An Analysis of Decentralised Exchanges

Cryptocurrencies and Decentralized Exchanges - COMP90088
University of Melbourne 2022 Semester 1

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Github repo: https://github.com/swawly/COMP90088-ResearchProject-DEXDataCollector

Abstract

In this paper we analyze the “wild west” of cryptography - decentralized exchanges (DEX). We perform a comparison among the top DEX platforms in regard to their functionality, fees, user base, volume and scalability. We present this data sourced from a variety of GraphQL queries, as well as the hurdles faced in sourcing data utilizing alternative methods.

1 Introduction

This section provides an overview of DEX exchanges functionality and a comparison of some commonly utilised protocols.

1.1 Decentralized Exchanges (DEX) Overview

Decentralized exchanges are blockchain-based peer to peer platforms where people can trade their cryptocurrency directly without the need of any arbitrator. This is commonly done using automated code called smart contracts. Some of the most popular DEXs – like Uniswap and Pancakeswap, provide a wide range of financial services to the users like earning interest on savings accounts, insurance against risks and liquidity pools where investors earn rewards for their funds locked in the contract. Unlike the centralized exchanges, DEX transactions are stored in the blockchain and only the users have access to their wallets. Since the wallets are not stored with the DEX, it is considered secure. In addition, users need not provide their information (KYC) in order to trade tokens on DEX, thus providing a sense of pseudo-anonymity.

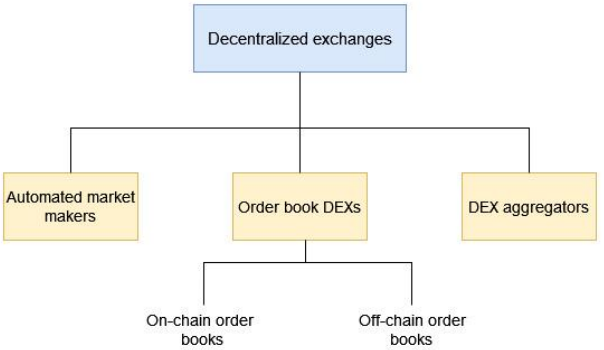
According to Forbes, DEX trading rose from $115 billion in 2020 to $1 trillion in 2021, with the peak volume in May 2021 (Busayatananphon and Boonchieng, 2022). Due to the better functionality and users being attracted to DeFi projects, DEXs might certainly replace the centralized exchanges to create the future of Decentralized finance (DeFi).

1.2 Overview of DEX platforms

Created in 2018, Uniswap was the first platform to enable the trading of blockchain tokens without relying on market makers, bids or asks (Lo and Medda, 2020). Uniswap utilizes the smart contract capabilities hosted on the Ethereum blockchain. Since its creation, several different exchanges and alternative protocols have been created, however at the time of writing Uniswap still asserts market dominance in the sheer volume of trades. The simplicity of the protocol has been the main driver of its success. Users provide liquidity to the exchange and the ratio of reserves is directly correlated to the price of the Uniswap token. Closely behind Uniswap is Pancakeswap, which is nearly identical in its use-case however it runs on the Binance Smart Chain (BSC) rather than Ethererum and in turn, offers lower transaction fees as ETH is not included in every transaction. dYdX, another common DEX, differs in that it does not use the automated market maker approach but rather an order book. This allows features such as future and margin trading. At the time of writing there exists over 200 decentralized exchanges that each offer slightly different features, fees and use-cases so these most popular exchanges are only the tip of the iceberg in terms of functionality.

1.3 Comparison of DEX Protocols

Decentralized exchange platforms differ from each other with respect to their functionality and are of three types.



DEX Protocols

1.3.1 Automated market makers (AMM)

Majority of the exchanges belong to the automated market makers category. The protocol uses mathematical formulas to set the asset price and organise them into liquidity pools and since they do not have an order book, the trades are facilitated between a user and a smart contract (Wintermeyer 2022). They also allow users to participate in liquidity pools where they can lock their funds or assets and earn rewards. The most popular exchanges under this category are Uniswap and Pancakeswap.

