Deep Dive the LP Pricing

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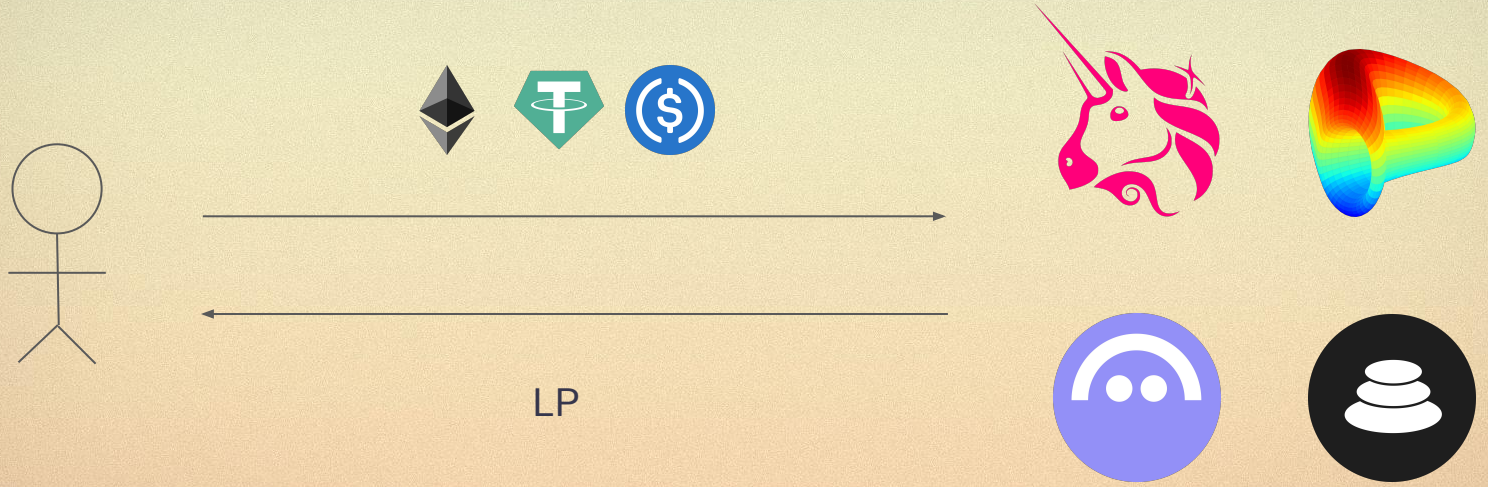
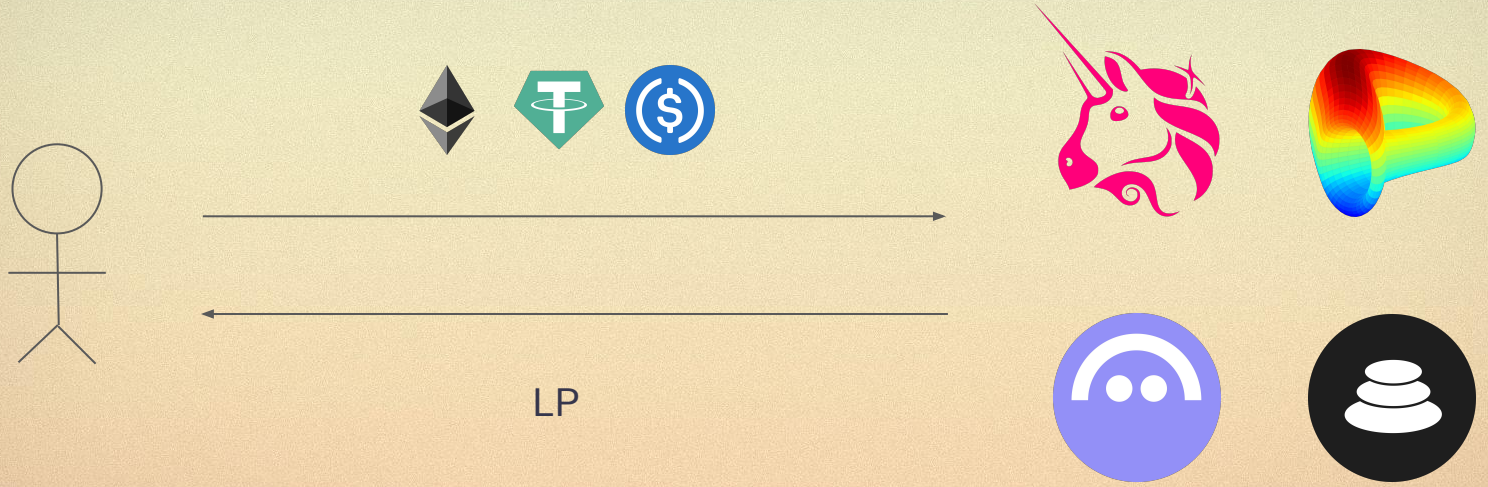
Section 1

What is LP Token ?

