1 Reinvest

Let us consider that the position has a ratio $r = \text{tokens}_a/\text{tokens}_b$ and that asset a is trading at price p relative to asset b. Given the tokens amounts (a, b), the amounts δ_i that should be swapped in order to maintain the same ratio will be determined by

$$\left.\begin{aligned} r &= \frac{a-\delta_a}{b+\delta_b} \\ \delta_b &= \delta_a \cdot p \end{aligned}\right\} \quad \delta_a = \frac{a - rb}{1 + r \times p}. \tag{1}$$

2 Deposit limits

From the `Uniswap V3` formulas, for a position with lower and upper price ranges $\sqrt{p}_a$ and $\sqrt{p}_b$ respectively, the amount of tokens x and y required for providing a liquidity L at price P read

$$\begin{aligned} P \leq p_a \quad & \begin{cases} x = L\dfrac{\sqrt{p_b} - \sqrt{p_a}}{\sqrt{p_a}\sqrt{p_b}} \\ y = 0 \end{cases} \\ P \geq p_b \quad & \begin{cases} x = 0 \\ y = L\left(\sqrt{p_b} - \sqrt{p_a}\right) \end{cases} \\ p_a < P < p_b \quad & \begin{cases} x = L\dfrac{\sqrt{p_b} - \sqrt{P}}{\sqrt{P}\sqrt{p_b}} \\ y = L\left(\sqrt{P} - \sqrt{p_a}\right) \end{cases} \end{aligned} \tag{2}$$

The maximum amounts correspond to the case in which the price is out of bounds

$$\max(x) = (2^{64} - 1)\frac{\sqrt{p_b} - \sqrt{p_a}}{\sqrt{p_a}\sqrt{p_b}}, \tag{3}$$

$$\max(y) = (2^{64} - 1)\left(\sqrt{p_b} - \sqrt{p_a}\right), \tag{4}$$

where it has been assumed that the liquidity is an `u64` number.