1.3.2 Order book DEXs

In this type of exchange, the platform maintains a record of all assets to be bought or sold. There are two types of order books: on-chain order books and off-chain order books. In on-chain order books, the entire transactions are stored in the blockchain whereas in the off-chain order books the transactions can be offloaded to a centralized entity.

1.3.3 DEX Aggregators

These exchange platforms use a wide range of mechanisms to fulfil the limitations of AMM's liquidity pools. It aggregates the liquidity from various pools to offer the users the best possible price.

1.4 Exchanges on Ethereum vs Binance Chain

The creation of Ethereum paved the way for smart contracts and now there are multiple chains out of which, the two prominent ones are Ethereum and Binance smart chain.

Among these two, Binance smart chain is becoming increasingly popular since it supports all decentralized applications that are on the Ethereum network too. Although the Ethereum chain has more value in trades, the Binance smart chain appears to be the favourite in terms of DEX trades. This is likely because the Binance chain facilitates fast exchange, and lower transaction fees and the block creation only takes about 3 seconds (Wintermeyer 2022). The shift towards Binance smart chain suggests that users are looking for low cost and high transaction processing speed.

2 Data Collection Methods

The below section details the various methods which we investigated in order to provide data for the analysis. Blockchain data is public and free to access, however it is large and cumbersome. Without specific hardware and an appropriate setup, the least trivial approach is to source the data from external providers. In this paper, we limited our scope to data from the beginning of 2021 (approx 1.5 years of data), with the aim to find useful data with reasonably low latency and cost.

2.1 Google BigQuery

Google offers many large datasets to the public on the BigQuery platform. The platform allows users to run SQL queries, with scaling costs proportional to the size of the data being retrieved. We investigated utilizing BigQuery to fetch data on the Ethereum blockchain, as many decentralized exchanges are hosted using smart contracts. However, we found the complexity involved in developing queries specific only to DEX platforms, as well as the cost of these queries, out of scope for the realm of this project.

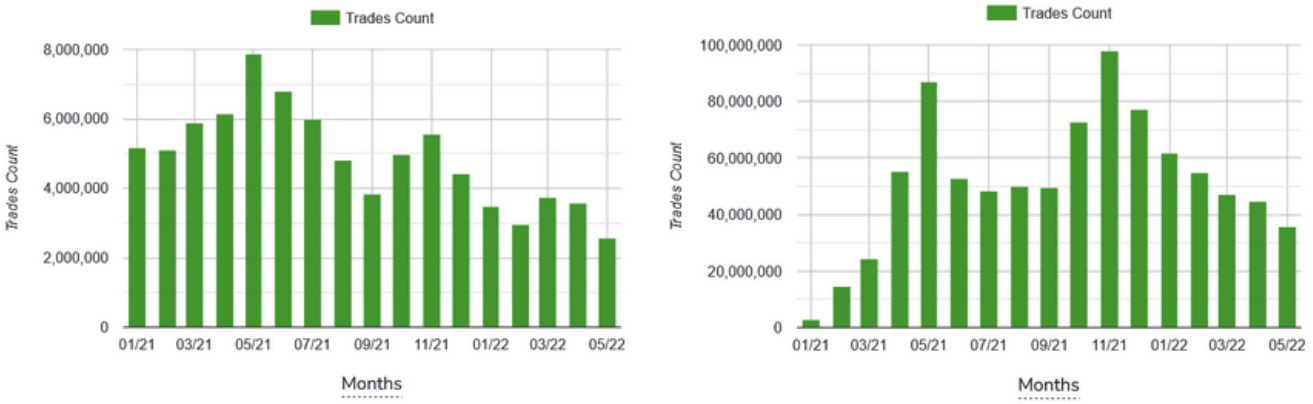
2.2 CoinMarketCap and other Subscription-Based APIs

CoinMarketCap is the world's most popular price-tracking website for cryptocurrencies. The website offers a high number of useful metrics as well as a subscription API. We utilized the API to fetch a small amount of data, however, any historical data requires a paid-subscription API account. As we required a larger time frame we investigated further options.

