FuGaZi

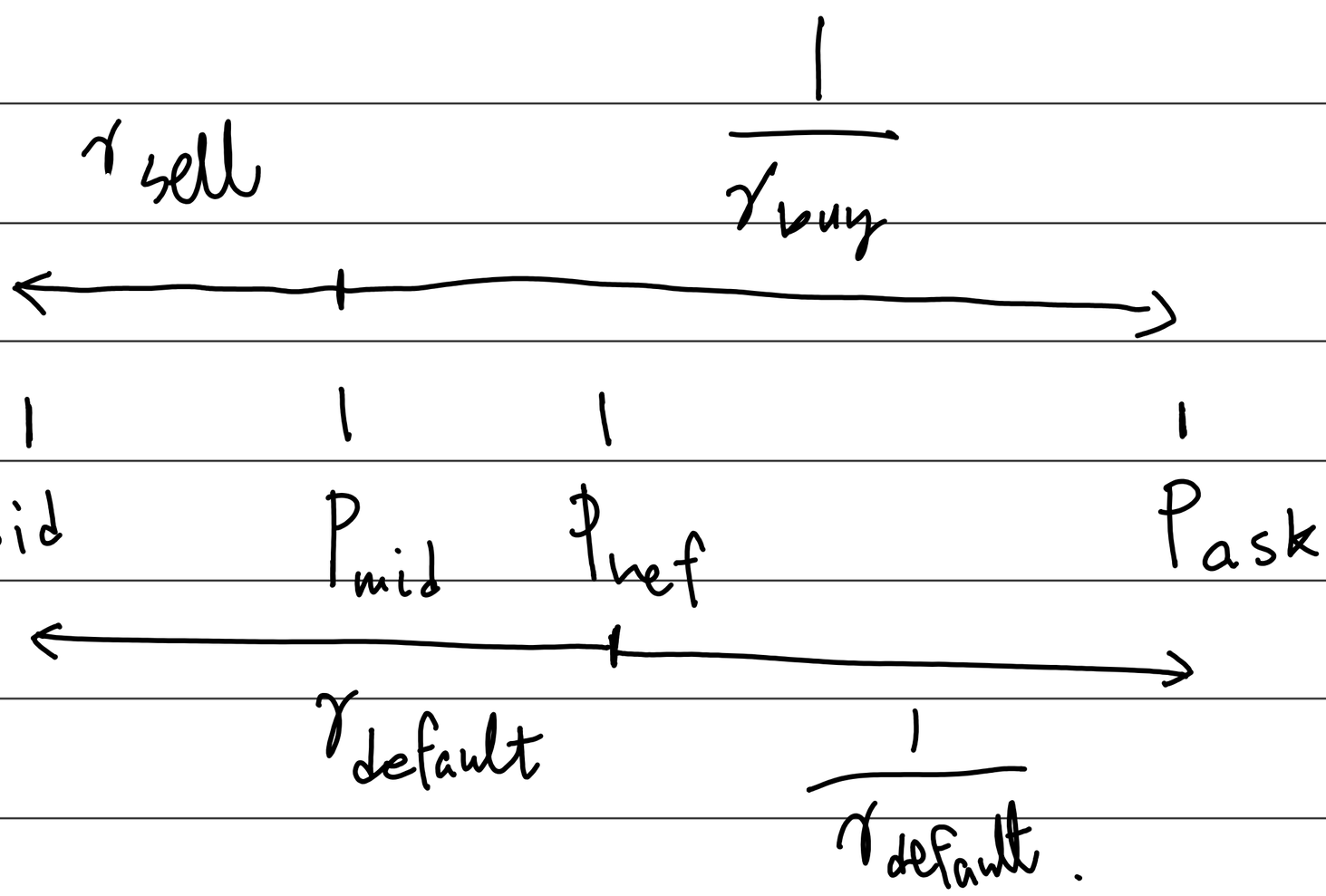
Optimal input routing:

$$\delta_i = \frac{L_i}{\sqrt{\gamma_i}} \cdot \frac{\Delta + \sum \frac{X_j}{\gamma_j}}{\sum \frac{L_j}{\sqrt{\gamma_j}}} - \frac{X_i}{\gamma_i}$$

