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Econ 460
1/24/21

Cryptocurrency Exchange Liquidity Incentives: Equity vs Cash

1. Introduction

Through the past year, we have seen decentralized cryptocurrency exchanges (DEXs) gain an unprecedented amount of exposure, and have come to a point where DEXs like Uniswap have surpassed the largest centralized crypto exchanges in the world in terms of trading volume. For context, a “decentralized exchange” is one where funds are not held by a single individual or company, and instead are secured by code. From August 14th to now alone, we have seen nearly eight billion dollars of liquidity added to decentralized exchanges. Part of this has come through innovations in liquidity incentivization, namely through liquidity mining. This is a program where the company gives away a crypto token (similar to equity in traditional finance) in return for people providing liquidity to their exchange (on top of existing per-trade fees). Traditionally, the profit generated from the order book spread acts as an incentive to provide liquidity to exchanges. Meaning that if investor A were to purchase XYZ stock for 5 dollars, and investor B were to sell XYZ stock for 4.80 in a separate transaction, the liquidity provider can profit 20 cents from taking the other side of both trades. Liquidity providers generally require additional incentives on top of this “order book spread” profit since they are supposed to facilitate trades even when the market moves against them.

Liquidity is an extremely important component of a successful exchange. When an exchange employs a market maker for this purpose, the assets have lower liquidity risk, improved price stability, and statistically significant positive returns (Feng, Bhat, and Marias 2019, 9). Part of a market maker's job is providing liquidity when it is not inherently profitable to do so, which necessitates additional incentives. There are varying ways to compensate market makers for their services outside of their potential earnings from the orderbook spread. Both traditional and cryptocurrency exchanges have offered rebates to liquidity makers while charging a fee for liquidity takers. An alternative is to incentivize market makers through direct payments in exchange for maintaining target levels of uptime, order book spread, and trading volume (Feng, Bhat, and Marias 2019, 10-11). Direct payments better enforce market maker action when exchange activity creates situations in which it is unprofitable to provide liquidity, even with trading fee rebates. We want to see how an equity-like cryptocurrency token reward compares to a fixed dollar reward as an incentive for liquidity provision.

2. Literature Review

Liquidity is an extremely important component of a successful exchange. When an exchange employs a market maker, the assets have a lower liquidity risk, improved price stability, and statistically significant positive returns (Feng, Bhat, and Marias 2019, 9). Part of a market maker's job is providing liquidity when it is not inherently profitable to do so, which necessitates additional incentives. There are varying ways to compensate market makers for their services outside of their potential earnings from the orderbook spread. Both traditional and cryptocurrency exchanges have offered rebates to liquidity makers while charging a fee for liquidity takers. An alternative is to incentivize market makers through direct payments in exchange for maintaining target levels of uptime, orderbook spread, and trading volume (Feng, Bhat, and Marias 2019, 10-11). Direct payments better enforce market maker action when exchange activity creates situations in which it is unprofitable to provide liquidity, even with fee rebates.

Both (Feng, Bhat, and Marias) and (Gawlikowicz et al.) focus on how market makers can best be incentivized. The first paper seeks to do this through attributing a market price to the amount of slippage reduced and creating a market for liquidity that allows liquidity providers larger fees as they take on more risk (Feng, Bhat, and Marias 2019, 16-17). Note that their definition of "liquidity mining" focuses around compensating liquidity providers in any currency, while we define it specifically as a project giving away their own token in exchange for liquidity provision. The second paper suggests formatting fees based on time since market creation, such that those who provided liquidity early on earn a larger share than those who join in later (Gawlikowicz et al. 2020, 5-6).

