

# Quantifying Price Improvement in OFAs

Brad Bachu  
Uniswap Labs

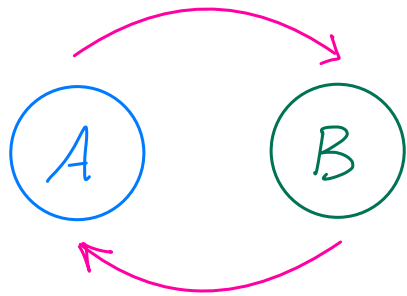
Xin Wan  
Uniswap Labs

Ciamac Moallemi  
Columbia University

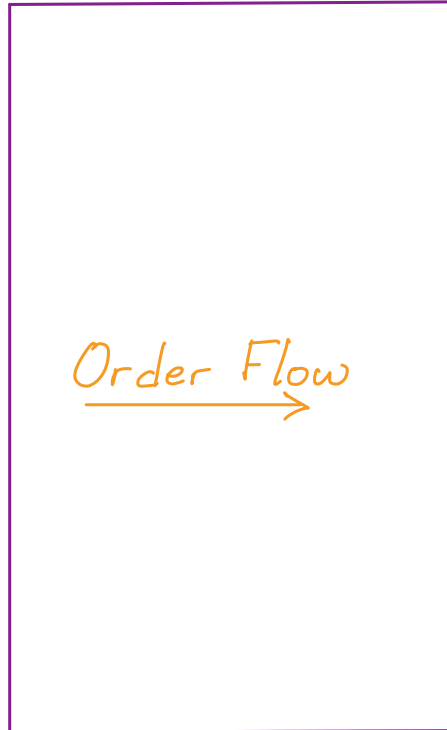
# Disclaimer

All views are my own

# Auction



Transaction Fee

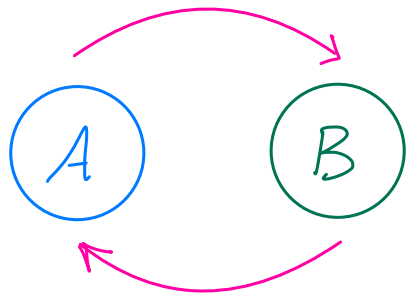


Searchers

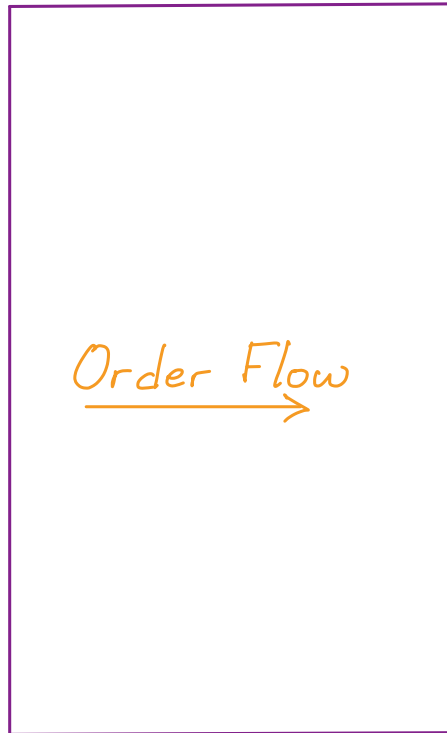
Fillers

Solvers