Optimal output routing:

$$\delta_i = Y_i - \frac{L_i}{\sqrt{\gamma_i}} \cdot \frac{\sum Y_j - \Delta}{\sum \frac{L_j}{\sqrt{\gamma_j}}}$$

Dynamic Fee $(\gamma_{buy}, \gamma_{sell})$



$$AD^{n-1}\sum x_i + \prod x_i = AD^n + \left(\frac{D}{n}\right)^n.$$

$$A \leftarrow A_0 \cdot \frac{\prod x_i}{\left(\frac{D}{n}\right)^n}$$

$$A_0 \cdot \frac{\prod x_i}{\left(\frac{D}{n}\right)^n} \cdot D^{n-1} \cdot \sum x_i + \prod x_i$$

$$= A_0 \cdot \frac{\prod x_i}{\left(\frac{D}{n}\right)^n} \cdot D^n + \left(\frac{D}{n}\right)^n.$$

$$A_0 \cdot \frac{n^n}{D} \cdot \sum x_i + \Big| = A_0 \cdot n^n + \frac{D^n}{n^n \prod x_i}$$

Final

$$A_0 \cdot n^n \sum x_i + D = A_0 \cdot n^n D + \frac{D^n}{h^n} \cdot \frac{D}{\prod x_i}$$

What Do We Want to Investigate?

Fee = 0.05 ~ 1 (%)

Block Time = 12 or 1 (s)

Volatility = Inst or Rol. (daily)

Mispricing. $= \log\left(\frac{\text{refP}}{\text{ammP}}\right)$.

$\gamma = \log(1 + \text{fee})$

$\lambda = \frac{1}{\text{BlockTime}}$

$\eta = \frac{\sqrt{2\lambda}\ \gamma}{\sigma}$

$= \gamma \times \frac{1}{\sigma \cdot \frac{1}{\sqrt{2\lambda}}}$

$= \gamma \times \frac{1}{\sigma \cdot \sqrt{\frac{\lambda^{-1}}{2}}}$.