What makes liquidity mining unique is that it involves indirect exchange of currency, yet still provides value to both parties involved: the traders and liquidity providers. We found an interesting article from Dmitriy Berenzon, which explains the concept of liquidity mining, in which a liquidity provider deposits 50% of each side of a trading pair into a decentralized exchange and receives the protocol's native tokens in return (Berenzon 2020). They are providing a service to the exchange by reducing the costs from slippage on trades. The native tokens often give the owner governance rights over the platform and possibly a revenue share. Guillermo Angeris explains this concept further with the most well known example of a decentralized exchange, Uniswap (Angeris et al. 2019). Uniswap launched a liquidity mining program by giving away their own token, UNI, to liquidity providers.

We would like to examine a capital raise to fund USD rewards as an alternative for liquidity mining for liquidity incentivisation. In the crypto space, a common capital raise method is holding an ICO, or initial coin offering, in which the company sells their coin to investors. The ICO space is covered well by Percy Venegas, who shows how “fundraising events can be automated by Decentralized Autonomous Organizations (DAO) while qualifying for the risks associated with putting one’s trust in a trustless system” (Venegas 2017). The concept of a DAO is completely different from traditional markets, because it is a decentralized governance system that allows investors to act as a collective without a self appointed chairman or board.

3. Theoretical Model

The market for exchange liquidity can be characterized by a supply and demand model based on the amount of money liquidity providers are willing to supply to exchanges and the exchange’s (or traded company’s) demand for liquidity. According to Microstructure theory, the fees earned by liquidity suppliers need to cover their losses due to adverse selection (Ødegaard and Skjeltorp 2012, 5). These losses come from the fact that liquidity providers are making trades against market participants who may have an information advantage. For the demand side, both the exchange and the individual company whose asset is listed there gain utility from greater liquidity on the exchange listing. Increased liquidity facilitates higher trading volumes, which increase exchange profits as well as likely improving the value of the company’s equity. In order to incentivise liquidity providers to supply at the quantity these firms demand, the exchange or traded companies must provide an additional subsidy. Our paper focuses on determining the most cost effective way to implement this subsidy.

We would like to explore the two options in liquidity incentivization: through equity incentives or cash incentives. These two options, while similar in terms of distribution, may have completely different values. This is due to the perceived expected value of equity incentives differing from the market value of the subsidy at the time of distribution. A liquidity provider who chooses to hold onto the equity likely values it at above the current market rate, which should be a more cost effective incentive relative to the exchange selling the equity to pay a cash reward. On the other hand, one who sells likely values the equity at or below the current rate (though still captures a large enough reward to choose to supply liquidity). There are also non-cash benefits in holding onto equity based reward tokens, as these tokens provide voting power in regards to the underlying exchange. A downside to equity-based rewards is that it adds variability in reward size that may deter risk-averse liquidity providers, though most cryptocurrency holders have a high risk tolerance due to the extreme volatility of the asset class.

4. Research Question

Based on a market cost of liquidity found on Hummingbot, would it have been cheaper for the Uniswap cryptocurrency exchange to incentivise liquidity through USD denominated payments from a capital raise instead of through their own token? To put it even more simply- is it cheaper to incentivise liquidity with cash or equity?

$$\mathbf{H_0: TVL/\$_{Uniswap} = TVL/\$_{Hummingbot}}$$

$$\mathbf{H_A: TVL/\$_{Uniswap} > TVL/\$_{Hummingbot}}$$

Note that we are comparing the median of the TVL/$ distributions. TVL/$ =liquidity supplied for every dollar in rewards

Figure 1

To answer this question, we first looked at the data from Hummingbot, a software for liquidity providers that generates a fixed dollar reward for providing liquidity on centralized exchanges. We transformed the data on open order volume, otherwise known as total value locked, and rewards distributed per week to calculate the total value locked per dollar of reward distributed.

This data allows us to see the cost of incentivising liquidity through Hummingbot. Hummingbot provides us a base example of the cost of liquidity when the liquidity provider incentives have a fixed dollar value, and so comparing this to Uniswap's TVL/$ allows us to discover the difference in cost of liquidity when the rewards move dynamically with the token price.

