

Fair Price Discovery with Decentrized Exchange

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Abstract

Ever since bitcoin solved peer to peer digital cash was possible, poeple have been trying to apply similar technoques to solve other hard problems. One such problem, peer to peer exchange, is one of the most difficult of these problems.

An exchange is a financial market, where trading of securities occur. The pupose of an exchange is two fold. 1) for price discovery, 2) for counter party settlement..

Centralized Exchanges (CEX), have been well researched and developed in traditional finaince for well over a century. [exchage cite] They evoled from trading under a tree, the Chicago trading pits, to electroic exchanges with continuous limit order books. Modern exchanges provide 24/7 trading, and offer co-location for the most prolfic traders, High Freaquency Trading (HFT) bots.

Decentralized exchange (DEX), aims to bring tradition centralized exchanges into a peer to peer blockchain protocol. Due to early bitcoin CEX hacks, most DEXs have been focused on the settlement utility of exchange. As price discovery is an emergent property of the real-time trading and difficult to research.

We present a DEX with focus on providing price discovery. Our solution, Fair Price Discovery (FPD)

1 Introduction

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The word "central" is part of the common definition of an exchange. "A central place where buying and sellers come to find price and execute trades.

The purpose of exchange is two fold. 1 - for price discovery [cite] 2 - for counter party settlement

Due to early bitcoin exchange hacks, Decentralized Exchange or (DEX), has been mostly focused on the non-custodial side for the settlement utility.

We focusing on the real public service of an Exchange, the price discovery utility. We design price discovery within a DEX, with a purpose of "Fair Price Discovery".

With, Fair Price Discovery (FPD), as our goal. We focus on a mechanism designed exchange, for reaching equilibrium which produces price.

Taking inspiration from Rational Protocol Design analysis of Bitcoin, and looking back to the original Bitcoin white-paper.

examining the state of the art in price-discovery, High Frequency Market Making, and electronic exchange matching engines

Since Bitcoin showed us how peer to peer electronic cash was possible, we have re-searching if and how peer-to-peer exchange was possible.

Exchanges are a critical part of the financial markets.

Ecological balance otherwise the order-driven market can collapse Transparency is an important feature

first to win is most important

Price Discovery

Price discovery as a key goal in the design of the market structure. In fact, the goal of the architecture of an exchange mechanism, is to attract as much liquidity needed to for price discovery. [3]

Price discovery is described in microstructure research as a search for an equilibrium price, from new external information. This new information is reflected in the traders orders, and is ultimately converted into a market price. [5]

price discovery is dynamic in nature, and an efficient price discovery process is characterized by the fast adjustment of market prices from the old equilibrium to the new equilibrium with the arrival of new information [6]

From a definitional perspective, any trading facility that has as its primary function the delivery of good price discovery can, de facto at least, be considered an exchange. Unfortunately, however, the price discovery function of an exchange typically receives insufficient attention in market structure discussions. This is largely attributable to the non-observability of equilibrium prices and, therefore, to the difficulty of quantifying the deviations of transaction prices from their equilibrium values [3]

Limit order books and price discovery are tightly related. [5] [4]

Continuous limit order books (CLOB) are the market micro structure that leads to price discovery ¹. There are two order types. Limit orders, where you provide your own price, with the risk of waiting to be matched. And market-orders, where you get filled immediately in return for a possible worse price.

Directional liquidity traders - use market orders Market Makers - use limit orders
HFT-bandit

Adverse Selection Show HFT Alpha Show how market-orders are the cryponite

Perfect Alpha and the High Frequency Trading (HFT) arms race

We define *Perfect Alpha* as recurring risk-less real-time arbitrage with positive EV. Believe it or not, *Perfect Alpha* is a product of centralized exchanges and continuous limit-order books.

Theorem 1 *When 2 or more orders come in after your order, there exists a free arbitrage, provided 1) each order is for 1 share at a time, 2) you are first to act. Perfect Alpha exists in Continuous Limit Order books.*

1. HFT - "Buy 1 @ 100"
2. Bob - "Buy 1 @ 100"

qty	bid	ask	qty
2	100		

¹Other types of markets such as call auctions, and dealer markets, don't provide the robustness of limit orders for price discovery. [2]

1.1 Decentralized Limit Order Books

make these problems much worse, by removing the one defensive market-order

1.2 Standard Blockchain Solutions

1.2.1 Permissionless

Ethereum smart contracts create MEV

MEV and front-running

Uniswap -

Total Ordering Consensus

1.2.2 Permissioned blockchains

remove the issues with open blockchains, and uses BFT techniques

1.2.3 Why does bitcoin work

Only when asking why? do we come with a new theory *Ration Design*

1.2.4 Why does it not work with Ethereum, Aequitas and BFT?

The problem is abstractions. Solving generic solution with frameworks vs solving for a specific utility

1.3 A new blockchain abstraction

Only when designing for a specific utility are we able to use designer intent vs adversarial motivations

1. First design with intent using Mechanism Design
2. Release the code and protocol
3. Test results from empirical evidence

We now have mechanism designed system that matched a rational design theory of decentralized exchange.

2 Results

[1]

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