$\frac{1}{8.2}$

$\frac{\sqrt{2\times}}{0.05} \times 0.003$

$\lambda = \frac{\text{Day}}{\text{BlockTime}}$

$= \frac{2\cancel{4}\times 60\times 60}{\cancel{12}s}$

$\frac{\log(1.003)}{0.05\times\sqrt{\frac{6}{24\times60\times60}}}$

$\frac{1}{1+\frac{2\times60\times0.003\times20}{0.05\times20}}$

$120\times20\times0.003$

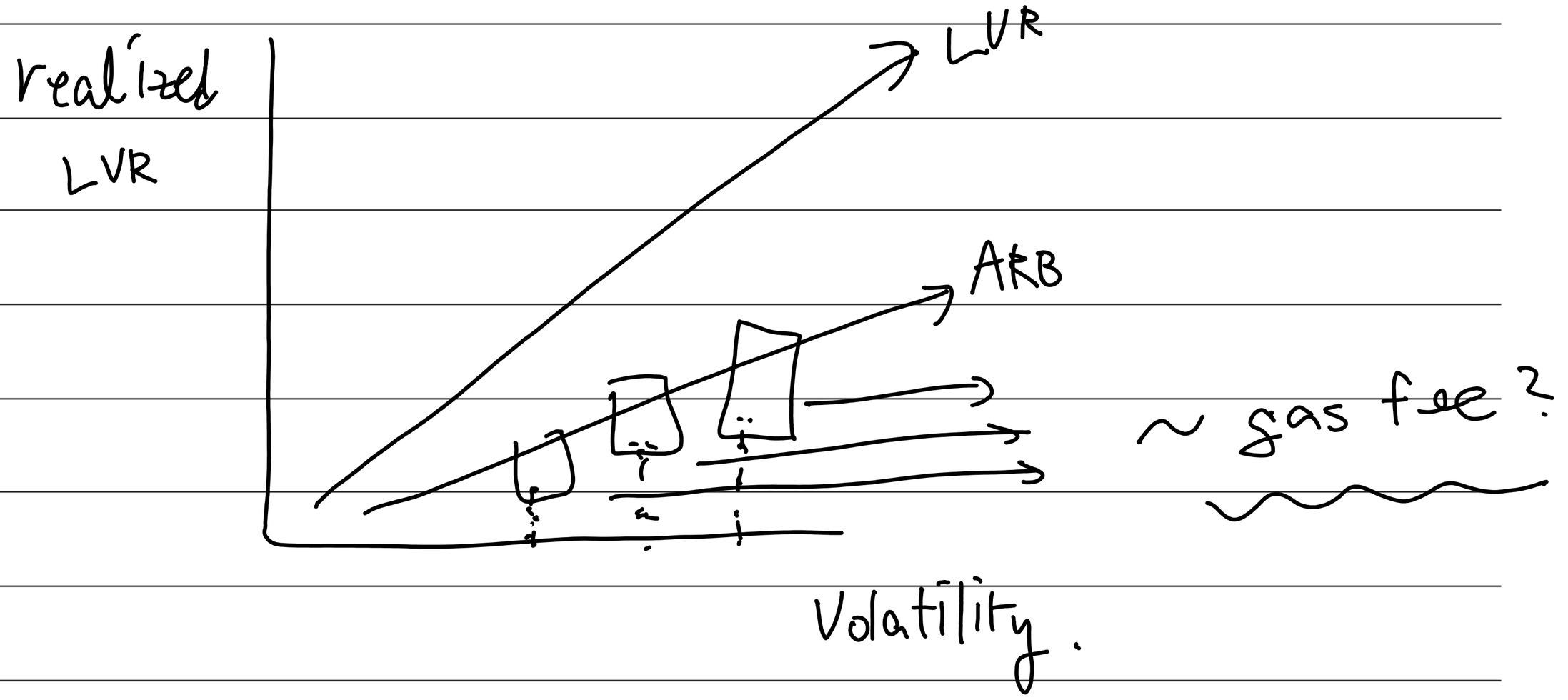
2초 1.

Mispricing distribution.

ARB/V(P)

$$= \frac{\sigma^2}{8} \times P_{trade} \times \frac{e^{\frac{\gamma}{2}} + e^{-\frac{\gamma}{2}}}{2 \times \left(1 - \frac{\sigma^2}{8\lambda}\right)}$$

$$LVR/V(P) = \frac{\sigma^2}{8}.$$



Goal # 1. Check if the prediction works well.

(Fee - LVR) / V(P).

