会议时间：2024/03/07 9:00-10:00 (GMT+08:00) 中国标准时间 - 北京

Title: All AMMs are CFMMs. All DeFi markets have invariants. A DeFi market is arbitrage-free if and only if it has an increasing invariant.

Abstract:
In a universal framework that expresses any market system in terms of state transition rules, we prove that every DeFi market system has an invariant function and is thus by definition a CFMM; indeed, all automated market makers (AMMs) are CFMMs.

Invariants connect directly to arbitrage and to completeness, according to two fundamental equivalences. First, a DeFi market system is, we prove, arbitrage-free if and only if it has a strictly increasing invariant, where "arbitrage-free" means that no state can be transformed into a dominated state by any sequence of transactions. Second, the invariant is, we prove, unique if and only if the market system is complete, meaning that it allows transitions between all pairs of states in the state space, in at least one direction.

Thus a necessary and sufficient condition for no-arbitrage (respectively, for completeness) is the existence of the increasing (respectively, the uniqueness of the) invariant, which, therefore, fulfills in nonlinear DeFi theory a foundational role parallel to the existence (respectively, uniqueness) of the pricing measure in the Fundamental Theorem of Asset Pricing for linear markets. Moreover, a market system is recoverable by its invariant if and only if it is complete.

Our examples illustrate (non)existence of various specific types of arbitrage in the context of various specific types of market systems -- with or without fees, with or without liquidity operations, and with or without coordination among multiple pools -- but the fundamental theorems have full generality, applicable to any DeFi market system and to any notion of arbitrage expressible as a strict partial order.

Bio: Roger Lee is an Associate Professor of Mathematics, and Faculty Director of the Financial Mathematics Program, at the University of Chicago. His research interests include financial derivatives, optimal trading, and DeFi. He has a PhD from Stanford and a BA from Harvard.

主题: 2024-Spring-Roger Lee
时间: 2024 年 3 月 7 日 09:00 上午 北京，上海

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