2.3 The Graph

The Graph is a project created to query data from Ethereum and InterPlanetary File System (IPFS) networks. Using the Graph, subgraphs or GraphQL schemas can be created to define blockchain APIs. The graph nodes then use this schema to get the required GraphQL API to access it (BitQuery 2020).

The primary reason behind the creation of this project is the difficulties faced by developers of



DEX trades on the Ethereum chain since 2021 compared to DEX trades on Binance smart chain since 2021

decentralized apps. They often need to access the centralized servers for data to aid their users. The graph project is a decentralized network for these developers to access the required data for their applications. Due to its decentralisation, data access to Ethereum and IPFS data is fast and secure.

2.4 BitQuery

Bitquery is building a blockchain data engine, which provides simple access to data across multiple blockchains. Bitquery's GraphQL APIs can be used to access any type of blockchain data for more than 30 blockchains (BitQuery 2020). Both Graph and BitQuery use GraphQL to enable the users to query data as per their choice. Unlike The Graph, BitQuery can be used to fetch data from more than 30 blockchains. We found BitQuery to be the best method for data collection and thus, throughout this project, we designed various GraphQL queries to analyse the real-time data for different DEX protocols across various blockchains. We review different exchanges and draw conclusions based on the results from a variety of metrics such as trading volume, fees and active users.

An example query is shown below. This query fetches the top decentralized exchanges on Ethereum from a given date and returns the total trade volume, currencies and contracts. GraphQL queries have a few advantages over standard SQL queries, one such being that the input query mimics the same structure as the output query. It also only requires a single API endpoint, which provides it with a lot of flexibility in its use. For this reason, it has become a common standard for web APIs today.

```
variables = {
       "limit": 10,
       "offset": 0,
       "network": "ethereum",
       "from": "2021-01-01",
       "till": "2022-05-23T23:59:59",
       "dateFormat": "%Y-%m-%d"}

query ($network: EthereumNetwork!, $from: ISO8601DateTime, $till: ISO8601DateTime) {
  ethereum(network: $network) {
       dexTrades(options: {desc: "tradeAmount"}, date: {since: $from, till: $till}) {
       exchange {
       fullName
       }
       trades: count
       tradeAmount(in: USD)
       currencies: count(uniq: buy_currency)
       contracts: count(uniq: smart_contracts)
       }
  }
}
```

Example GraphQL query that fetches trade volume, count, currencies and contracts

3 Data Analysis

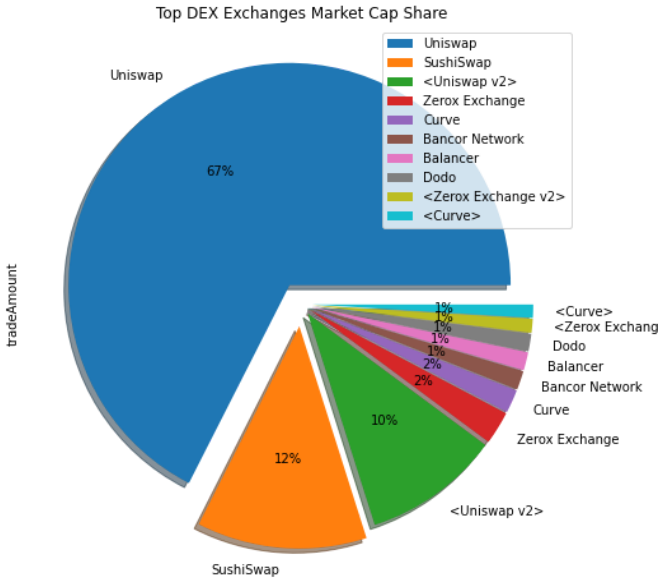
In this section we discuss the results of a variety of metrics used to analyze DEX platforms.

3.1 Popularity

We used a variety of metrics to gauge the popularity of a variety of decentralized exchanges. The most predominantly used metric, market cap, is often a good place to start. However, the market cap alone can often be misleading in the cryptocurrency space as it makes a variety of assumptions, such as not taking into account illiquid coins that are yet to be minted, as well as coins that may be permanently lost or unusable due to reasons such as users losing their private keys.