# Auction



Transaction Fee



Searchers

Fillers

Solvers

Uniswap-X

Uniswap Classic

1Inch Fusion

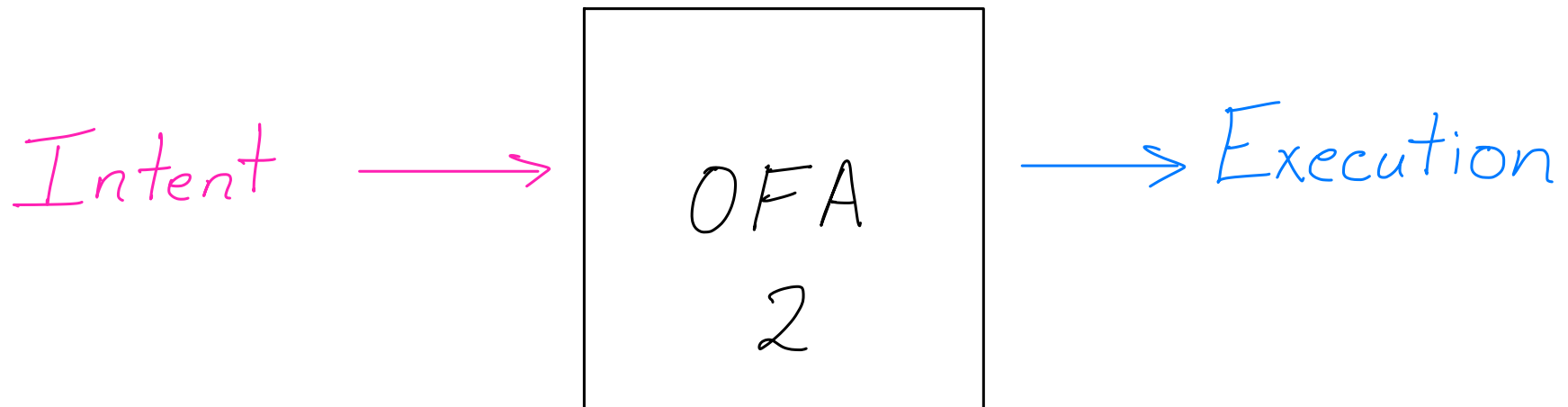
1Inch Aggregator

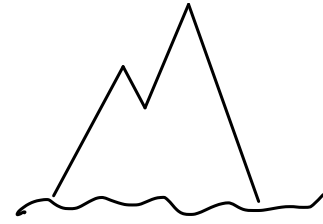
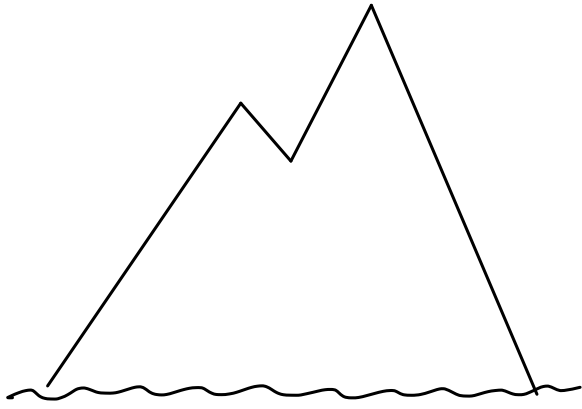
CoW Swap

MEV Blocker

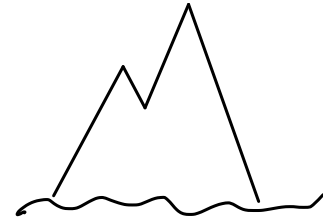
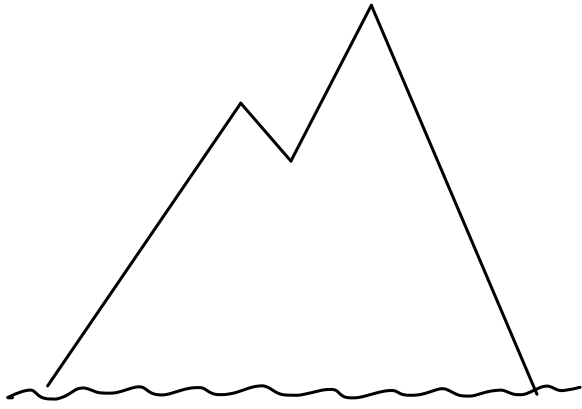
MEV Share & More

Problem: How to Compare?





