AMMs as Managed, Customized Portfolios

Theo Diamandis

Research Partner, Bain Capital Crypto

What is the value of the LP position?

Under *no arbitrage*, position of numeraire **R₁** and asset **R₂** with price **p** at time **t** has value

$$V(p,t) = \text{minimize} \quad R_1 + pR_2$$

$$\text{subject to} \quad R \in S_t$$

where **S_t** is the set of allowable states of the AMM at time **t**.

- Constant function market maker (CFMM):

$$S_t = \{R \mid \varphi(R) \geq k\}$$

Example: Constant Product AMM

For a constant product AMM with $\varphi(R) = \sqrt{R_1 R_2}$:

$$V(p, t) = 2k(\sqrt{p} - \sqrt{p_0}) + \mathbf{fees}(t)$$

Considerations:

- Do I want this derivative?
- What rebalancing costs do I pay arbitrageurs? (LVR)
- How can I hedge the price movement?

Replicating Market Makers: $V \rightarrow \varphi$

Examples in practice:

- Zero coupon bonds at maturity (yield token pools)
- Weighted portfolios (geometric mean MMs, perpetual exchange lending pools)
- Covered calls & other options
- [Proposed] prediction markets

General theory [Angeris et al. 2021, 2023]

- For **V** concave, homogeneous, increasing:

$$\phi(R) = \inf_{p>0} \left(\frac{R_1 + pR_2}{V(p)} \right)$$

Why do some work & some fail?

Key factors (hypotheses):

- Ease of **hedging** price movement   *(if desire "delta neutral" strategy)*

- Amount extracted by **arbitrage**   *(LVR or "rebalancing fees")*

- Usefulness of **custom V(p, t)**   *(is the portfolio value useful?)*

There are over $10T of assets in ETFS

Let's bring passive liquidity on chain.

Interested in collaborating?

Theo Diamandis
Research Partner, Bain Capital Crypto
@theo_diamandis