Notable topics in financial markets

Konstantin Sokolov

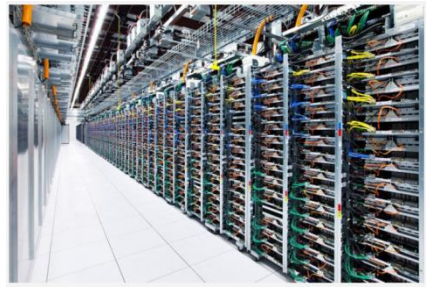
13th Biennial Conference of the Czech Economic Society

The value of a millisecond

Sound travels 34 centimeters in air*

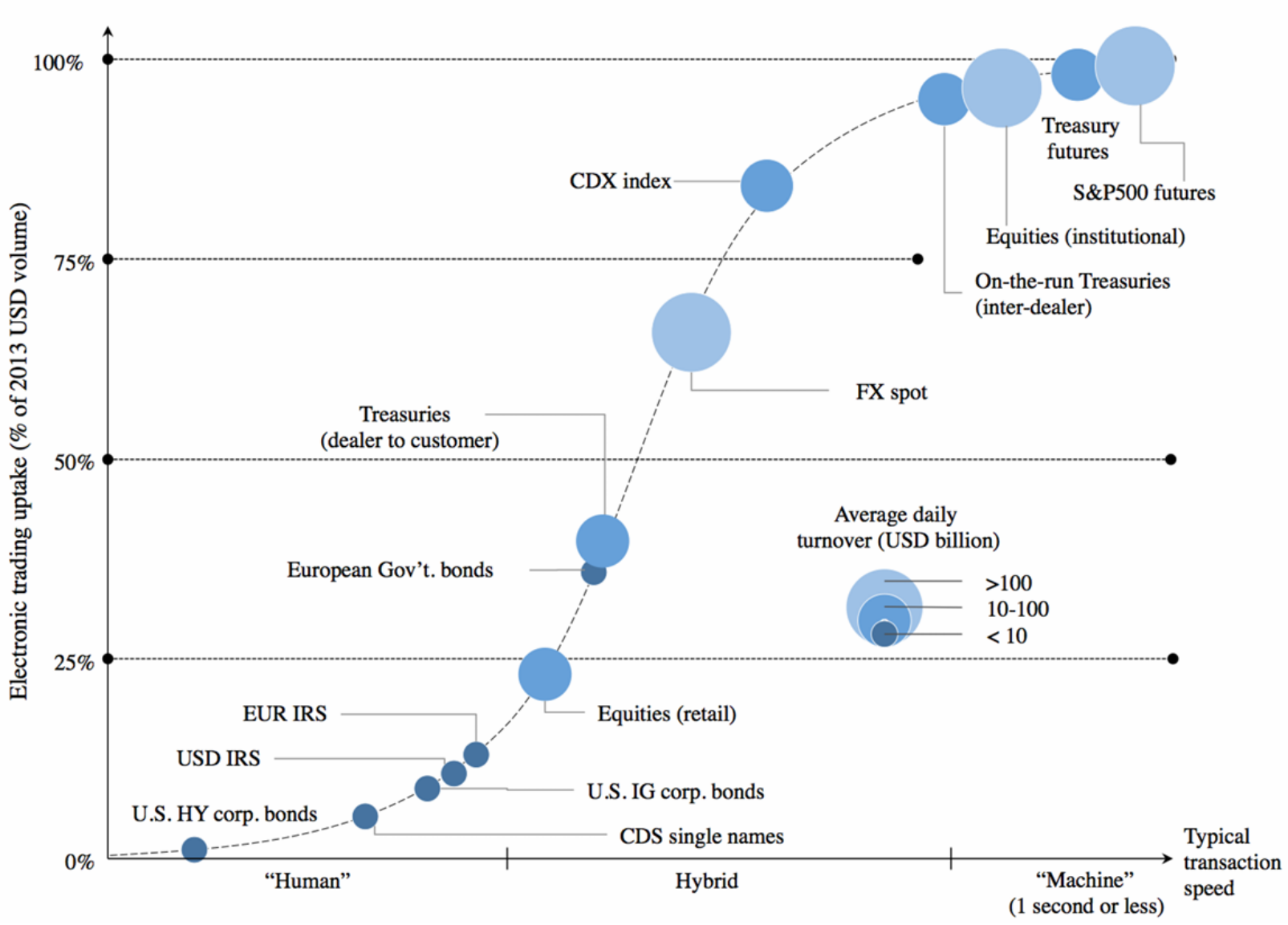
Hummingbird makes 1/20 of the wing flap

A stock can experience 3,920 quote changes and 860 trades**



*20C and 60% humidity
** NYSE

What drives latency differences across asset classes?