Height above Sea level



Height above Sea level

Price Improvement compared to Uniswap Classic



# Uniswap Classic

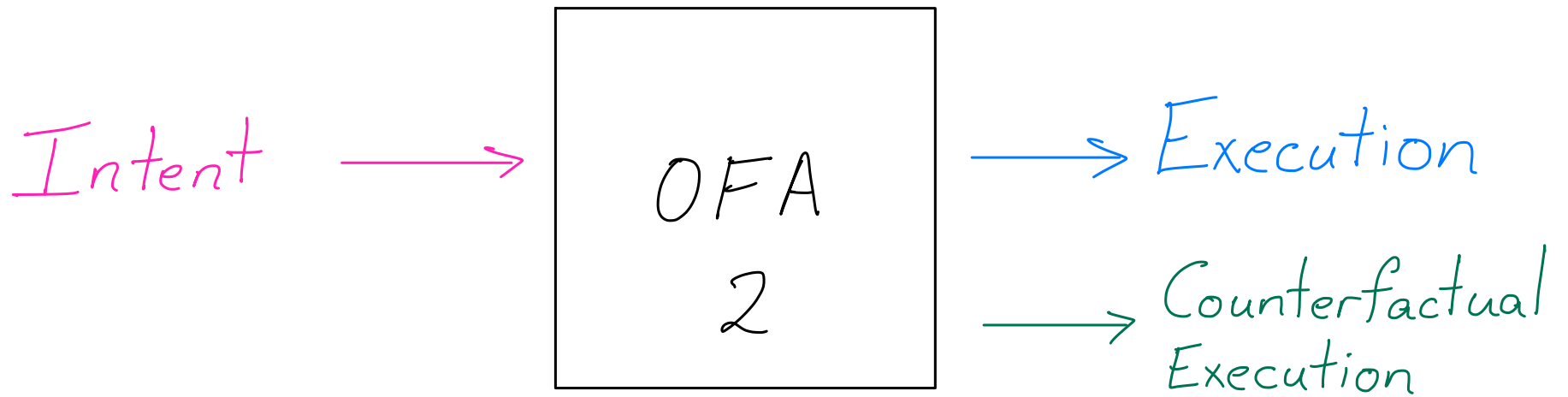
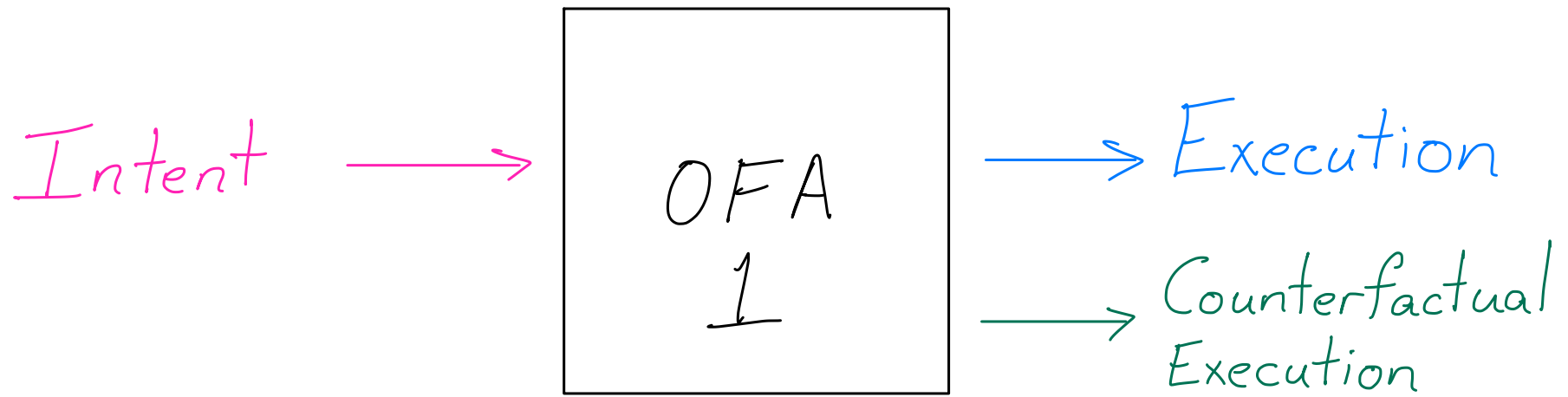
- Typical / Expected Execution (Ethereum)
- Token Coverage