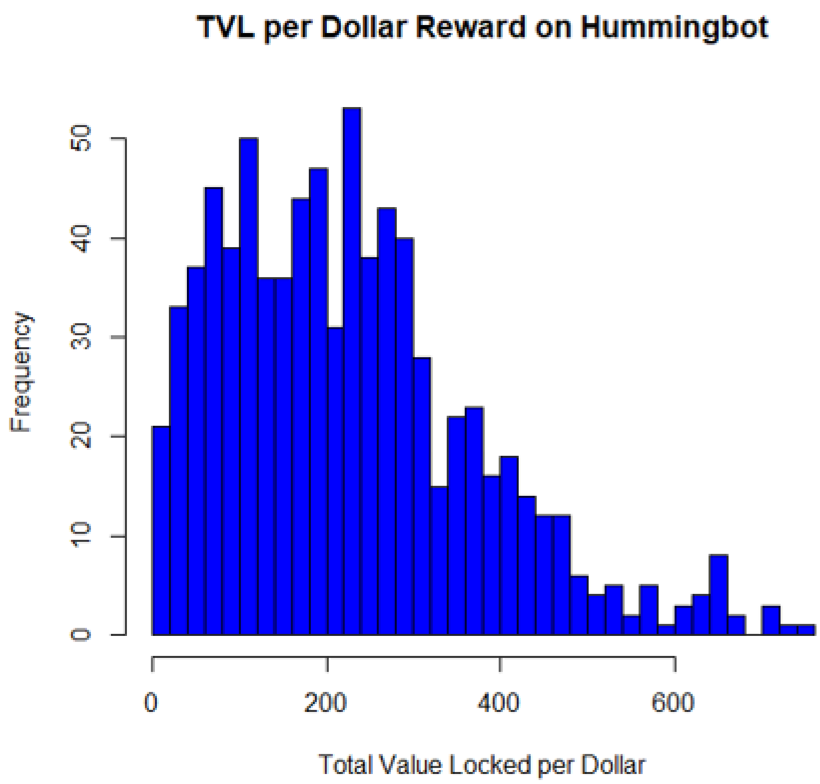

Figure 2

Note that each data point represents the TVL/$ based on a daily snapshot of rewards and TVL. TVL/$ =liquidity supplied for every dollar in rewards

Summary Statistics	
Mean	225.40
Standard Deviation	147.70
N	798
Min	4.99
Max	750.27

Figure 3

N represents each day that TVL/$ was recorded for the Hummingbot dataset.

We then looked at Uniswap's data on total value locked, ultimately transforming it to get TVL per dollar reward just as we did with Hummingbot. We collected data on TVL from defipulse.com to be used for the figure. Unlike Hummingbot, the value of the Uniswap rewards distributed to liquidity providers were not fixed, and varied based on a daily snapshot reference of the price of the reward token, UNI.

To calculate the rewards distributed, we multiplied the price during each snapshot by 333,332 UNI tokens, the number of tokens distributed to liquidity providers per day. We calculated a baseline level of liquidity by averaging TVL over the period between July 24th and August 27th. We chose not to include data after the 27th due to a confounding event that greatly impacted liquidity up until the UNI token was released. The baseline of $150 million Total Value Locked was subtracted out for this figure to get a statistic that isolates the effects of the UNI token incentive.