LP Token

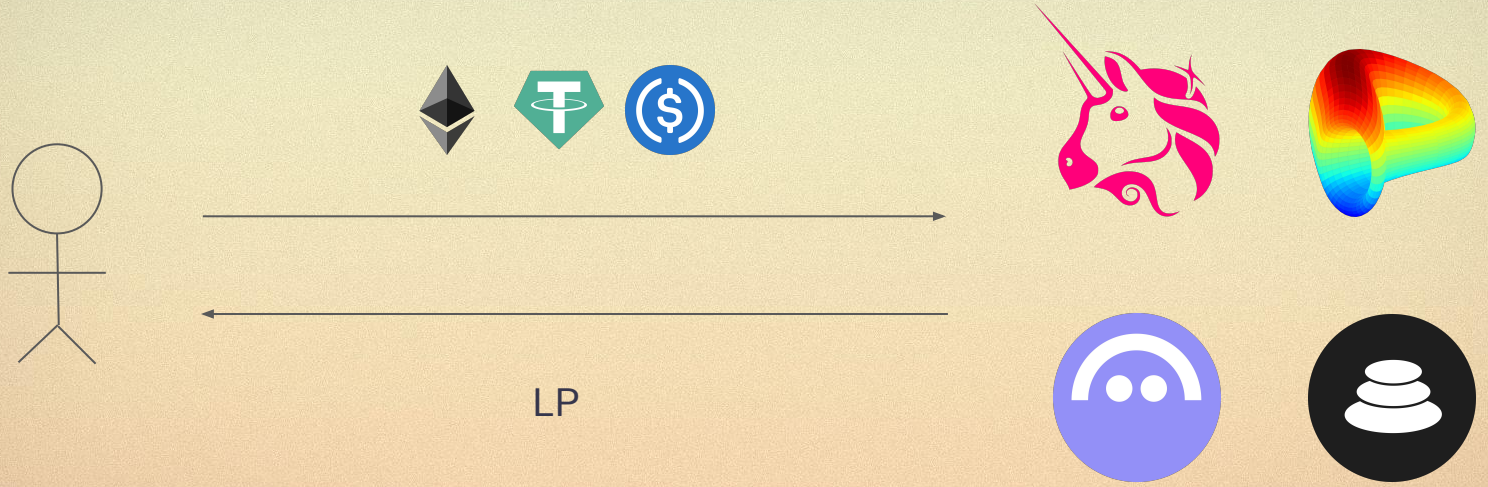


LP Token



LP Pricing = Enabling more use-cases, composability & more capital efficiency

LP Token



LP Value = Total Liquidity Pool Value / Total LP Supply

But...

- Many many hacks in the past due to LP price manipulation e.g.
  - Sandwich attack
  - Price-per-share inflation via $ donation

Section 2

How do we compute robust LP price?

“It depends.”

LP pricing depends on ...

- LP use-cases
  - Collateral
  - Borrowing
- LP types (UniV2, UniV3, UniV4, Curve, etc)
  - AMM Invariant
  - LP mechanics

LP Use-cases

- Determine what kind of pricing is “necessary”.
  Examples:
  - LP as collateral
    - DON’T **over-estimate** price — can over-borrow against LP
    - No price dump — can lead to bad debt
    - You can underestimate the price – at the cost of capital efficiency (& liquidation risk)
  - LP borrowing
    - DON’T **under-estimate** price — can over-borrow LP against other collateral
    - No price pump — can lead to bad debt
    - You can overestimate the price – at the cost of capital efficiency (& liquidation risk)

LP Types

- Determine what kind of pricing can be implemented.
- Some can be exact computation. Some may need to be approximated.
- Some LP types may not be suitable for certain use-cases.

  Examples:
  - UniV2 — allows “**donating**” $$$ via transfer & sync → SHOULD NOT be borrowed
  - UniV3 — anyone can “**increaseLiquidity**” to any tokenId → SHOULD NOT be borrowed as a position

Example LP types

- UniV3 — exact formula, per NFT position
- Balancer — exact formula, using Taylor approximation
- Curve Stableswap — gradient descent algorithm
- Solidly — gradient descent algorithm
- Pendle PT-SY
- GMX
- TraderJoe Liquidity Book — exact formula
- Other forms of LPs including ETH liquid staking & restaking