Source: Pagnotta and Philippon (2018)

Maker-taker fees:
Liquidity in an oligopoly

Maker-taker fee

- a fee to execute a market order
- a rebate per limit order that has been executed

~ approximately $0.003 taker fee and a slightly smaller rebate

The difference between the fees and rebates becomes exchange revenue.

Maker-taker fees:
Liquidity in an oligopoly

SEC Report (2015)

- Maker-taker fees improve displayed liquidity
- Exchanges become competitive against off-exchange trading venues

…however

Maker taker fees serve as a tool for price discrimination

- 3,762 factors of price discrimination (RBC report, 2018)
- Non-competitive profits within the industry (Chao, Yao, and Ye, 2019)

What are the costs of price discrimination?

Exchange data as a source of revenue

Exchange mission statements:

NYSE: To leverage technology and **information** to solve our customers' problems with a relentless focus on efficiency and ingenuity.

CBOE: To build a trusted, **inclusive** global marketplace that enables people to pursue a sustainable financial future.

Euronext: Our mission is to **connect** European economies to global capital markets, to accelerate innovation and sustainable growth.

LSEG: The London Stock Exchange's mission is to **connect** those who need capital with those who have it, and to provide access to long-term and liquid international investor capital.

Exchange data as a source of revenue

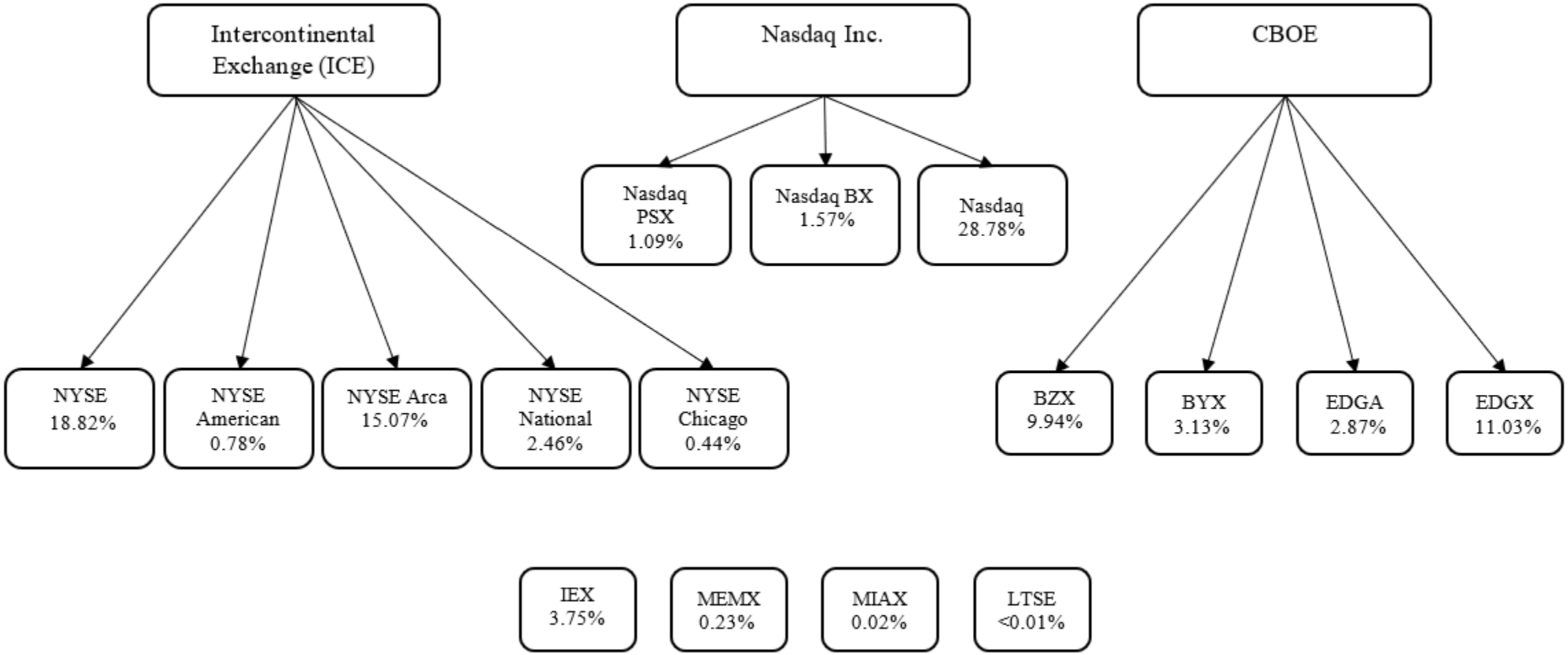
The competition for speed is costly:

