker's current allocation strategy, which supplies 65% of the total vault target debt to USDe pools. There are some signs pointing towards smaller users preferring sUSDe, but with higher leverage. Finally, this trend might change if Ethena decides to reallocate incentives. USDe markets have a total of 122 million in exposure, versus 63 million for sUSDe, with an almost equal amount of wallets across USDe and sUSDe collateral categories.

There is a relatively low concentration of borrowers. Furthermore, positions are well collateralized, with a median health factor across all markets of 1.13, and debt weighted protection buffer before bad debt of ~22% across all positions.

The scenario analysis highlights that Maker is currently able to sustainably cover bad debt up to 20% haircuts for any given exposure level up to $1B through the surplus buffer and protocol owned liquidity. The analysis of the vault's behavior in case of additional deposits shows how different strategies can be pursued based on the risk tolerance to USDe haircuts.

Future Plans

Allocation Framework

In our opinion, Maker governance should consider the risk related data (covered above) as well as the weighted average borrow rates of the Spark DAI Vault when deciding on what returns justify continued DAI allocation. @BA-Labs will only provide additional recommendations if the risk/return is favorable and the overall exposure is sustainable. In order to make allocation decisions more transparent and efficient, we are working on providing a decision making framework which Maker governance can utilize to determine appropriate allocations towards the Morpho Spark DAI Vault.

Adding New Features to the Block Analitica Morpho Dashboard

Building on the findings of the analysis section above, we plan on adding new metrics to the Morpho Spark DAI Vault section of the Block Analitica Morpho Dashboard. This will allow us, and the broader Maker community, to monitor real-time data regarding the exposures and risks of the Morpho Spark DAI Vault.

Re-Underwrite USDe Exposure

As exposure to Ethena grows, we will actively work to re-underwrite USDe exposure. For example, we recently requested that a more formal bug bounty and responsible disclosure program be put in place. On April 4, 2024, the Ethena team announced the launch of the Ethena bug bounty program, in partnership with Immunefi. While this might have already been planned, we acknowledge that the Ethena team is working towards increasing transparency and assurance. We will continue to make requests for various changes as Maker increases Morpho Spark DAI Vault exposure.