Analysis of the Impact of Fees on dYdX Trading Volumes

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1 Abstract

dYdX has implemented three periods of fee holidays. The impact on trading volumes of these fee holidays is used as an input to determine current traders elasticity to trading fees. Until the Luna collapse trade volumes reacted positively to reduced fees. Since then there has been little reaction.

The results from the fee holidays is supplemented with an analysis of competitors pricing, the impact on number of active traders and the impact and distribution of rewards.

The result is a fee strategy recommendation for the community to use once the protocol is fully decentralized in v4. The recommendation iterates on the current fee structure to remain relatively predictable for traders.

2 Introduction

Fee setting on an exchange is its pricing strategy. The goal is to set a fee structure and level that maximises total value created by dYdX. This is different from a profit maximising objective because dYdX and the industry generally are early in their development. Because of this, and other dynamic factors, the optimal fee strategy is likely to evolve constantly through time.

Trading volume is the measure of value used. This allows a quantitative analysis of the impact different fee structures. A regression model accounting for other sources of change in volumes is proposed which should form the basis of future monitoring.

In aggregate trade volume does not appear to be significantly affected in either direction by the fee changes so far. The larger ETH and BTC markets with more decentralized alternatives did show some preference to lower fees, particularly before the Luna collapse. We conclude that differentiated, lower fees in these markets could better segment trader

preferences.

High volume traders are extremely loyal to dYdX and rarely churn. They are also growing as a proportion of total volume. This behaviour has not really been affected by fees in either direction.

3 Current Perpetual Futures Fee Structures Offered

Table 3 below summarises trading fees on some popular centralised and decentralised exchanges[1].

Most exchanges differentiate between maker and taker prices. Exceptions GMX and Perpetual Protocol are AMM exchanges where all orders clear against a liquidity pool. This means maker orders do not contribute to protocol liquidity on them.

dYdX current pricing is similar to centralized exchanges in structure and amount. Decentralized exchanges typically charge a little more. Before shutting down Mango Markets was an exception to this even charging negative fees on maker orders.

All exchanges mentioned except for GMX use funding fees as the mechanism to peg the market price to the underlying index. These funding fees are symmetrical in that the total fee for long positions (positive or negative) is the exact inverse of the total fee on shorts. The exchange/protocol does not take any portion of this funding. GMX charges an analogous funding fee on total open interest and imbalance in the market. Traders always pay funding to the protocol creating another tax on traders.

Table 1: Perpetual Futures Fees:

	Maker	**Taker**
dYdX (current)	0.02%	0.05%
Binance	0.02%	0.04%
OKX	0.02%	0.05%
ByBit	0.01%	0.06%
GMX	0.10%	0.10%
Kwenta	0.10%	0.30%
Mango Markets	-0.01%	0.03%

[1] At the lowest volume tier

4 dYdX Fees

4.1 Fee Structure

dYdX follows the maker-taker pricing methodology where a different fee is charged depending on the type of order being executed.

- `Maker orders` are orders that do not immediately fill and add to orderbook liquidity.
- `Taker orders` consume orderbook liquidity and fill immediately.

Fees on dYdX also depend on 30 day trading volume of an account. Trading accounts are categorised into discrete trading levels based on 30 day trading volume with fees decreasing with larger volumes.

4.2 Trading Rewards

Trading rewards are relatively unique to dYDX and play an important role in incentivizing trading volumes. dYdX has allocated 25% of its current maximum token supply of 1 000 000 000 DYDX for trading rewards over 5 years. This initially amounted to 3 846 154 DYDX per epoch, recently reduced by 25% to 2 884 615 DYDX per epoch from epoch 15.

Our findings confirm the results of previous work by Xenophon Labs that these trading rewards have a significant impact on trading behaviour and need to be accounted for when modelling any other marginal impacts on volume. Specifically it is clear that there are traders forecasting the dollar value of DYDX rewards at payout and calibrating their fee spending accordingly to profit.

This is different from finding that all trading being rewards motivated though. It only takes one sufficiently capitalised account doing this to increase volumes to the point where the risk-adjusted return of additional volume is no longer worthwhile. As a result, the price of the DYDX token emerges as a significant driver of total trading volumes per epoch. The phenomenon is particularly noticeable in the last few days of each epoch when this outcome can be more accurately forecasted.

4.3 Fee Holiday Experiments

On 18 January 2022, an immediate fee holiday was announced reducing fees by up to 66%. This lasted until 18 April 2022 when fees returned to their original level.

In the week following the Luna collapse, a second fee holiday (identical to the first) was announced on 17 May 2022. By then, market conditions had dramatically changed and the impact can be visibly reflected in our results. Volumes in epoch 9, between the

first fee holiday and the second, dropped almost 50%. At the time it was reasonable to attribute a lot of this change to increasing trading fees. Using subsequent data we come to a different conclusion after accounting for the token price and overall industry volumes.

On 1 August 2022, dYdX announced another change in the fee structure. This time, it offered users with free trading of up to $100k per month.

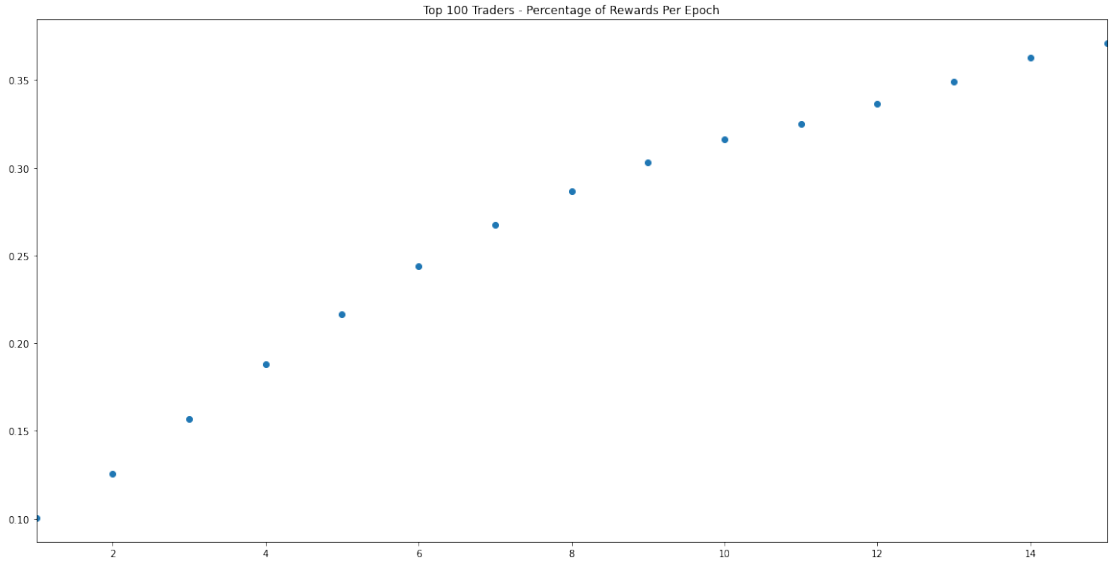
In addition, similar to centralised exchanges (eg. Binance, FTX), holders of DYDX tokens could receive additional fee discounts.