- Co-location fees $10,000+ /month
- High-speed real-time data $10,000 /month
- High-speed network $300,000+ /month
- Trading profit > $29 million/month*

* Baron, Brogaard, Hagströmer (2019)

Exchange data as a source of revenue

Exchanges disseminate market information by selling data



Exchange data as a source of revenue

Data fees should harm liquidity (Brogaard, Brugler, and Rösch, 2021)

…however,

Core US exchanges subsidize peripheral ones (Brannon and Jennings, 2019, Spatt, 2020)

Who bears the costs of peripheral markets?

Should market makers compete on speed?

Fast liquidity providers

- avoid adverse selection costs (Aït-Sahalia and Sağlam, 2017, Brogaard, Hagströmer, Nordén, and Riordan, 2015)

Therefore, adoption of low-latency technology should be limited to market makers (IEX).

…however,

Competition on speed leads to a winner-takes-it-all equilibrium.

Slower market makers exit, which may lead to a monopoly (Hoffmann, 2014, Bongaerts and Van Achter, 2021).

Who Benefits from Securities Exchange Innovation?*

Andriy Shkilko[†] **Konstantin Sokolov**[‡] **Eduard Yelagin**[§]

May 15, 2024

Abstract. Securities markets continuously innovate to keep pace with technology. It is often debated if such innovation is beneficial, and which market participants capture the benefits. We contribute to this debate by examining the effects of a wide range of proprietary enhancements to the trading process introduced by the stock exchanges in the United States. Generally, exchange innovation is associated with improvements in liquidity and price efficiency, although the reduction in liquidity costs primarily benefits investors trading in small quantities. Institutional investors experience less favorable outcomes; while their trading costs remain unchanged, their market participation declines.

Key words: liquidity, market quality, equity trading, innovation

JEL: G14; G15

Main Results

Exchange innovation is associated with:

- a decline in trading costs for those, who trade small amounts,
  driven by:
  - a decline in market maker adverse selection costs and
  - a decline in other market making costs and/or profits

- an increase in overall trading volume
- an improvement in price efficiency
- a reduction in volatility

- an increase in institutional trading costs
- a decline in institutional volume

Who benefits from securities exchange regulation?

Academic papers often conduct event studies of regulation

- How well a piece of regulation meets it goals?
- What are the costs of a particular regulatory intervention?
- What we can learn from unintended consequences of a new rule?

There is a lack of a study aggregating regulations over the long run.

Rethinking investor protection

Financial market regulators mission statements:

- European Securities and Markets Authority's mission is to enhance **investor protection**, promote orderly financial markets and safeguard financial stability.

- The US Securities and Exchange Commission has a three-part mission: **Protect investors**. Maintain fair, orderly, and efficient markets. Facilitate capital formation.

- The UK Financial Conduct Authority aims to ensure honest and fair markets by **protecting consumers**, protecting the financial markets, and promoting competition.

Rethinking investor protection

Trusted system

Investor protection => counterparty risk mitigation

Investors put their trust into the moral standing of the counterparty.

Rethinking investor protection

Trustless system

Investor protection => ???

Aave Lending Pool V2:

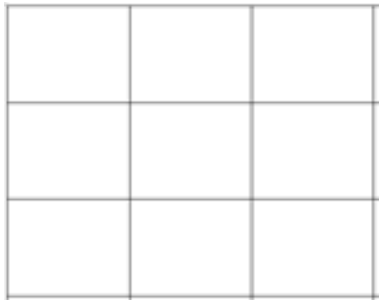
User:
(index_topic_1 address reserve, address user,
index_topic_2 address onBehalfOf, uint256 amount, uint256 borrowRateMode, uint256 borrowRate, index_topic_3 uint16 referral)

Collateral conditions:
(index_topic_1 address reserve, uint256 liquidityRate, uint256 stableBorrowRate, uint256 variableBorrowRate, uint256 liquidityIndex,
uint256 variableBorrowIndex)