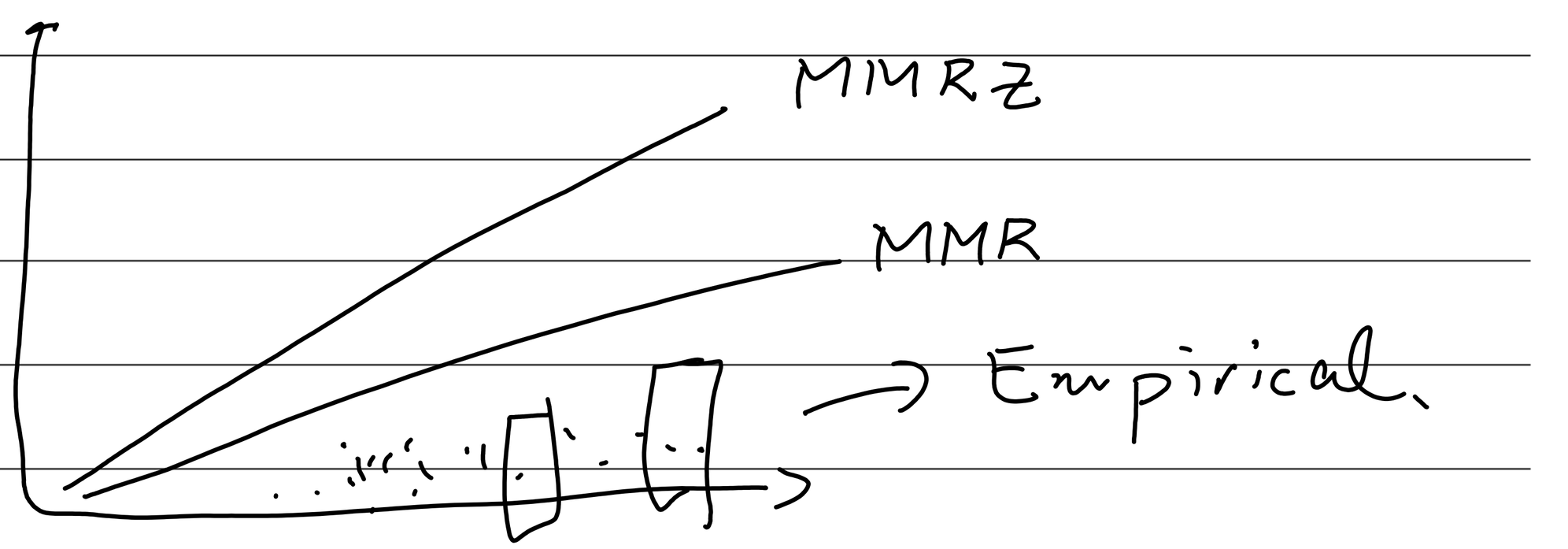
What Makes Error?

Filter the trades w/

$$LVR - Fee - Gas > 0.$$

See distribution.

Theoretical Estimates.



What Makes the difference?

Gas Cost, Pool Size. → V2, V3, ...

High Gas vs. Low Gas.

Goal #2. Which Pool Should I ape into?

ETH-USD Pool

(MAINNET)

V2 — DAI, USDC, USDT

$$\int \frac{(Fee - LVR)}{V} \, dt$$

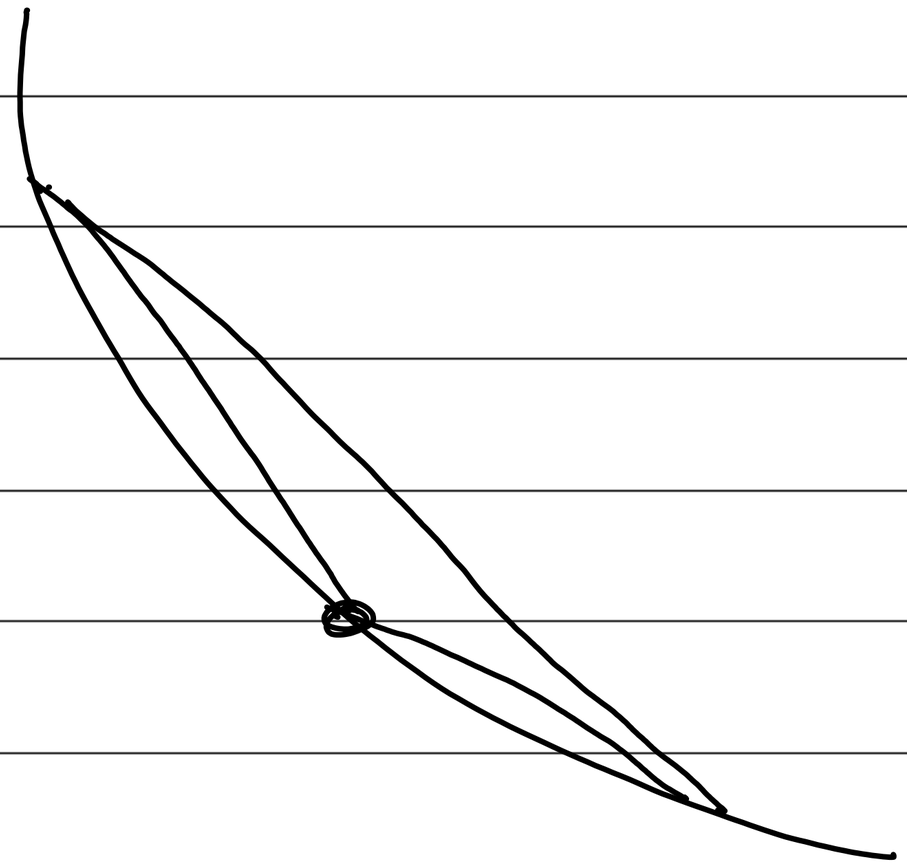
//.