5 Reward Concentration Per Epoch

The distribution of trading rewards was used to gain insights into trader segments. This is used to inform differentiation in pricing options, particularly volume discounts. Two trends are evident when analysing this data.

The concentration of trading rewards is increasing. Both the share of rewards going to the top 100 accounts and the rewards gini coefficient continue to increase.

There is very little change in the top 100 accounts receiving rewards. The table below shows the number of new accounts in the top 100 rewards. From epoch 5 over 90% of accounts have remained the same from epoch to epoch. 69% of accounts in the top 100 in epoch 5 are still in the top 100 in epoch 14. From a pricing perspective this segment appears satisfied. The stable trend started from epoch 4, two epochs before the first fee holiday. It should also be noted that paying trading fees purely for rewards has barely been profitable since epoch 9 (See section 8) and these accounts continue to trade a lot.



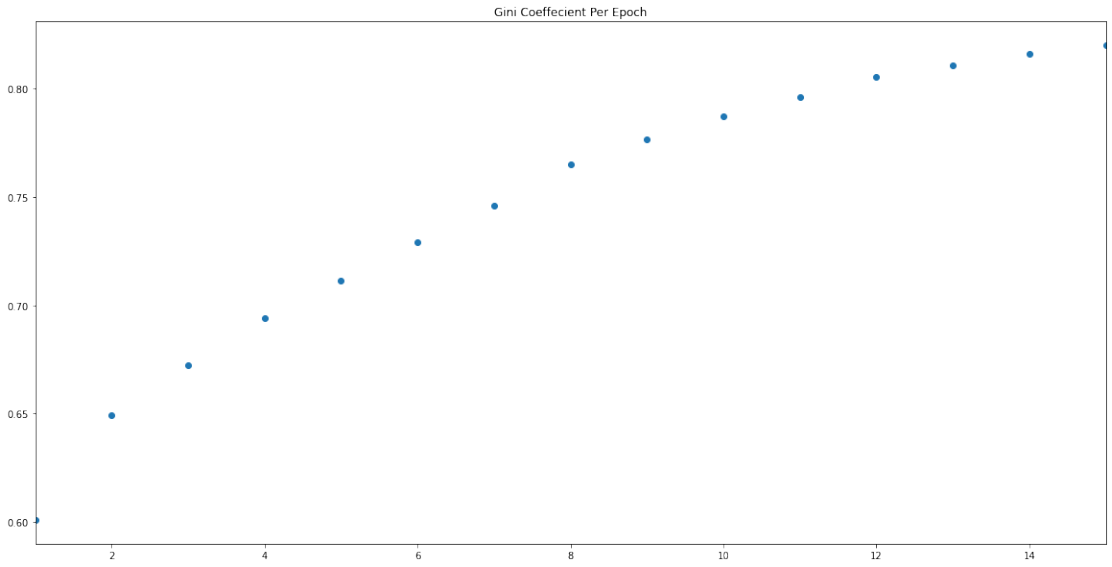
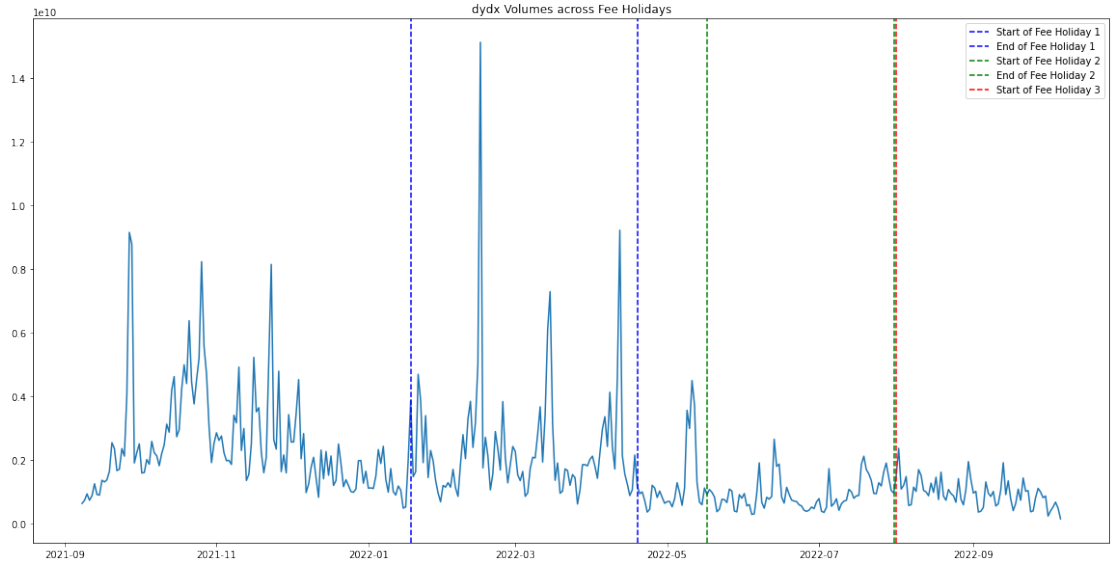


Table 2: Number of accounts from the top 100 in the verticle axis epoch that no longer remain in the top 100 in the horizontal axis epoch

Epoch	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	21	100	42	51	56	62	65	66	71	72	72	74	74	75
2	-	100	26	36	40	47	50	52	57	58	58	60	60	61
3	-	-	100	100	100	100	100	100	100	100	100	100	100	100
4	-	-	-	13	20	26	29	31	36	37	37	39	40	40
5	-	-	-	-	9	15	19	21	26	28	27	29	31	31
6	-	-	-	-	-	7	11	13	18	20	19	22	25	25
7	-	-	-	-	-	-	4	7	12	16	15	18	21	21
8	-	-	-	-	-	-	-	3	10	14	13	16	19	19
9	-	-	-	-	-	-	-	-	9	13	12	15	18	18
10	-	-	-	-	-	-	-	-	-	6	5	8	11	11
11	-	-	-	-	-	-	-	-	-	-	3	9	12	12
12	-	-	-	-	-	-	-	-	-	-	-	6	9	9
13	-	-	-	-	-	-	-	-	-	-	-	-	3	3
14	-	-	-	-	-	-	-	-	-	-	-	-	-	1

6 Reaction of Volumes to Fee Holidays

Traders have not shown a strong preference for lower fees overall. We ran a regression controlling for the attractiveness of trading rewards and market sentiment to isolate the impact fees had on trading volumes. After standard data cleaning to remove any biases, the fee parameter was not significant using the entire sample of the first 15 epochs data. This doesn't tell the whole story though.