Uniswap and its successors dominate the market in terms of the sheer volume of trades in USD. Sushiswap, Uniswap's successor, was developed as a fork of Uniswap with a few modifications that have increased its popularity. Developed in 2020, Sushiswap offered a few extra features over Uniswap such as the opportunity for lending and margin trading as well as liquidity mining.

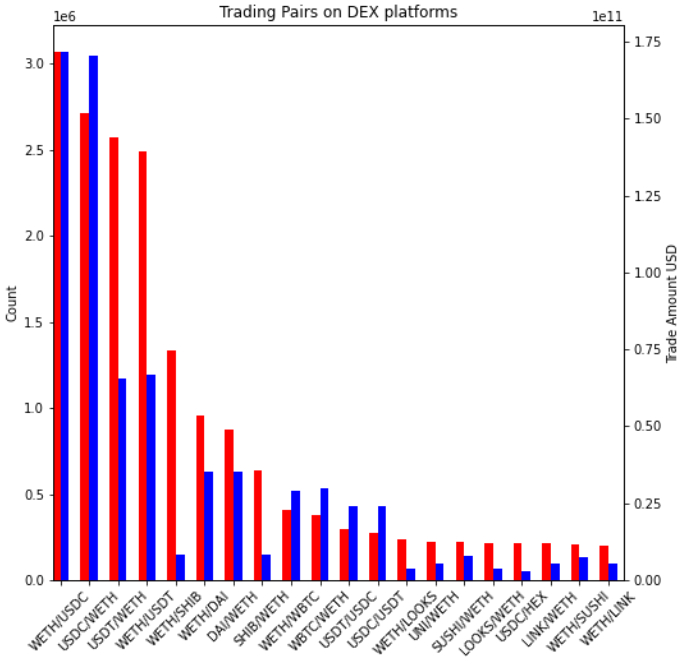
Platforms with high amounts of smart contracts such as Uniswap, Sushiswap and Balancer create smart contracts for every tradeable pair of tokens on the exchange. These tokens are naturally limited to ERC-20 tokens and the primary tradable units are generally wrapped tokens and stable coins.



Top DEX Exchanges Market Cap Share on ETH

3.2 Trade Volume Pairs

The figure below shows the distribution of the top traded tokens among DEX platforms on the Ethereum chain using two metrics: the count (red) of the trades with that pair as well as the volume (blue) in USD of the pair.

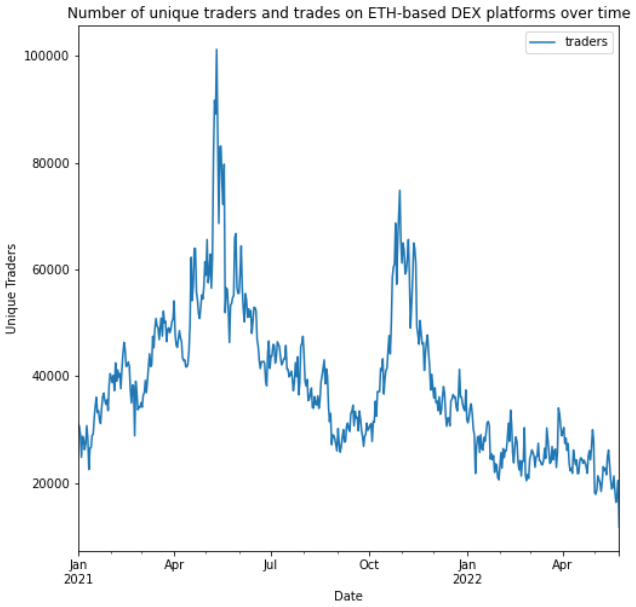


Most Traded Token pairs (Count & Volume) on ETH

Wrapped tokens such as WETH and WBTC make up the majority of trades, as these are required when trading is limited to only ERC-20 tokens on the Ethereum blockchain. Also in the mix are many stable coins such as USDC and USDT. There exists a correlation between trade count and trade volume for most pairs, one exception being WETH and USDT, which can likely be attributed to the low token value of USDT.