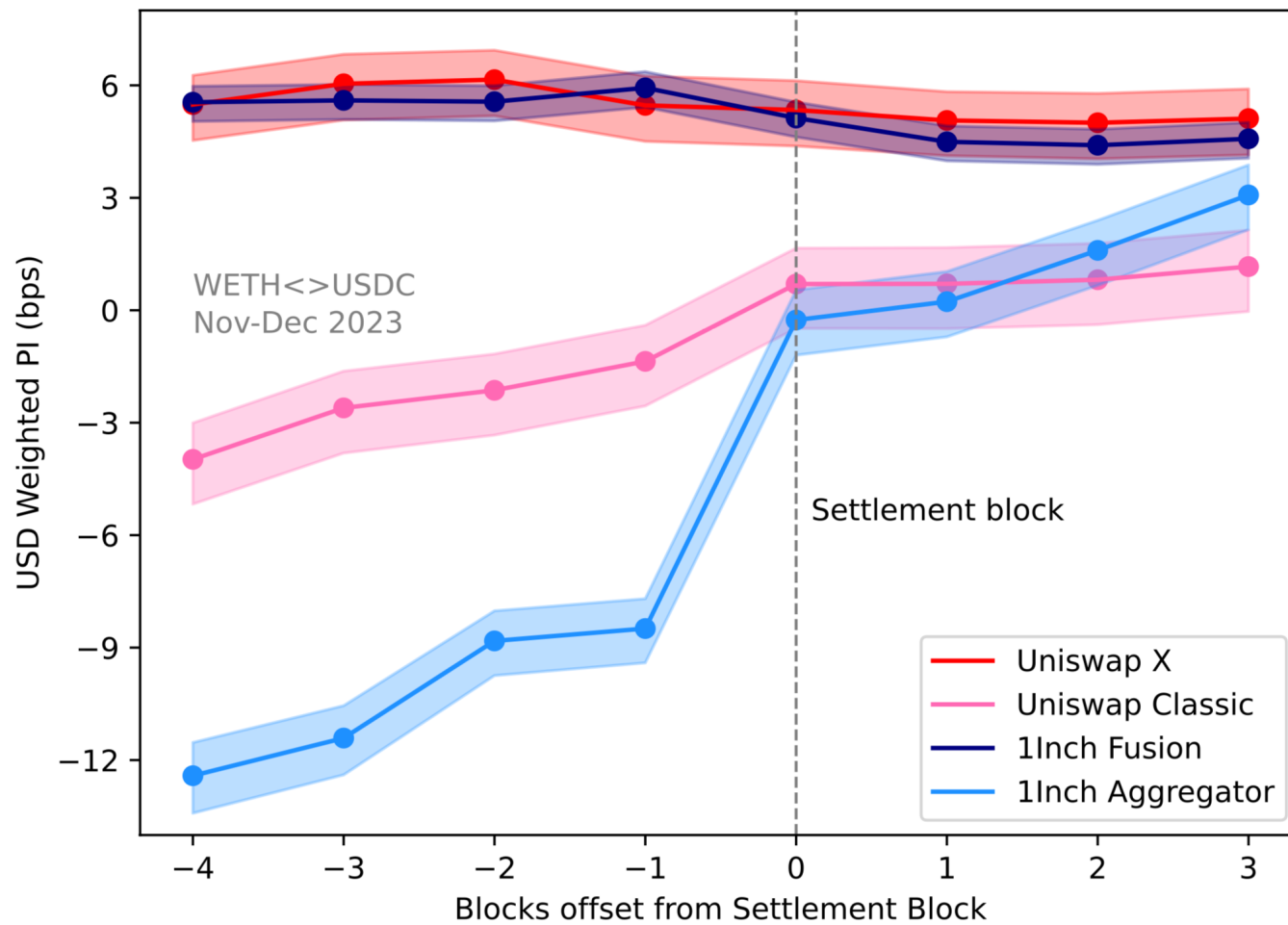
Problem: How to Compare?