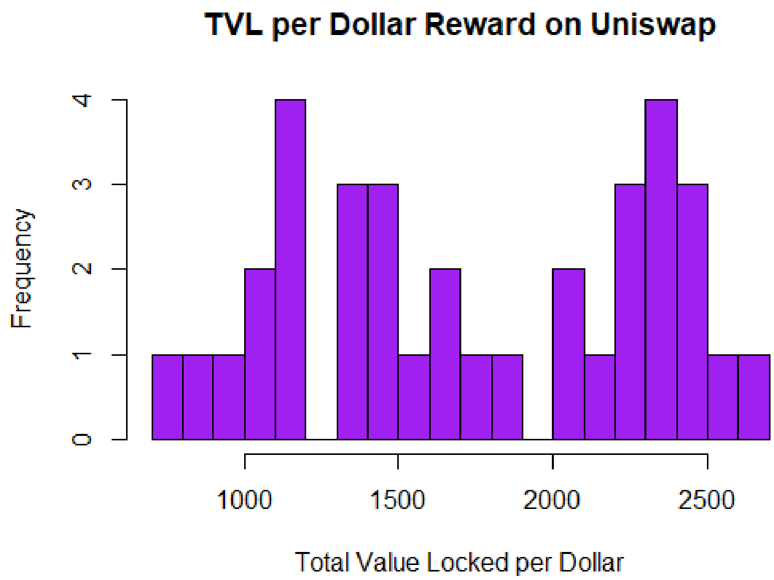

Figure 4

Each data point represents the TVL/$ on a given day. TVL/$ = liquidity supplied for every dollar in rewards

Summary Statistics	
Mean	1750.90
Standard Deviation	571.75
N	35
Min	755.5
Max	2684.9

Figure 5

N represents each day that TVL/$ was recorded for the Uniswap dataset. TVL/$ =liquidity supplied for every dollar in rewards

Note that in order to compare the two distributions, we need to assume several things. We are making the assumption that the Hummingbot-incentivised exchange pairs have similar risk profiles to Uniswap exchange pairs, from the perspective of the liquidity provider. Mechanically, Hummingbot-incentivised and Uniswap exchange pairs have similar risk profiles because they both expose the liquidity provider to a similar potential for taking trades that move against their position. We are also assuming that the baseline level of liquidity remains roughly constant over the examined time periods.

In order to compare the distributions of TVL/$ across the two platforms, we are using a Mann Whitney U Test. This is a non-parametric test, allowing for a comparison of the median without classifying the types of distribution or requiring large sample sizes. The results of the test will specify which distribution has a higher median and therefore indicates which platform's incentives were more cost effective. We will use a one sided test, meaning the null hypothesis is that the two populations (of TVL/$) are equal compared to the alternative hypothesis that Uniswap's median is larger. This allows us to ascertain which incentive type is more cost effective.

The weakness with the Mann Whitney U test is that it relies on the assumption that our two groups have independence of observations. This means that we have to assume that the amount of liquidity supplied per dollar of incentives on Uniswap is not related to the amount supplied on Hummingbot. The assumption is reasonable because the two groups have different pools of incentives and the liquidity providers may have different demographics due to the split focuses on centralized vs decentralized exchanges. The data also passes the requirements for the Mann Whitney U Test that the dependent variable is continuous (TVL/$) and the independent variable consists of two categorical groups (Hummingbot and Uniswap).

We think our findings could influence financing decisions for future DeFi projects in the cryptocurrency space. We also hope our research piques the interest of the traditional exchanges as they consider equity-based incentives.

Work Cited

Angeris, Guillermo, Hsien-Tang Kao, Rei Chiang, Charlie Noyes, and Tarun Chitra. "An analysis of Uniswap markets." *Cryptoeconomic Systems Journal* (2019).

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Venegas, Percy. "Initial coin offering (ICO) risk, value and cost in blockchain trustless crypto markets." *Value and Cost in Blockchain Trustless Crypto Markets (August 1, 2017)* (2017).

Plan

1. Find 4 new papers and integrate them into our literature review. ~4 hours
2. Finalize data set to increase the sample size with recent data points and update relevant figures. We already have an older version of all the data we need, just need to refresh some of it. ~1 hour
3. Learn how to implement the Mann Whitney U Test in R and execute the test. ~6 hours
4. Figure out and create applicable visual representations of our test results (tables, graphs etc.) ~4 hours
5. Draw formal conclusions based on test results. ~2 hours