Summary

- Existing research on Uniswap's liquidity mining experiments on Optimism concludes that the programs did not retain liquidity after incentives ended.
- Gauntlet has re-examined the data to account for general market trends in liquidity provision and the role of trading volume and fees in liquidity mining.
- We hypothesize a liquidity → volume bootstrapping mechanism through which incentives can have a long-lasting impact on TVL and volume.
- We conclude that for 2 of the 5 pools examined, liquidity mining did have a significant positive impact on TVL and volume beyond the end of the experiment

, consistent with our hypothesized mechanism.

- For the remaining 3 of 5 pools, we conclude that more analysis is needed to determine whether liquidity mining had a sustained impact on TVL or volume.

Background

In 2022 and 2023, Uniswap conducted an incentives experiment in which UNI incentives were distributed to liquidity providers (LPs) of specific Uniswap pools on Optimism. This experiment was run in two phases — Phase 1 started in November 2022 and lasted two weeks, while Phase 2 started in January 2023 and lasted three weeks. Each phase targets a different set of LP pools for incentive distributions.

The results of the experiment were mixed. For both phases, it was clearly observed that liquidity in all relevant pools appeared to increase throughout the duration of the incentives period and subsequently decrease after the incentives period was concluded. Analysis of the results was provided by SpringZhang and 1choiku for Phase 1 and Zelos for Phase 2.

Focusing on the decreasing volume or TVL after the incentives period finished, it may appear the incentives program had been ineffective in creating sticky liquidity or any long-term effect. From this analysis, it would be natural for Uniswap Foundation to conclude that a liquidity mining rewards program is ineffective at generating a long-term "flywheel" of sustained lift in liquidity and volume for their protocol.

Gauntlet has re-examined the data from the Optimism liquidity mining experiments and has arrived at a different conclusion. For some pools, the liquidity mining program does appear to have a long term effect. Our analysis identified and attempted to correct two primary flaws in the existing research:

The existing research does not normalize for overall market trends in similar pools not involved in the experiment (i.e. a control group)

The existing research did not analyze trading volume enabled by improvements of liquidity

Based on Gauntlet's analysis, we disagree with the conclusion that the liquidity mining program on Optimism was ineffective at driving sustained improvements to liquidity and volume for all pools. We also expanded upon Zelos's research through a discussion of the sustained lift that was generated as a result of this program.

We focus our analysis on Phase 2 of the experiment as it is both more recent and less confounded by market stress around the collapse of FTX which occurred during Phase 1 of the experiment.

Theory

From the results of both Phase 1 and 2, it is clear that liquidity mining can at least create a short-term improvement in liquidity for relevant pools as discussed in all previous analyses.

However, it is less obvious that the experiment resulted in a sustained lift in liquidity for these pools. Before diving into the data it is worthwhile to discuss how temporary liquidity mining programs may result in long-term sustained lift for a liquidity pool. There are two mechanisms Gauntlet has identified.

Forgetful Liquidity Providers

One possible theory for a sustained lift from a liquidity mining program is through forgetful LPs. If liquidity is supplied to capture incentives and left unmonitored, it may remain unmoved for some time after the program ends.

Though this may occur in some long-lasting liquidity mining programs, it is unlikely at a 2–3 week timeframe, given the end date of the program was well-known from the start. Further, the fact that liquidity had to be bridged to Optimism to participate likely reduced the number of unattentive LPs in the first place.

The fact that the program ran on a less active L2 (Optimism) for a pre-announced brief time likely prevented this mechanism from delivering a stronger impact. Previous analysis pointed primarily to LPs removing liquidity immediately after the end of the program as evidence that the program had failed.

Liquidity → Volume Bootstrapping

Rather than focusing on passive LPs who forget to remove liquidity, Gauntlet posits that incentives can bootstrap enduring liquidity if the initial temporary effect generates trading volume. Specifically, we hypothesize the following chain of events:

1. Liquidity mining incentives begin
2. LPs add liquidity to the pool, which improves execution quality for traders
3. Traders route more of their swaps through the pool and thus pay more fees to LPs
4. Fees from traders further attract liquidity to the pool until a stable equilibrium between liquidity and LP returns (fees + incentives) is reached.
5. Liquidity mining incentives end
6. Some liquidity is removed due to the reduced LP returns
7. The final equilibrium level of liquidity is higher than initially because of the greater fee incentives enabled by sustained trading volume.