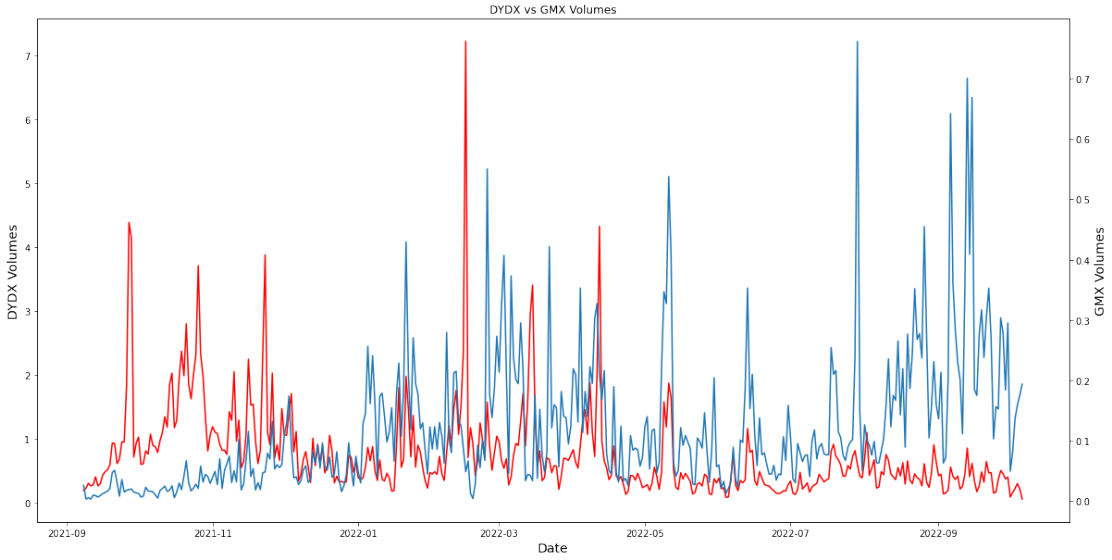


There is a difference in the fee elasticity between markets. We split the markets into three segments to see how different markets react to trading fees. The most developed markets, ETH and BTC, showed a strong preference for lower fees before the Luna collapse. The other two segments showed much weaker preference for lower fees before the Luna collapse.

After the Luna collapse, trading conditions changed. The value of trading rewards became a stronger factor in determining trading volume. There is also some evidence that this coincided with much less (possibly negative) value placed in lower fees.

All statistical results can be found in the appendix.

We conclude that factors other than fees drive bear market trading volumes. We can also point to the recent success of GMX in increasing its volumes as a confirmation of this. GMX is a high fee exchange. It did not see a large drop in trading activity and has recently increased to all time weekly high volumes.


DYDX vs GMX Volumes
DYDX Volumes
GMX Volumes
Date
2021-09
2021-11
2022-01
2022-03
2022-05
2022-07
2022-09

7 Fee Pricing Considerations

Setting trading fees is akin to pricing in a general business. This analysis so far has focused on previous fee changes to estimate fee elasticities of traders on dYdX. This helps provide context and rationale for fee setting in dYdX's present. The stated goal of dYdX is to become one of the largest exchanges in all of crypto. This is an extremely ambitious and difficult goal. It requires getting all aspects of the exchange right.

The ideal pricing strategy does not exist. It depends on the overall strategy which in turn depends on where the exchange is in its journey and the target users at any given time. With that in mind iterating on the fee structure and level is important to continue appealing to target users.

The focus of this report is on maximizing dYdX trading volume. Volumes help attract market maker capital. Increased volumes then increase market maker profit. Trading activity can also be sticky so focusing on that has a long payback period.

Trading volumes elasticity to fees does not fit a traditional economic demand curve. For starters, the profit and loss of most traders is affected far more by other factors. Their appetite for trading volume in turn is likely affected more by their profit and loss than simply fees.

Fees on alternative exchanges is an important pricing consideration. The level of fees is a consideration when choosing an exchange for at least some traders.

Target trader personas from a growth/marketing perspective dictate the level of importance of fees on other exchanges. dYdX is currently targeting small retail traders.

dYdX already offers trading rewards that offsets the impact of fees. In the medium to long term the cost of rewards should be lower than the value of fees paid. If not, the exchange is making a loss on each trade before any other expenses. Up to now this has not always been the case.

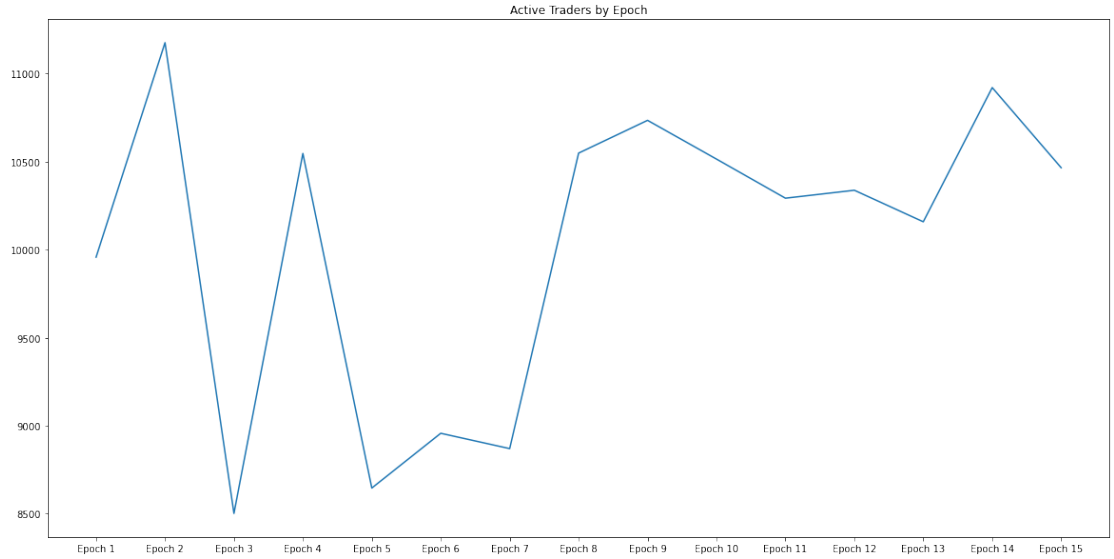
Not all markets show the same sensitivity to fees. dYdX has far more live markets than other decentralized finance perpetuals exchanges. This likely explains why the ETH and BTC markets are more sensitive to trading fees than the rest.

Maker-taker pricing is generally the norm despite some academic objections. The academic research concludes that charging lower fees on limit orders lowers spreads. This is appropriate for dYdX as growing and maintaining liquidity is essential.

Volume discounts allow differentiated pricing to different trader segments. Trading volume defines these segments.

Epoch	Fees less Rewards ($m)
1	$ -45.2
2	$ -8.6
3	$ 0.7
4	$ 10.5
5	$ -4.5
6	$ -11.4
7	$ -2.4
8	$ -2.5
9	$ 4.7
10	$ 0.4
11	$ -1.4
12	$ -1.5
13	$ 0.9
14	$ 0.7
15	$ -0.8
16	$ 2.5

Since epoch 13 dYdX has charged zero fees for low volume traders. The number of active traders ticked up in epoch 14 with the deposit incentive and has otherwise not responded to this yet.