3.3 Unique Users

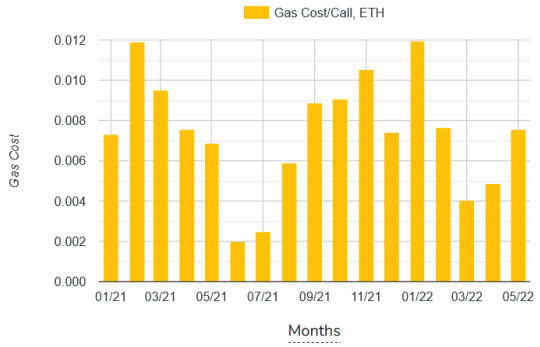
We performed a query that fetched the number of unique users on decentralized exchanges on Ethereum. Whilst there is a large volume of trades on DEX platforms as shown in section 3.1, the number of unique traders is comparatively quite low. This suggests a small number of traders are making a large volume of trades, on average, and thus DEX platforms are still in their early development and far from making it into mainstream use. For DEX platforms to make it into mainstream use we would expect to see a much higher proportion of unique traders compared to the total market cap.



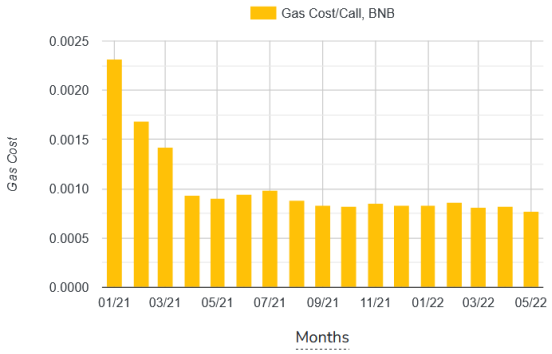
The number of Unique Traders of DEX platforms

3.4 Trading Fees and Gas Consumption

Since decentralized exchanges don't have any intermediator, they have much fewer fees as compared to their centralized counterparts. The transaction fees for the exchanges based on the Ethereum network depend on the gas price and when the number of transactions increases on the Ethereum chain, the gas price also tends to increase. If users want to commit a small trade, they may end up paying more than $100 on gas fees and this is what makes it unsuitable for smaller transactions. Prominent exchanges on the Ethereum chain such as Uniswap and Sushiswap charge 0.3% as a trading fee.



Average transaction cost in Ethereum since 2021



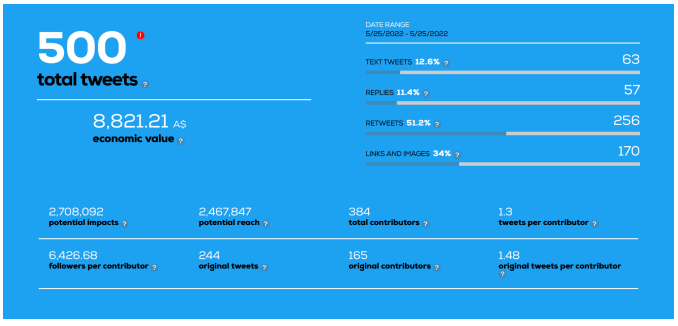
Average transaction cost in Binance chain since 2021

On the other hand, transaction fees in Binance smart chain are quite low. Binance took advantage of the increasing gas cost in Ethereum and kept its fees low which attracts many users since Binance is also compatible with decentralized apps on Ethereum, and traders prefer exchanges on Binance smart chain. Exchanges such as Pancakeswap have a 0.25% trading fee and Biswap has the lowest transaction fee of 0.1%.

3.5 Twitter Online Presence

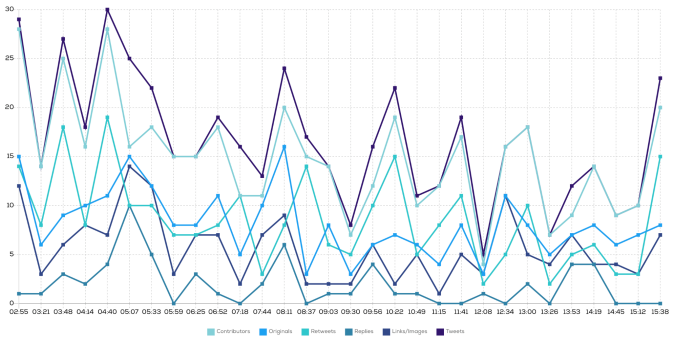
We analysed the online engagement rate among users to gain an insight into some of the popular exchanges. The data is gathered from TweetBinder, a community version for the duration of 7 days and capped at 500 tweets so as to keep the comparison under check. The data retrieved is used for comparison between the exchanges and to provide a respective idea between them.

