An Analysis of DeFi Aggregators with a Focus on Swapping Functionalities

Capstone Project Summary

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Vienna, 09 June 2025 Dennis Beelen

1. Introduction

Decentralized exchange (DEX) aggregators are a type of DeFi aggregator that specialize in token swaps, routing trades across multiple liquidity sources and exchanges to reduce costs and improve execution. They play a key role in Ethereum-based trading, but little empirical research has compared how these platforms perform in real-world conditions. This capstone performs a qualitative analysis of platform design, routing logic, and fee models combined with transaction-level data of execution quality, transaction cost, and transaction speed to assess the performance of five major DEX aggregators 1inch, CowSwap, KyberSwap, Velora, and Odos.

2. Methodology

The qualitative part involved an investigation of each aggregator's public documents, APIs, and user interfaces to understand their routing logic, fee structures, token support, chain compatibility, and order types. On the quantitative side, a unique transaction dataset was constructed. Using tools like the Etherscan API and Web3.py, every swap routed through the latest smart-contract router of the five aggregators was tracked and decoded, covering the period from February 10 to February 16 and March 10 to March 23, 2025. Three key metrics were constructed and analyzed for every transaction: gross trader slippage, defined as the actual achieved price of a transaction compared to the Uniswap-V3 quoted price; net execution quality, calculated as the gross price impact adjusted for all fees and gas costs; and latency, measured as the time between the transaction's first appearance in the mempool and the time it is confirmed in a block, or, for CowSwap, from the submission of the trade intent to its confirmation. To control for different market conditions and trade characteristics, regression models were used to isolate the impact of each aggregator on the outcome variables.

3. Results

The first key distinction to emerge is architectural. Among the platforms, two primary types were observed. Real-time routers such as 1inch, KyberSwap, Velora, and Odos identify optimal trading paths at the moment a swap is initiated, accessing liquidity from public pools. CowSwap, by contrast, adopts a batch-auction routing model. It collects signed trade intents, bundles them into batches, and submits them to private solvers who can source liquidity from both on-chain and off-chain markets. In terms of network coverage, KyberSwap and Odos support the highest number of blockchains, while Odos was the only aggregator that does not allow cross-chain swaps in any way. When comparing execution quality, CowSwap emerged as the top performer after accounting for market conditions, offering the best net price improvement and outperforming 1inch by 0.12 percentage points. Velora followed closely with a net gain of 0.11 percentage points. KyberSwap and Odos delivered pricing insignificantly different from 1inch after fees are considered. Before accounting for fees, all platforms actually outperformed 1inch, with CowSwap again in the lead at 0.49 percentage points, trailed by Velora at 0.30, KyberSwap at 0.26, and Odos at 0.15. These findings suggest that transaction fees have a large influence on the net performance of the aggregators. On the subject of fees, real-time routers were more expensive for small trades due to the fixed cost of gas fees, which takes up a larger proportion of the total amount. Odos, had a very high gas fee rate for very small trades, while for large trades gas costs were significantly more advantageous compared to 1inch. Overall it found that Velora had the lowest overall gas fee rate. CowSwap's solver fees remained modest for smaller trades, but slightly increase as trade size increases. In terms of latency, real-time routers were predictably faster, typically confirming trades within a single Ethereum block, around 7.5 to 8 seconds on average. CowSwap exhibited a longer delay, adding approximately two additional blocks, with a

median latency of 36 seconds. From the latency regression it was found that KyberSwap has the lowest latencies, followed by Odos, then Velora, and trailed by 1inch. While these differences among real-time routers were relatively minor, they could still matter in latency-sensitive use cases.

4. Conclusion

This capstone provides one of the first public, data-driven comparisons of Ethereum's major DEX aggregators 1inch, CowSwap, KyberSwap, Velora, and Odos evaluating performance in terms of user functionalities, transaction fees, execution quality, and speed. The results confirm that DEX aggregation improves trading outcomes compared to using DEXs directly, but platform architecture plays a key role in shaping results. CowSwap's batch-auction design delivers strong price outcomes, especially for small trades, by accessing private liquidity and matching trades internally. However, this benefit comes with longer confirmation times. KyberSwap, by contrast, offers the fastest execution speeds but also has higher gas costs. These differences suggest no single best aggregator exists, performance depends on trade size, urgency, and token types. The findings highlight the importance of evaluating both routing logic and fee structures when choosing a DEX aggregator.