The DYDX and hedgies balance of a trader currently affects their fee level. The idea behind this is to increase trader retention and add utility to the native tokens.

Market conditions affect traders sensitivity to fees. Evidence to date suggests a

stronger focus on fees when activity is higher. This is slightly counter-intuitive and should continue to be monitored. A regression including the variables used in this report controls for other factors.

Traders could react differently when fees are increased to when fees are decreased. All changes should be closely monitored and the results reported.

It is worth continually experimenting with trading fees and closely monitoring. Iterating to optimal frameworks while taking a data-driven approach to monitoring and evaluating.

8 Fee Strategy Recommendations

The intention of this report is to discuss all the elements of a pricing strategy. It is important for this strategy to provide clear suggestions. Using the analysis above we recommend exploring the following pricing strategy in v4.

The recommendation is to roughly segment traders as follows:

- **Small retail traders:** Traders doing less than $50k volume per epoch. The reduced $50k level from the current $100k level is slightly arbitrary and should remain an element closely monitored. The rationale is to broaden the number of accounts receiving trading rewards. The rewards should appeal to some of these additional earning accounts increasing their trading volumes and improving loyalty. This increase is also a response to the lack of trading volume impact from fee holiday 3 so far and attempts to iterate on the idea, effectively splitting the difference.
- **Active traders:** Traders trading more regularly. They do more than $50k volume per epoch, but not in the high volume category.
- **High volume traders:** These are extremely active traders and market makers on the exchange. The wallets in this segment have changed little from epoch 3.

The specific fee strategy recommended can be summarised as folllows:

- Change fees back to pre-fee holiday levels for taker orders. Maker orders remain the same. This offers traders more distinct fee alternatives in execution. It also aligns more closely with research into optimal fee structures in traditional finance markets (see below 9). Traders who are insensitive or prefer higher fees for higher rewards can trade market orders consuming liquidity while those who are sensitive can trade limit orders adding to liquidity.
- Keep the zero fees for small volume traders. Reduce the threshold to $50k per epoch. Robinhood has proven successful in using zero fee trading to onboard retail traders. Thus far the fee holiday 3 experiment has not had a clear impact on trading volumes. We propose dropping the fee threshold to see whether distributing rewards more broadly could help grow volumes.
- Experiment with lower fees on ETH and BTC markets. These markets fees should stay as they are.
- Keep the volume discounts. This also helps distribute trading rewards more broadly. This segments higher volume traders. Their total fees paid are higher in absolute amount and it follows that their sensitivity to the fee level is higher.

- When market conditions improve experiment again with fee holidays to accelerate growth and as a differentiator against other on-chain exchanges. Use volume growth as the metric to define conditions improving.
- Keep tracking the output of the regression used here. Quickly roll back any negative changes. This reduces the risk involved with experimentation.

Volume discounts offer a clean way to segment fee pricing. As traders volumes increase they pay lower fees. To continue incentivizing liquidity as much as possible we recommend leaving the maker pricing at current levels. The table below shows the recommendation for non-ETH, BTC markets. This is a combination of the current fee structure for maker orders and the fee tier and the previous taker pricing.

Table 3: Recommendation for non-ETH, BTC markets

Level	**30D Volume**	**Maker**	**Taker**	**30D Volume**	**Maker**	**Taker**
Free	0-50k	0%	0%	0-100k	0%	0%
1	50k-1M	0.020%	0.100%	100k-1M	0.020%	0.050%
2	1M-5M	0.015%	0.080%	1M-5M	0.015%	0.040%
3	5M-10M	0.010%	0.050%	5M-10M	0.010%	0.035%
4	10M-50M	0.005%	0.040%	10M-50M	0.005%	0.030%
5	50M-200M	0%	0.030%	50M-200M	0%	0.025%
VIP	200M+	0%	0.020%	200M+	0%	0.020%

** Red : Currently implemented on dYdX

There should be further research into the impact of additional fee discounts for DYDX tokens held. This is a tokenomics factor beyond the scope of this report.

9 Literature Review

Fundamentally, many scholars believe that a maker-taker fee structure incentives healthy markets and compensates market makers for the potential risks borne. Su (2020) highlighted the asymmetric information of existing markets as takers have more information through their willingness to actively remove liquidity from the order book. In contrast, makers are subject to price risk with their idle orders, incurring 'costs of liquidity' due to this adverse election on bad fills. As a result, maker rebates appear justified for the tail risks incurred by market makers. Furthermore, Malinova and Park find that incentivising liquidity through maker rebates reduced transaction costs, particularly for retail traders. This lowered execution costs, increased the frequency of retail market orders (relative to limit orders) which had the effect of reducing the adverse selection costs faced by market makers. This leads to sustainably greater liquidity. Supported by Black, he concluded that the reduced bid-offer spreads incentivised by subsidised maker orders increases informational efficiency. This results from tighter spreads leading to more frequent spread crossing and less pricing error. The informational impact of an active trade being executed improves pricing generally.

However, Harris highlights a major concern that maker-taker pricing has caused traders to be more concerned about net prices, rather than quoted price. This proves pertinent for small trades in low price stocks since these fees and rebate often represent a large component of overall transaction costs. At the same time, Wang, Yau and Baptiste noted that trading volume of the futures market shared a negative relationship with bid-ask spreads, and a positive relationship with intraday price volatility. In particular, the authors estimate how trading volumes responded differently to changes in transaction costs based on their elasticities - determined by the availability of close substitutes. Therefore, while some market participants favour the use of liquidity subsidies, there are evident concerns that this could result in excessive fees for liquidity takers.

Expanding to the cryptocurrency trading landscape, Fortune has also recently reported on the impact of FTX US's move to zero fee trading on spot BTC pairs. The article focuses on the impact on market dynamics broadly using Robinhood's role in bringing down stock trading fees in the US and Chinese exchanges zero fee Bitcoin trading during 2013-2017 as guides. It mentions a few alternative avenues to monetise some of which could apply to dYdX and some which do not. The Chinese exchanges charged withdrawal fees and US brokerages either sold off order flow to third parties or used trading for user acquisition into their brands.

On the other hand, decentralised exchanges (DEXs) have grown in importance as a marketplace for traders to transact, while maintaining full custody of their funds. Currently, fee rates are fixed across popular protocols such as Uniswap (0.3 percent) and GMX (0.1 percent) and have largely remained in status quo since its inception. In particular, for dYdX, the protocol will witness a process of decentralisation where the

community can set fees for the various markets. This enhances competitiveness of the exchange for successful user adoption and trading participation.

Especially with the present climate of distrust on CEXs, dYdX is well positioned to ride on these opportunities and optimise for volumes in the long run. Ultimately, with better fee setting capabilities, this will attract more trading activities and indirectly incentivise more capital from market makers, creating a positive feedback loop.