3.5.1 UniSwap



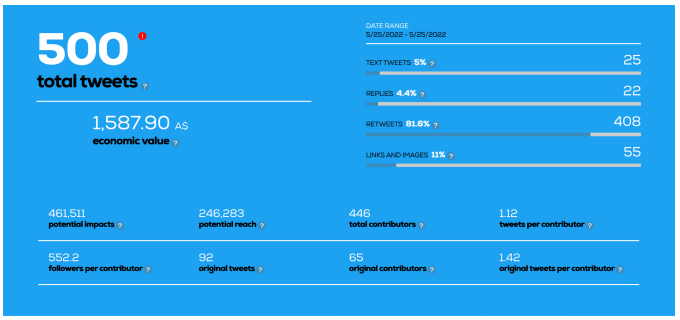
Uniswap Twitter Metrics

The data based on the “#Uniswap” hashtag shows that Uniswap has the highest impact and reach among people with a considerable economic value. Uniswap generated more than 500 tweets in a single day and has a reach of more than 2 million users. This is a healthy indication of the user base of the platform.



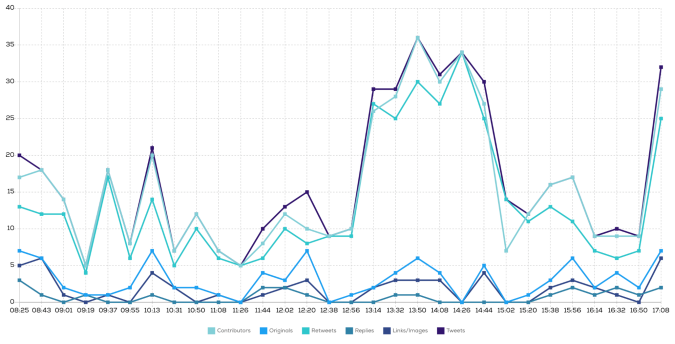
Uniswap Twitter Data Comparison graph

3.5.2 PancakeSwap



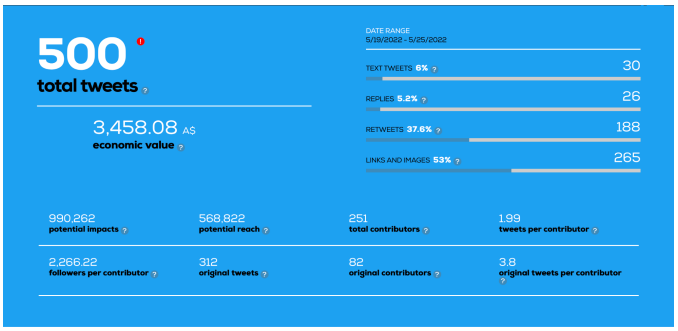
PancakeSwap Twitter Metrics

At the same time, PancakeSwap also generated more than 500 tweets in a single day and has a reach of more than 200,000 users which is comparable to Uniswap. The potential reach of PancakeSwap Tweets is significantly less than that of Uniswap’s by a factor of 10, representative of the popularity of the platform as shown in section 3.1.