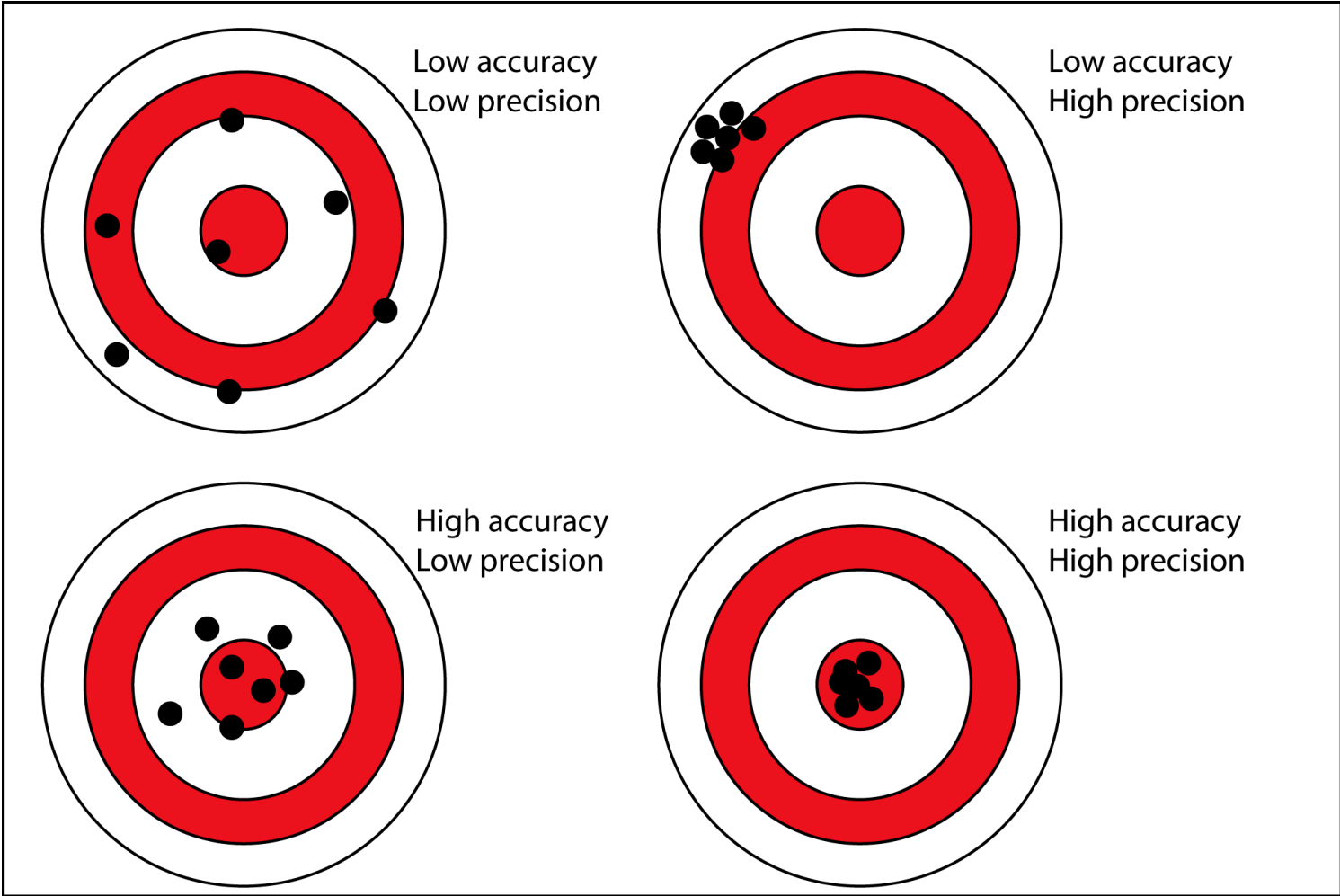
Solution: Price Imp. compared to Uniswap Cl.