10 Conclusion

The regression model proposed allows an objective way to measure the impact of changes in fees. As future experiments and ideas around fees are implemented we recommend continuing to use it to measure the results. This is the most important recommendation and continually iterating on fees while measuring the impact will ultimately allow dYdX to create the best exchange for all traders.

Industry norms make it easier for traders to understand their fees. Since one of dYdX DAO's values is *"decentralize through transparency"* it makes sense to make trading fees as simple to understand as possible. This means not deviating too much from competitor fee structures and not changing the overall fee structure too much. This structure is similar to a traditional finance fee structures which has gone through centuries of research and iteration.

Interestingly traders are not obviously sensitive to trading fees within the small bounds of fees used so far. This provides an opportunity to add to taker fees. This will affect the distribution of trading rewards and intends to reward smaller traders proportionally more. Lerge traders have been extremely loyal across different fee levels in the past and do not appear likely to change their behaviour.

11 Appendix

For anyone wanting to dig a little deeper into the details we've included the methodology and results here in the appendix.

11.1 Analysis

This study seeks to quantitatively identify the impact of the fee holidays on dYdX trading volumes. After all, the primary objective of subsidizing liquidity provision and trading is for the exchange to attract more volume. In addition to our regression analysis, we have determined other potential factors which may also influence trading behavior on dYdX and hence, indirectly contribute to trading volumes.

In general, perpetuals trading volumes in aggregate are highly volatile. For instance, aggregate trading volumes of these products are down over 70% across all trading venues from their peak in 4Q21. As such, we chose Binance volumes in the pairs offered by dYdX as the proxy variable for market sentiment. This factor was significant in all cases as expected.

Trading rewards also play an important role in incentivising volume on dYdX. The attractiveness of this incentive is a function of the price of DYDX, trading fees, and the forecast volumes for the particular epoch. For our study, we have also included the price of DYDX[2] to account for trading behaviour.

The purpose of the model is to test whether fee holidays impact trading volumes. A binary variable representing fee holidays is used for this.

Formally:

$$tradingvolume = \beta_1 \times fees + \beta_2 \times price + \beta_3 \times external + \epsilon \tag{1}$$

where:
trading volume : dYdX trading volume
fees : 1 if a dYdX fee holiday and 0 if not
price : Price of DYDX in USD
external : Binance trading volume
ϵ : residual

[2]Note that the price data is a necessary to account for the attractiveness of trading rewards. It's inclusion serves no other purpose or comment on the token.

11.2 Data

11.2.1 Exchange Trading Volume - Binance, dYdX

We obtained the trading volumes for the largest centralised exchange, Binance through their APIs and an internal dataset for dYdX from the dYdX Trading team. Data on daily volumes for each of the 36 markets supported on dYdX were retrieved. Binance's trading volume provided a control for market conditions since the exchange accounts for over 55 percent of daily spot and futures volume. These were then aggregated to provide a daily volume for the respective exchanges.

11.2.2 Fee Holidays

Noting the relevant fee holiday changes, we introduced a binary variable that turns fees on (1) or (0) based on the aforementioned fee revisions.

11.2.3 dYdX Price

The daily close price of dYdX was retrieved through coingecko API. We analyzed the effect of the fee structure changes by looking at the period from September 8, 2021 to October 6, 2022. The window with the initial starting date was specifically chosen as this marked the launch of dYdX token, enabling us to account for the trading rewards which potentially influences trading behavior.

11.2.4 Removal of outliers

Initial results showed extreme residual outliers corresponding to the ends of epochs 1, 2, 3, 6, 7 and 8. These dates were removed from the samples as trading activity on these days was clearly not driven by sensitivity to trading fees and possessed the potential to bias the results. The exact dates and initial residual plot can be found in the appendix 11.11.

Interestingly, this end of epoch behaviour does not appear to produce outlier outcomes from epoch 9 which corresponds to the fee weight increase in the rewards formula proposed by Xenophon Labs. This happened to also coincide with the collapse of the Luna ecosystem which we will expound on below 11.2.5.

It is also unclear why this behaviour was not significant in the earlier epochs 4 or 5.

11.2.5 Impact of the Luna Collapse

Nonetheless, an unexpected observation from this analysis is the immediate, dramatic change in trading behaviour after the collapse of Luna (May 12 2022). It can be seen in the residual plot that the variance of residuals immediately decreased after the Luna collapse and never recovered. As such, we will further analyse the dataset by splitting

itinto 2 time frames - pre and post Luna.

An interpretation of this phenomenon is that this was exactly the time the market dynamics shifted from a bull market to a bear market:

Before the Luna collapse, all three parameters were significant with a sensitivity to the DYDX price of 0.062 and positive reaction to the fee holiday of 0.415. After the collapse. in less favourable market sentiment these parameters changed to 0.265 and -0.72 respectively. It can be deduced that during a bear market, there was significantly more trading volume due to rewards targeted strategies. At the same time, we also note the negative sensitivity to fee holidays - recent free trading of up to $100k per epoch. The change could have possibly repelled smaller retail traders who had lower volumes and would thus, be not eligible to receive rewards.

The table in 11.3 displays the results of our regression

11.2.6 Impact on different Market Segments

Apart from analysing the impact of the change in fee structure across all markets, we further segregated them into their respective market segments to provide a granular perspective for these different groups. This was based on their respective average trading volumes over the time period. The data was similarly treated to remove end of epoch periods:

Segment 1 : ETH, BTC
Segment 2 : SOL, AVAX, MATIC, ATOM, UNI, ETC
Segment 3 : Remaining Long Tail Markets on dYdX

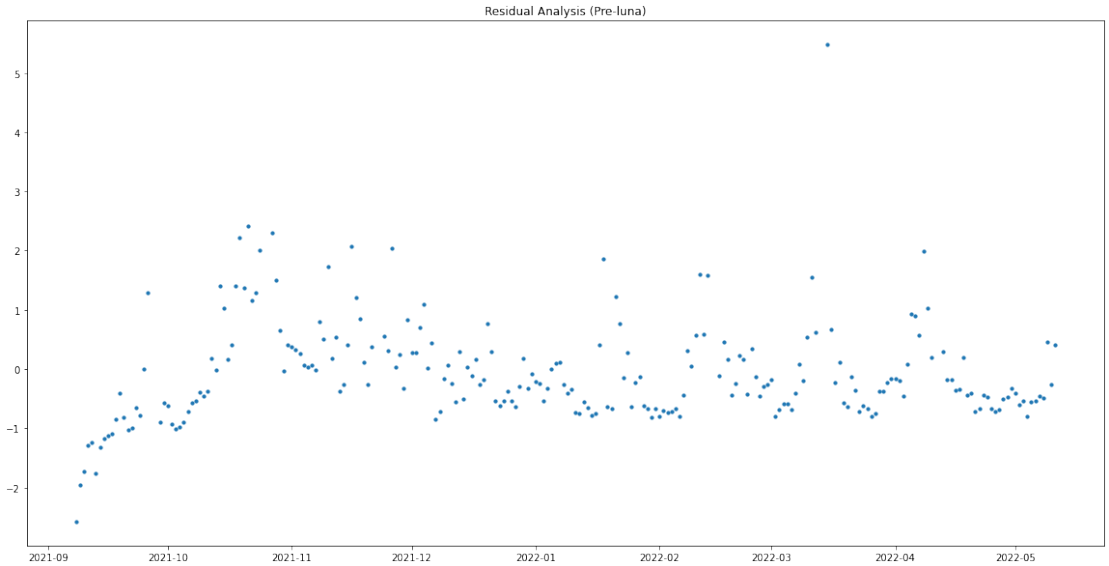
The impact of a fee change was most pronounced in the largest market segment 1, prior to the Luna crisis with a high significance of 0.3070 from fees. This was largely expected since majority of the volumes and traders were located in the ETH and BTC markets and any change in fees will likely influence trading behavior. On the other hand, the other segments experience limited impacts with the fee changes, rendering it relatively fee inelastic. On the contrary, in post-Luna, fee changes fell drastically in significance while trading rewards exerted a slightly stronger impact on trading volumes. In particular, we noticed a similar observation that for both segments 1 and 2, fee parameters became negative which could be attributed to the $100k requirement as aforementioned.