Section 3

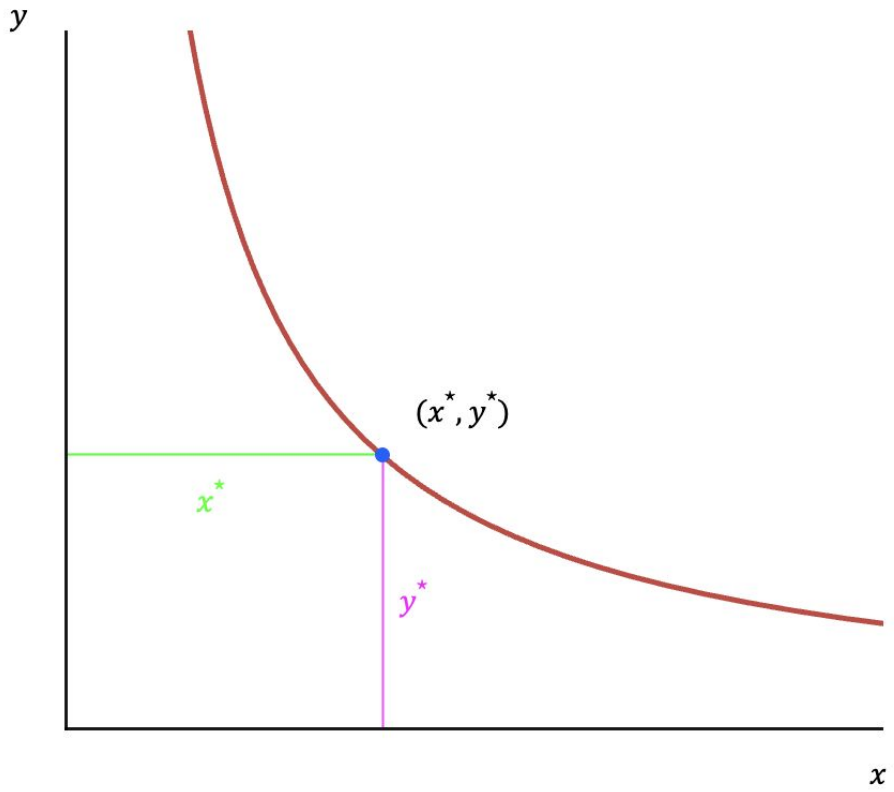
LP Pricing Example

General Framework

- Derive “fair balance” from asset oracle prices.
  - **DO NOT** use spot balance.
  - Given asset prices, calculate the “should be” pool asset balances.
- Derive “fair LP price”.
  - Sum of asset fair balance * asset oracle price

UniV2 LP Pricing

1. Derive “fair balance”.
2. Derive “fair price”.

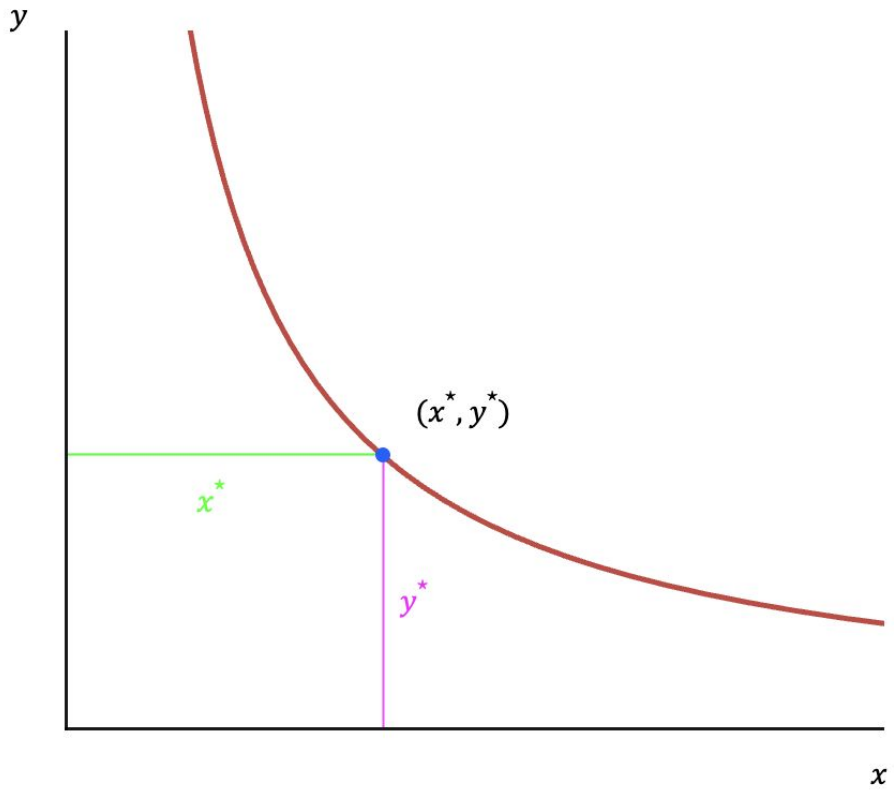


$xy = k,$ Main CPAMM Invariant

$p_y/p_x = x/y,$ Spot Price

$x^* = \sqrt{kp_y/p_x}$, $y^* = \sqrt{kp_x/p_y}$ Fair balance

$p_{LP} = \frac{p_x \cdot x^* + p_y \cdot y^*}{TotalSupply_{LP}} = \frac{2\sqrt{kp_x p_y}}{TotalSupply_{LP}}$ Fair LP price



Thank you!

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