Price Improvement compared to Uniswap Classic

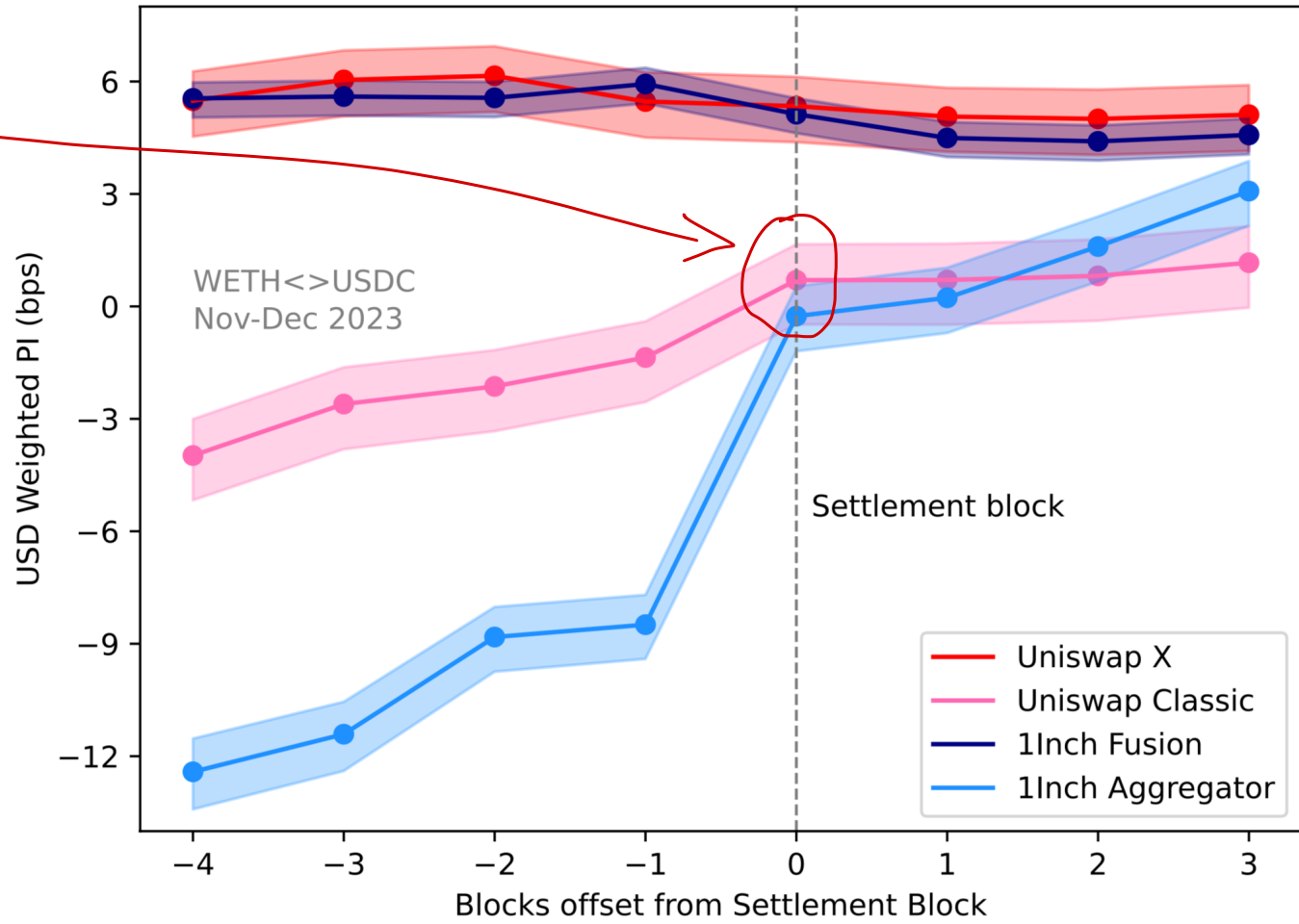
$$\frac{\text{Price} - \text{Counterfactual Price}}{\text{Counterfactual Price}}$$







Here



Question : What are they doing to get PI?



Question: What are they doing to get PI?