This confirms our initial hypothesis that smaller market segments remain rather insensitive to both changes in fee structure and trading rewards as compared to the larger market segments. In fact, under normal market conditions, fees appear to play a larger role in driving volume while the rewards grows in influence during volatile market conditions.

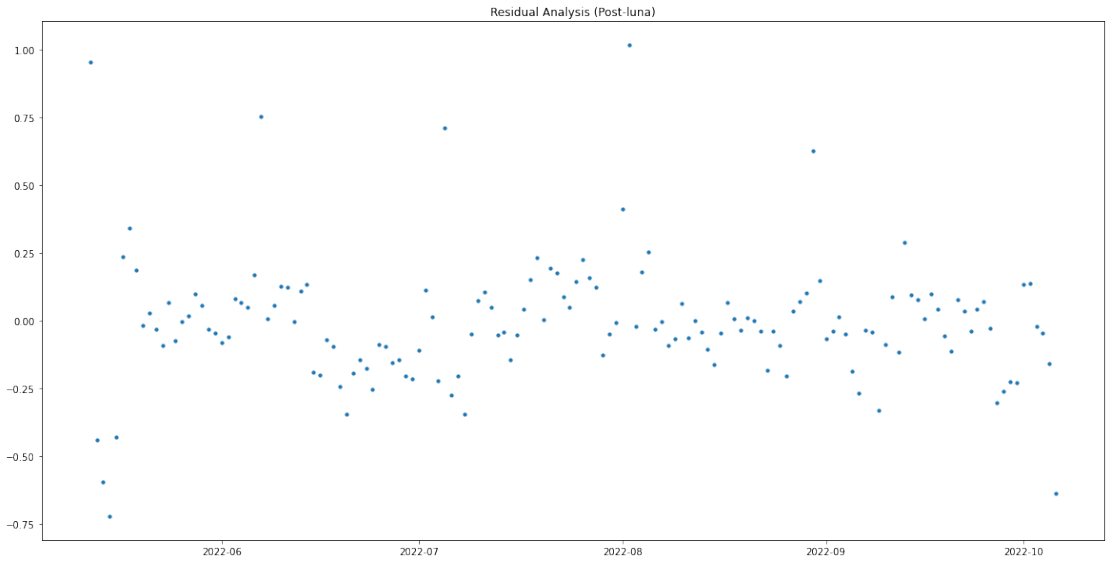
11.3 Summary Statistics on Trading Activity for dYdX

		Coeffecients	Std Error	t value	p value	Adj R^2
Combined	Binance Volume	0.0364	0.003	14.205	0.000	0.851
	DYDX Price	0.0798	0.007	10.974	0.000	
	Fees	-0.0259	0.079	-0.328	0.743	
Combined (Pre-Luna)	Binance Volume	0.0414	0.003	11.997	0.000	0.866
	DYDX Price	0.0620	0.009	6.539	0.000	
	Fees	0.4152	0.114	3.631	0.000	
Combined (Post-Luna)	Binance Volume	0.0390	0.002	23.414	0.000	0.953
	DYDX Price	0.2653	0.038	7.013	0.000	
	Fees	-0.7191	0.074	-9.673	0.000	

Pre Luna



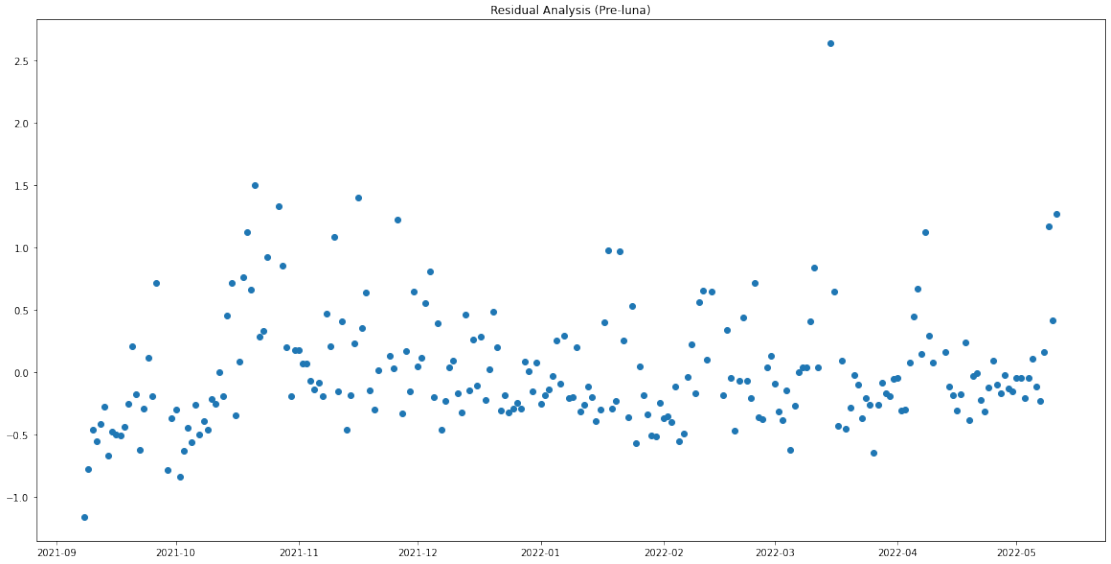
Post Luna


Residual Analysis (Post-luna)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
2022-06
2022-07
2022-08
2022-09
2022-10

