Bootstrapping Looping Strategies - DEX LP looping extension

david.relkin@nomadic-labs.com

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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}

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[1] DEX 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 :

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

  - We assume curator cap is maxxed out:

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

  where $\alpha = 0.5$, so that:

  $$l_v N_v = \alpha(N_d + N_d^*) \qquad (2)$$

  where $\alpha = 0.5$

  - lending rate curve:

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

  - reward[2] 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 personna's APY:

$$
\begin{cases}
APY_l = r_l + \dfrac{R_l}{N_l} \\[2mm]
APY_d \approx \dfrac{r}{2} + \dfrac{R_d}{N_d + l_{vd}N_{vd}} \\[2mm]
APY_v = l_v r - (l_v - 1)r_v + \dfrac{R_v}{N_v} \\[2mm]
APY_{vd} = l_{vd}APY_d - (l_{vd} - 1)r_{vd} + \dfrac{R_{vd}}{N_{vd}}
\end{cases} \qquad (4)
$$

Market APYs can be estimated by AB testing, ie shocking reward budget every epoch and observing where TVL stabilitizes [3].
For stable lending and DEX, we observed $APY_l = 15\%$ and $APY_d = 20\%$.
For looping we assess the mimimum APY with high marketing impact to be $APY_v = 75\%$ and $APY_{vd} = 100\%$.

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

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

Also, all rewards and notionals are positive.