If this theory were true, we would expect liquidity and trading volume in pools with liquidity mining programs to increase and subsequently decrease after the incentives are removed. However, a higher liquidity equilibrium would emerge compared to the pre-incentive period. This theory requires two things to hold true:

- Liquidity must increase as a result of liquidity mining incentives
- Trading Volume must increase as a result of the increase in liquidity.

If either of these relationships does not hold then this mechanism will fail, which may explain why the Liquidity → Volume Bootstrapping theory does not hold for all liquidity pools. Gauntlet's analysis examines the existence of this mechanism within the Optimism Liquidity Mining experiments.

Methodology

To improve on the previous analysis and account for the noise of market fluctuations affecting liquidity and trading volume, we paired each pool that was part of the incentive program with a control pool that shares similar market characteristics and was not part of the incentive program. We can view the pools with incentives as being the "treatment group" while pools without incentives were the "control group".

The following is a list of treatment pools from the Phase 2 Optimism Liquidity Mining Experiment we examined and the control pool that we paired it with:

[

690x353

2234×1144 157 KB

](https://global.discourse-cdn.com/business6/uploads/uniswap1/original/2X/e/e2f7dd52a4dd838c9201bcc0e7b799185ceab8b0.jpeg)

To pick a control group for each treatment group, we picked the highest TVL pool (outside of the treatment pools) in the same category, with those categories being WETH/ETH staking derivative, OP/major, stablecoin/stablecoin, WETH/stablecoin, and OP/major, respectively. Since there was no other ETH staking derivative with significant usage at the time of this experiment on Uniswap v3 Optimism, we use the wstETH/ETH 0.05% pool on Uniswap v3 Ethereum as a proxy.

To answer the questions at hand, we computed a time series of each treatment pool's share of TVL and volume relative to its control pool. We then performed one-sided t-tests to see if there was a meaningful increase in volume or TVL after the incentives started and after the incentives ended. If liquidity mining was successful, we expect to see TVL increase during the experiment, leading to increased trading volume during the experiment, and resulting in TVL and trading volume remaining elevated after the experiment.

The FTX fallout occurred during Phase 1 of the experiment, which caused a significant drop in TVL across all Uniswap pools. We are thus unable to draw any reasonable conclusions from Phase 1 of the experiment due to the effects of this market event. As such, we focused our analysis on Phase 2.

Data

We are using data from The Graph for our analysis, specifically theianlapham/optimism-post-regenesis subgraph for Optimism data and the uniswap/uniswap-v3 subgraph for Ethereum data (these are the subgraphs used by the Uniswap analytics frontend). In order to remove the impact of price fluctuations on our analysis, we used token prices at the start of the experiment to compute TVL and volume.

Results

In the sections below, we show a series of charts and data for each treatment-control pair. We first show a time series comparing the TVL and fees of the treatment group against the control group, The blue line is for the treatment group, and the orange line is for the control group. Black vertical bars show the start and end dates of the experiment. Fees are directly proportional to trading volume and we plot fees instead of volume as they are often more similar between treatment and control. To reduce noise, we applied smoothing with a 7-day rolling window.

In the second chart, we show a time series of TVL and fee market share between treatment and control. While the total market share adds up to 100%, we zoomed in on the y-axis to better highlight the movement in the market share of the treatment group.

Finally, we show the results from our one-sided t-tests with the following alternative hypotheses:

- Treatment TVL market share increased during the experiment
- Treatment volume market share increased during the experiment
- Treatment TVL market share after the experiment
- Treatment volume market share after the experiment

For each of these, we show the percent change of the TVL or market share, as well as the p-value from the t-test. To account for the delay in user reaction after incentives ended, we collected our “after” data one week following the end of the experiment.