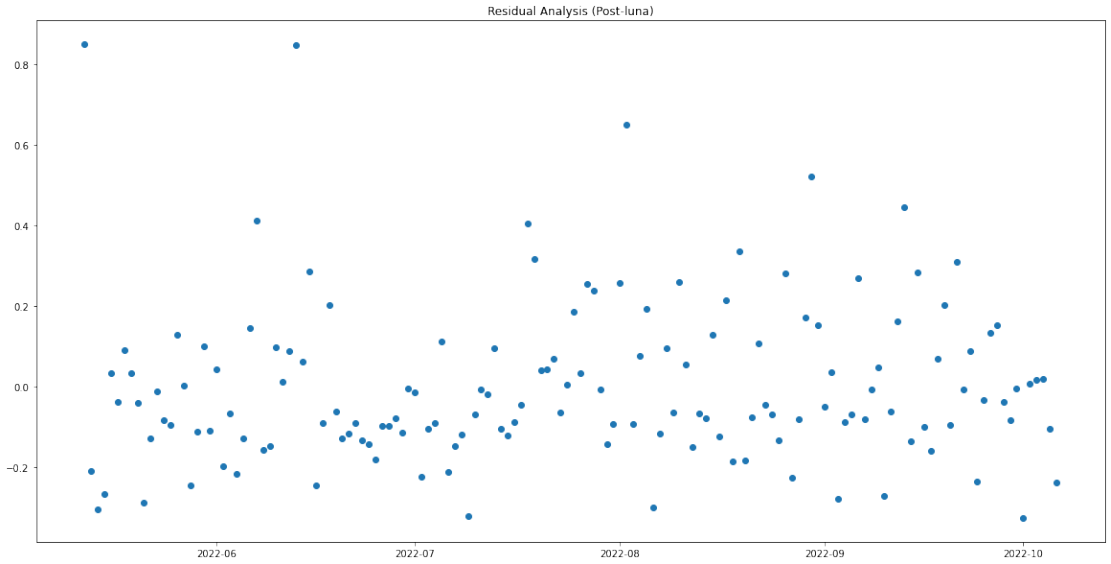
11.4 Summary Statistics on Trading Activity for Market Segments on dYdX ETH and BTC

		Coeffecients	Std Error	t value	p value
Segment 1 (Pre-Luna)	Binance Volume	0.0143	0.003	4.609	0.000
	DYDX Price	0.0447	0.005	8.393	0.000
	Fees	0.3070	0.066	4.668	0.000
Segment 1 (Post-Luna)	Binance Volume	0.0111	0.002	6.541	0.000
	DYDX Price	0.1573	0.033	4.805	0.000
	Fees	-0.1349	0.064	-2.116	0.036

11.5 Pre Luna



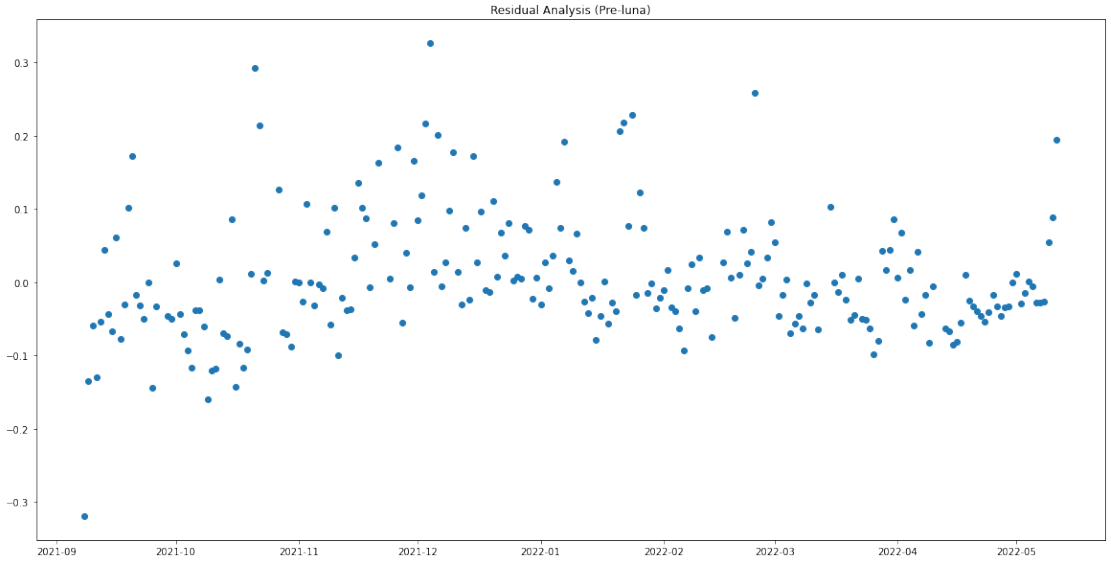
11.6 Post Luna



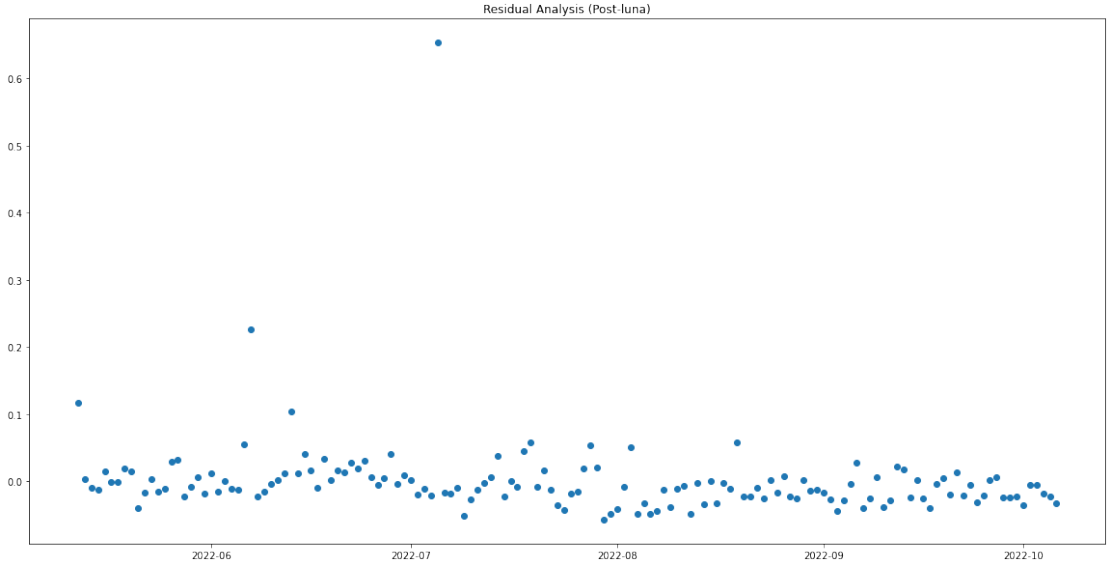
SOL, AVAX, MATIC, ATOM, UNI, ETC

		Coeffecients	Std Error	t value	p value
Segment 2 (Pre-Luna)	Binance Volume	0.0152	0.002	6.907	0.000
	DYDX Price	0.0088	0.001	10.578	0.000
	Fees	0.0503	0.010	4.960	0.000
Segment 2 (Post-Luna)	Binance Volume	0.0079	0.004	1.995	0.048
	DYDX Price	0.0270	0.012	2.284	0.024
	Fees	-0.0067	0.018	-0.366	0.715

