Rebalancer

Detailed overview of how rebalancing works through the lens of an actual example.

Assume theAVAX-USDC farm on Trader Joe has 22M liquidity and the price ofAVAX is 18. That translates to 11MUSDC and 611,111 (11M/18)AVAX . Assuming we have 1M worth of LP on Trader Joe which comes from a 3X LYF position onHomora , our debt inUSDC is 1/6M and our debt inAVAX is 1/36M ~27.78K AVAX or500K USD.

Say after some time we accrue 10K in farm token rewards and 2KUSDC plus 4000/18AVAX in interest. Therefore

Say the price ofAVAX changes to 20. After the 10K in rewards is added to ourLP , assume the farm's liquidity becomes 23.20M so that it has N_a=11.60MUSDC and N_b=580KAVAX . The amount of tokens in ourLP is

The current leverage becomes 3.29. In order to bring the leverage back to 3 and achieve delta-neutral, we need to remove someLP tokens , swap someUSDC toAVAX and repay some of our debts.

The amount ofLP we need to remove is proven to be

We need to remove 5.731%LP in our position during rebalance. After that the amount of tokens in ourLP is

The amount of tokens left in the pool is

The optimal amount ofUSDC to be swapped toAVAX is proven to be

which amounts to 3% of theLP position.

The swap satisfies

Therefore

The amount ofUSDC to repay Delta_d_a is the amount withdrawn minus the amount swapped

Therefore the final amount ofUSDC in debt is

The final amount ofUSDC in theLP after the swap is proven to be

And the amount of repaidAVAX is

The final amount ofAVAX in debt is

And the final amount ofAVAX in theLP after the swap is

which matches the debt amount(up to rounding errors) inAVAX to reach delta-neutral.

The swap price ofAVAX in terms ofUSDC is

which indicates a slippage (including the swap fee) of 0.8%.

Also the pool price ofAVAX in terms ofUSDC after the swap is

As a result the final leverage is

The actual calculations are much more accurate and only have single digit errors (in Solidityuint). In a word our contract is able to rebalance the pseudo delta-neutral position by removing the optimal amount ofLP and swapping the minimal amount of tokens, with less than1,800,000 in gas .

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