Pool #1

— wstETH/WETH 0.05% Treatment vs wstETH/ETH 0.05% Control

[

402x500

1184×1472 195 KB

](https://global.discourse-cdn.com/business6/uploads/uniswap1/original/2X/f/fba274fd4634716070c69b1428024f07ae0ccead.jpeg)

The liquidity bootstrapping flywheel effect was successful for wstETH/WETH: TVL market share skyrocketed during the experiment, leading to a big boost in fees, leading to significant boost in TVL and fees after the experiment. For this pool, the liquidity mining program transformed it from almost completely dormant to fairly active. Though volume and liquidity declined after incentives ended, the new equilibrium level is much higher than it was before. The observed wstETH/WETH pool behavior closely matches the mechanism theorized earlier, leading us to conclude that in this case, the incentives program did successfully demonstrate liquidity → volume bootstrapping.

Pool #2

— OP/USDC 0.3% Treatment vs WETH/OP 0.3% Control

[

405x500

1184×1460 191 KB

](https://global.discourse-cdn.com/business6/uploads/uniswap1/original/2X/7/74dcde270a47ce45609c360db31996db255566d6.jpeg)

For the 30bps OP/USDC pool, we see the liquidity → volume mechanism in action again. Relative to the control analog, TVL increased significantly during the experiment, leading to an increase in fees during the experiment, and to a continued boost in TVL and volume after the experiment. Though the relative impact was not as dramatic as the wstETH/WETH pool, we conclude that liquidity → volume bootstrapping was successful in this case as well.

Pool #3

— USDC/DAI 0.01% Treatment vs USDC/USDT 0.01% Control

[

395x500

1130×1430 180 KB

](https://global.discourse-cdn.com/business6/uploads/uniswap1/original/2X/6/6b55e02ca9a0988c5916d700055a465665a3cf1a.jpeg)

For the 1bp USDC/DAI pool, we saw a huge boost in TVL that seemed to disappear after the experiment ended. However, due to fluctuations in TVL shortly before the experiment, the TVL market share was higher after the experiment than it was before. Fees for the USDC/DAI spiked at the beginning and end of the experiment, which could be due to users buying or selling DAI in order to participate. While our statistics indicate that TVL increased after the experiment and volume was not materially affected, it is hard to interpret this pool due to confounding factors. We find that the evidence for liquidity → volume bootstrapping is inconclusive in this case.

Other pools

[

690x386

1920×1076 139 KB

](https://global.discourse-cdn.com/business6/uploads/uniswap1/original/2X/e/ea4c434191ea3c03780c1bacb06005c774f03563.jpeg)

For two further pools, we observed no statistically significant increase in relative volume or TVL after the end of the program. While this does not definitively mean the incentive program failed to have a sustained impact, we conclude that the evidence for liquidity → volume bootstrapping is weaker in these cases.

Conclusion

The results from the Phase 2 Optimism experiment in general support the thesis that a sustained impact can be achieved by liquidity mining through the liquidity → volume bootstrapping mechanism for some pools.

Of the five liquidity pools in the experiment, two (wstETH/WETH .05% and OP/USDC 0.3%) experienced a statistically significant sustained lift in both TVL and volume relative to economically similar pools.

Three pools did not experience sustained impact (USDC/DAI 0.05% and WETH/DAI 0.05%, and OP/USDC 0.01%) for reasons that require further analysis. It is possible that one of several possible confounding factors played a role either in complicating our analysis or interrupting the effect from taking root. Some possible influences may be a poor control analog, external incentives programs, cannibalization of liquidity or volume, a lack of organic trading volume to route to these pools, or some other unexplored exogenous causes. Future analysis will be necessary to conclusively decide whether liquidity mining was a success or failure for these pools.

In the bigger picture of incentive optimization, it is encouraging that we saw a 40% success rate out of five pools in this fairly simple experiment. With further research and modeling, we aim to identify pools that are good candidates for liquidity mining and improve success rates with better targeting.