→ Retail vs. → Arb

V3	DAI	USDC	USDT.
0.05			
0.3			
1			

V3

SUSHI or Camelot.



TOPIC : What Makes Difference ?

기준 : $\frac{\text{Gas Fee}}{\text{Liquidity}}$ 가 같을 때

(≈ V(P))

이론적인 값에 가까울 것이다.

(ETH XXX or XXX ETH only)

Compute Theoretical Numbers.] → Diff.

Compute Historical Numbers.

↓

filter the Arb-Tx only.

(LVR - Fee - Gas > 0)

↓

{ Uni V2
  Uni V3
  Arb. V2.
  Arb. V3

Diff

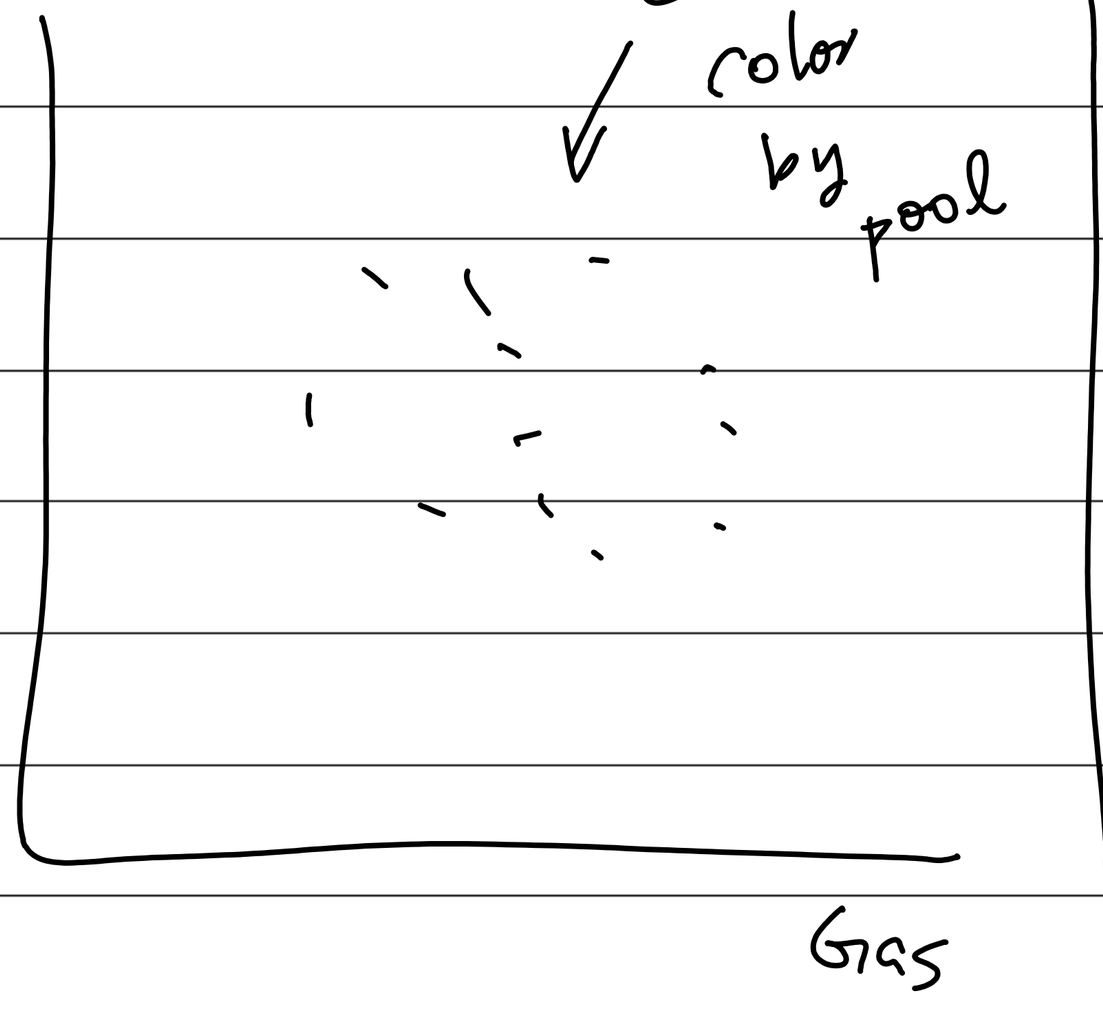


fig 1.

Diff

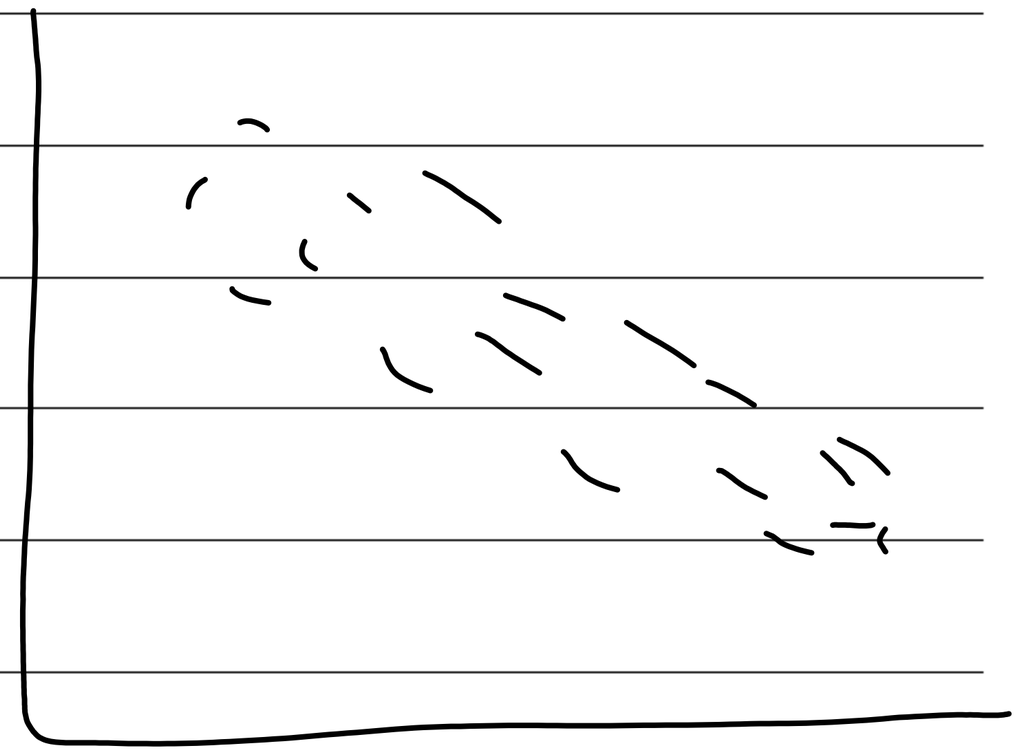


fig 2.

TOPIC: LP 들은 얼마나 잃고 있는가?

$$\int \frac{LVR}{V(p)} dt.$$

$$\int \frac{Fee}{V(p)} dt.$$

가설: Loss in V3 > Loss in V2

Why?: JIT & Active Liquidity.

결론: 리테일은 V2가 낫다.
메인넷

[Active Cost ↑]