AMMs
Constant Product AMMs.

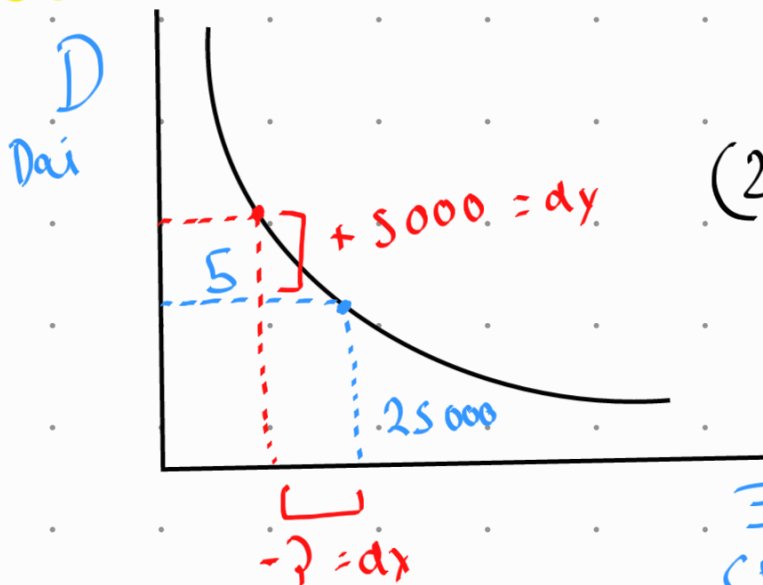## Automated Market Makers

$$y \, x = K$$

$$K = 25,000 \times 5 = 125,000$$

$$\frac{25000}{5} = 5000$$

D Dai

5

25 000

Ether

At Swap

D Dai

5

+ 5000 = dy

25 000

$-? = dx$

Ether

$$y \, x = K$$
$$(25000 + 5000)(5 + dx) = 125006$$
$$dx = \frac{125000}{30\,000} - 5$$
$$dx \approx 0.833\overline{3}$$
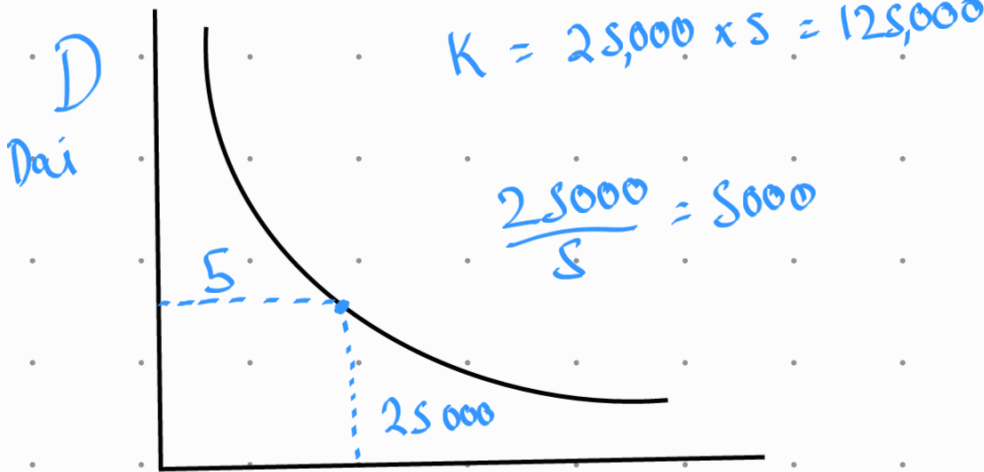
Price of dai to ether $= \dfrac{5000}{0.833} = 6000$

> K does not move during a swap.

Providing Liquidity

$$5 \Xi \ | \ 25000 \ \text{DAI} \qquad 5 \ \text{LP}$$
$$+ \ 5 \Xi \ | \ 25000 \ \text{DAI}$$

LP tokens recieved $= \dfrac{\text{token deposited}}{\text{token in pool}} \times \text{LP token supply}$

$$\dfrac{5 \Xi}{5 \Xi} \times 5 = 5 \ \text{LP}$$

$$\dfrac{25000 \ D}{25000 \ D} \times 5 = 5 \text{LP}$$

Swaps After adding liquidity

$$10 \Xi \ | \ 50,000 \ D$$

$$(10)(50,000) = 500,000$$

$$(10 - dx)(50,000 + 5000) = 500,000$$

$$dx = \dfrac{500,000}{55,000} - 10$$

$$dx \approx 0.909$$

Price of Dai to Ether $= \dfrac{5000}{0.909} \approx 5560$

Higher Liquidity = better Asset Price.

Impermanent Loss

Pool State T_1 $10 \, \Xi \mid 50,000\, D$ 5 LP / 10 LP

My Share ↗   ↑ Total Supply

$\downarrow$

T_2 $15\, \Xi \mid 33,000\, D$

Ξ price $\approx 2,222$ USD

$7.5\, \Xi \cdot 2,222 + 16.666 = \$33,333$

T_3 $5\, \Xi \cdot 2,222 + 25,000 = \$36,110$

Impermanent Loss $= 36,110 - 33333 = \$2777$