11.7 Pre Luna



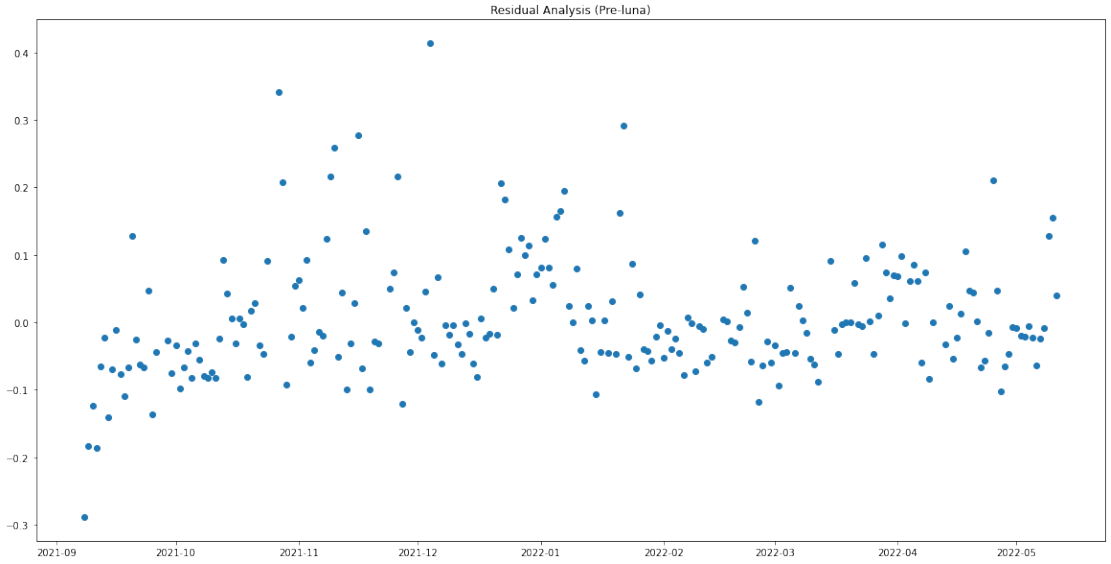
11.8 Post Luna



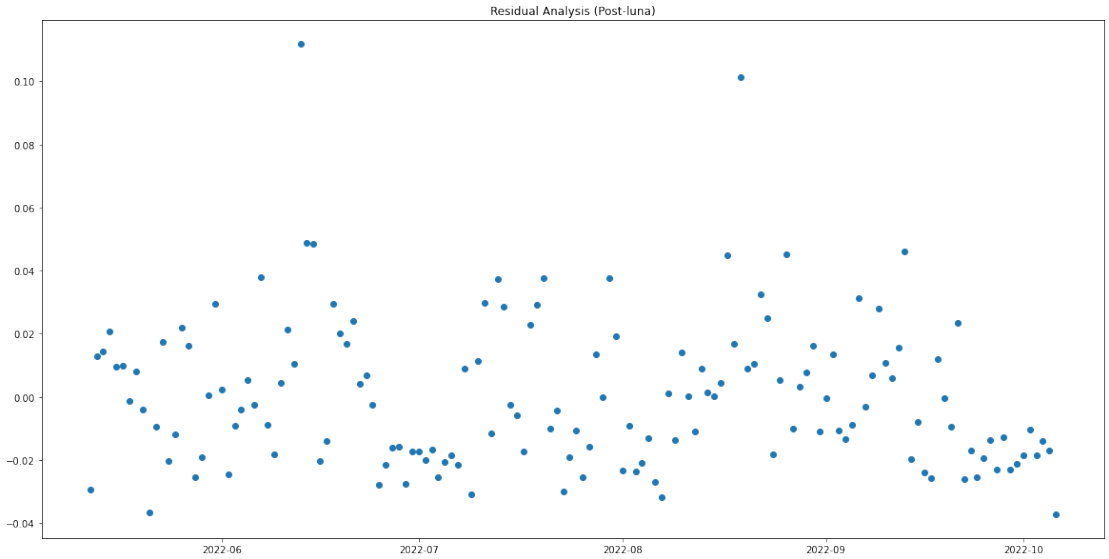
Remaining Long Tail Markets on dYdX

		Coeffecients	Std Error	t value	p value
Segment 3 (Pre-Luna)	Binance Volume	0.3431	0.034	10.014	0.000
	DYDX Price	0.0055	0.001	6.220	0.000
	Fees	0.0396	0.011	3.614	0.000
Segment 3 (Post-Luna)	Binance Volume	0.1237	0.016	7.956	0.000
	DYDX Price	0.0274	0.004	6.571	0.000
	Fees	-0.0025	0.007	-0.363	0.717

11.9 Pre Luna



11.10 Post Luna



11.11 Epoch End Outliers Removed

The following dates corresponding with epoch ends or the day before epoch ends created outliers biasing the results. They were removed from the sample:

27 09 2021
28 09 2021
25 10 2021
26 10 2021
22 11 2021
23 11 2021
14 02 2022
15 02 2022
13 03 2022
14 03 2022
15 03 2022
11 04 2022
12 04 2022

These corresponded to the epochs where it was profitable to "farm" rewards.

11.12 Volume Discounts

11.12.1 Initial Fee Structure

Level	30D Volume	Maker	Taker
1	0−1M	0.05%	0.10%
2	$1M$−5M	0.04%	0.09%
3	$5M$−10M	0.03%	0.08%
4	$10M$−50M	0.02%	0.08%
5	$50M$−200M	0.01%	0.07%
VIP	$200M+	0.00%	0.06%

11.12.2 First Two Fee Holiday Fee Structures

Level	30D Volume	Maker	Taker
1	0−1M	0.02%	0.05%
2	$1M$−5M	0.015%	0.04%
3	$5M$−10M	0.01%	0.035%
4	$10M$−50M	0.005%	0.03%
5	$50M$−200M	0.00%	0.03%
VIP	$200M+	0.00%	0.020%

11.12.3 Current Fee Structures

Level	30D Volume	Maker	Taker
Free	0−100k	0.00%	0.00%
1	$100k$−1M	0.02%	0.05%
2	$1M$−5M	0.02%	0.04%
3	$5M$−10M	0.01%	0.04%
4	$10M$−50M	0.01%	0.03%
5	$50M$−200M	0%	0.03%
VIP	$200M+	0%	0.02%

11.13 DYDX Token Discounts

Traders receive additional discounts for holding DYDX and stDYDX balances in their wallets according to the table below. This element was deliberately omitted from this analysis as it is a tokenomic issue rather than a fee issue.

DYDX + stkDYDX Current Balance	Discount
>100	3.00%
>1,000	5.00%
>5,000	10.00%
>10,000	15.00%
>50,000	20.00%
>100,000	25.00%
>200,000	30.00%
>500,000	35.00%
>1,000,000	40.00%
>2,500,000	45.00%
>5,000,000	50.00%