Answer:  $PI \sim \text{Liquidity} + \text{Gas} + \text{Fees}$

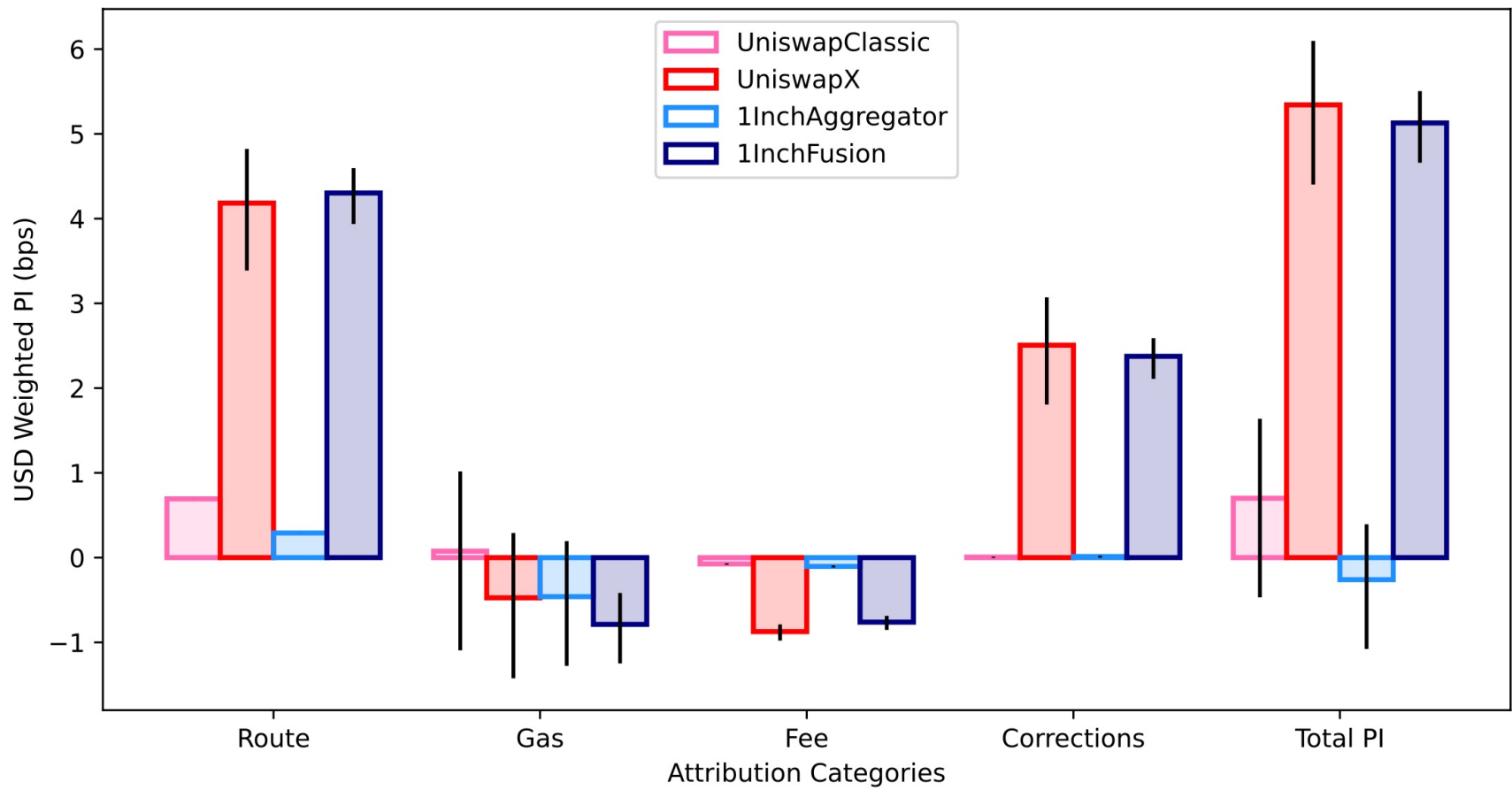
Problem: What are they doing to get PI?

Solution:  $PI \sim \text{Liquidity} + \text{Gas} + \text{Fees}$

Taylor Series!

$$p(\vec{x}) = p(\vec{x}') + \left. \frac{\partial p}{\partial o} \right|_{\vec{x}'} (o - o') + \left. \frac{\partial p}{\partial g} \right|_{\vec{x}'} (g - g') + \left. \frac{\partial p}{\partial f} \right|_{\vec{x}'} (f - f') + R(\vec{x}, \vec{x}')$$

$$\begin{aligned} \pi &= \left. \frac{\partial p}{\partial o} \right|_{\vec{x}'} \frac{(o - o')}{p'} + \left. \frac{\partial p}{\partial g} \right|_{\vec{x}'} \frac{(g - g')}{p'} + \left. \frac{\partial p}{\partial f} \right|_{\vec{x}'} \frac{(f - f')}{p'} + \frac{R(\vec{x}, \vec{x}')}{p'} \\ &= \pi_0^{\text{routing}} + \pi_0^{\text{gas}} + \pi_0^{\text{fee}} + \pi^{\text{remainder}} \end{aligned}$$



# Future Work

- Expand dataset (Pairs & Time)
- Evaluate other mechanisms (CoW Swap, MEV Tax)
- Use different benchmarks
- Analyze fillers (private/public)

Thank You