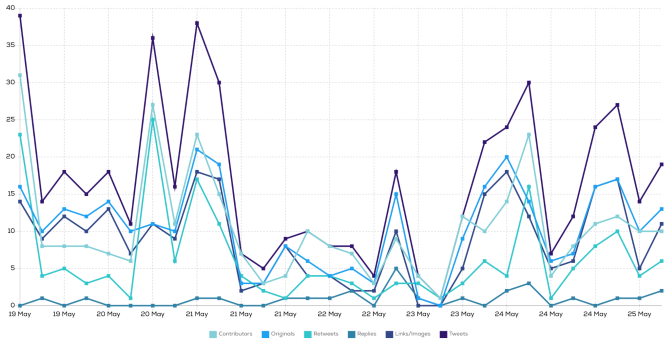
Pancake Swap Twitter Data Comparison graph

3.5.3 SushiSwap



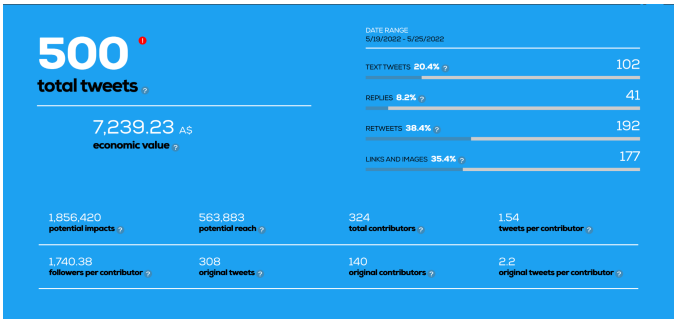
Sushiswap Twitter Metrics

Upon the analysis of Tweet data of #Sushiswap based upon a time frame of 7 days and 500 tweets we can identify that average tweet turnout which is upward of 500,000 still stands less than Uniswap and dYdX but more than Pancake swap. The economical value describes the impactful value of the exchange which is comparatively less than Uniswap and dYdx. The trend showcases that sushi swap, although being a derivative of pancake swap, does have much social existence and prompts to hold a good future. The graph below compares and sums up the different aspects of the Twitter trend.



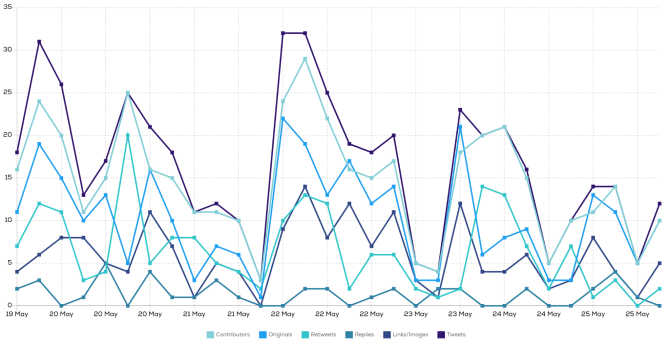
Sushiswap Twitter Data Comparison Graph

3.5.4 dYdX



dYdX Twitter Metrics

dYdX is a largely accepted and acclaimed exchange. It has the second-highest economic value count out of the other exchanges. Based upon the comparatively higher potential impact of dYdX, it can be concluded that it has gained the crowd and emerged as an active exchange platform. The target value stands pretty high with respect to established standards along with greater potential reach. The graph shows compression between the various aspects of the #dYdX.



dYdx Twitter data comparison graph

4 Future Improvements

We encountered a number of hurdles in this analysis. One such hurdle is the difficulty in data collection as detailed in section 2. Without substantial financial backing to provide the means to fetch meaningful historical data we were limited in the depth of conclusions we were able to make.

Furthermore, one such difficulty involved the segregation of many DEX platforms across different blockchains. Whilst many are hosted on Ethereum, there are a number hosted on the Binance chain and some are hosted on their own platforms. Retrieving meaningful data that can be compared across platforms was not a trivial task.

There existed a few metrics which we had envisioned obtaining data from that ultimately would be beyond our scope, such as network hash power, specific to DEX platforms. These metrics required more sophisticated data collection methods beyond the capabilities of GraphQL queries.

6 Conclusion

In this paper we provided insight into analytic tools for DEX platforms, as well as conclusions, comparisons and analysis of DEX platforms in a variety of metrics. We found that a variety of exchanges are emerging with innovative technologies and capabilities, and platforms with lower fees are increasingly attracting new users. We further detail the challenges we encountered in data collection and subsequent minimizations of the project scope. We conclude that overall DEX platforms are in their early days, relatively speaking, compared to centralized platforms indicative of their volume and user base. However, the potential of the technology remains promising for the future of cryptocurrencies and decentralized trading.

5 References

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