

Bootstrapping Looping Strategies - DEX LP looping extension

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Abstract

We extend "Bootstrapping Looping Strategies" to include a DEX LP looping vault, and capped fixed yield lending club reward. The optimization problem is formulated as a constrained optimization problem and is not longer linear; it may be solved using the Lagrange multiplier method.

1 Looping: 5 components Ecosystem

Looping is made up of:

- a yield-bearing asset with yield r , correlated to a base asset (eg mRe7 correlated to USDC).
- a DEX protocol (eg Curve)
 - direct liquidity ¹ (ie. not via looping vault below) supplied by users: N_d , and sponsor: N_d^*
 - fee APY: $r_d \approx 0$
 - reward paid by sponsor: R_d
- a looping vault (eg Gearbox credit account)
 - deposit by users only: N_v (and $N_v^* = 0$)
 - reward paid by sponsor: R_v
 - borrow rate r_v
 - We assume r is high enough so that loopers seek maximum leverage l_v , so that $N_v^b = N_v(l_v - 1)$
- a DEX LP looping vault (eg Gearbox credit account)
 - deposit by users: N_{vd} , and sponsor N_{vd}^*
 - reward paid by sponsor: R_{vd}

¹DEX liquidity is defined as the sum of the two pools

- borrow rate r_{vd}
- We can assume $\frac{r}{2} + \frac{R_d}{N_d + N_d^*}$ is high enough for loopers to seek maximum leverage l_{vd} , so $N_{vd}^b = N_{vd}(l_{vd} - 1)$
- a Lending pool (eg Gearbox passive pool):
 - supply by users: N_l , and sponsor: N_l^*
 - We assume utilization at $U = 90\%$ target :

$$N_v(l_v - 1) + (N_{vd} + N_{vd}^*)(l_{vd} - 1) = U(N_l + N_l^*) \quad (1)$$

- We assume curator cap is maxxed out:

$$\alpha_v l_v N_v + \alpha_{vd} \frac{1}{2} l_{vd} (N_{vd} + N_{vd}^*) = \frac{1}{2} (N_d + N_d^* + l_{vd} (N_{vd} + N_{vd}^*)) \quad (2)$$

where $\alpha_v = 1$ and $\alpha_{vd} = 1.1$

- lending rate curve:

$$r_l = \frac{r_v N_v (l_v - 1) + r_{vd} (N_{vd} + N_{vd}^*) (l_{vd} - 1)}{N_v (l_v - 1) + (N_{vd} + N_{vd}^*) (l_{vd} - 1)} (1 - \epsilon) \quad (3)$$

- reward² paid by sponsor: R_l
- capped fixed yield lending club reward: $\min(r_{lc} N_l, R_{lc})$.

1.1 Equilibrium APYs: empirical observations

Expressing each persona's APY:

$$\left\{ \begin{array}{l} APY_l = r_l + \frac{R_l}{N_l} + \min(r_{lc}, \frac{R_{lc}}{N_l}) \\ APY_d \approx \frac{r}{2} + \frac{R_d}{N_d + l_{vd} N_{vd}} \\ APY_v > l_v r - (l_v - 1) r_v + \frac{R_v}{N_v} \\ APY_{vd} > l_{vd} APY_d - (l_{vd} - 1) r_{vd} + \frac{R_{vd}}{N_{vd}} \end{array} \right. \quad (4)$$

Market APYs can be estimated by AB testing, ie shocking reward budget every epoch and observing where TVL stabilizes³.

For stable lending and DEX, we observed $APY_l = 15\%$ and $APY_d = 20\%$.

For looping we assess the minimum APY with high marketing impact to be $APY_v = 75\%$ and $APY_{vd} = 100\%$.

²Rewards are defined as a fixed annual budget and the sponsor is blacklisted, ie $APY = \frac{R}{N}$

³In further studies we may estimate and use the half-life of this equilibrium and the present study dynamic

1.2 Sponsor budget

The sponsor is bound by a liquidity budget and a reward target. The latter includes reward paid, cost of capital (0 for now), offset by APY accrued:

$$\begin{cases} N_l^* + N_d^* + N_{vd}^* \leq N \\ (R_l + R_d + R_v + R_{vd}) - N_l^* r_l - N_d^* \frac{r}{2} - l_{vd} N_{vd}^* \frac{r}{2} + r_{vd} N_{vd}^* (l_{vd} - 1) = R \end{cases} \quad (5)$$

Also, all rewards and notionals are positive.

2 Optimization Problem

$$\max_{R_l, R_d, R_v, R_{vd}} \text{TVL} = N_l + N_d + N_v + N_{vd} \quad (6)$$

Subject to the constraints:

$$\begin{cases} N_l \geq 0 \\ N_d \geq 0 \\ R_l \geq 0 \\ R_d \geq 0 \\ R_v \geq 0 \\ R_{vd} \geq 0 \\ N_l^* \geq 0 \\ N_d^* \geq 0 \\ N_{vd}^* \geq 0 \end{cases} \quad (7)$$

$$\{N_l^* + N_d^* + N_{vd}^* = N \quad (8)$$