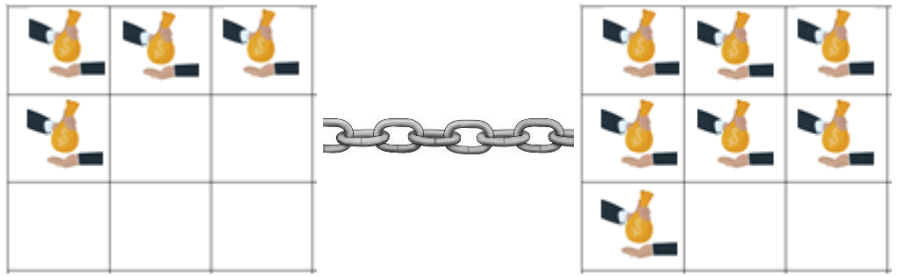
Borrowing conditions:
(index_topic_1 address user index_topic_2 address onBehalfOf, uint256 amount, uint256 currentBalance, uint256 balanceIncrease, ui
nt256 newRate, uint256 avgStableRate, uint256 newTotalSupply)

Investors put their trust into the correctness of the code.

Rethinking investor protection



Rethinking investor protection



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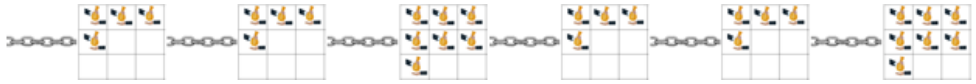

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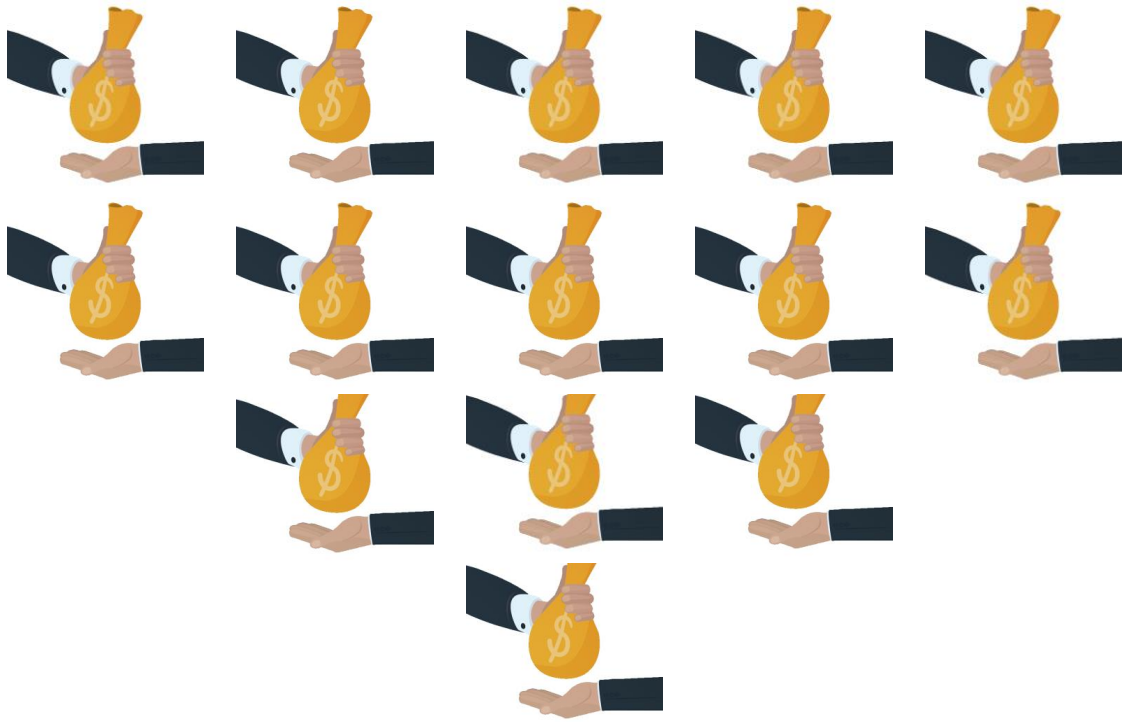

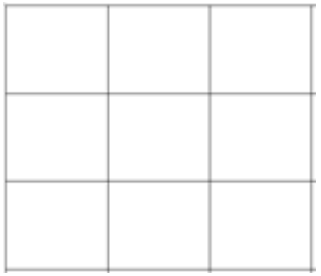

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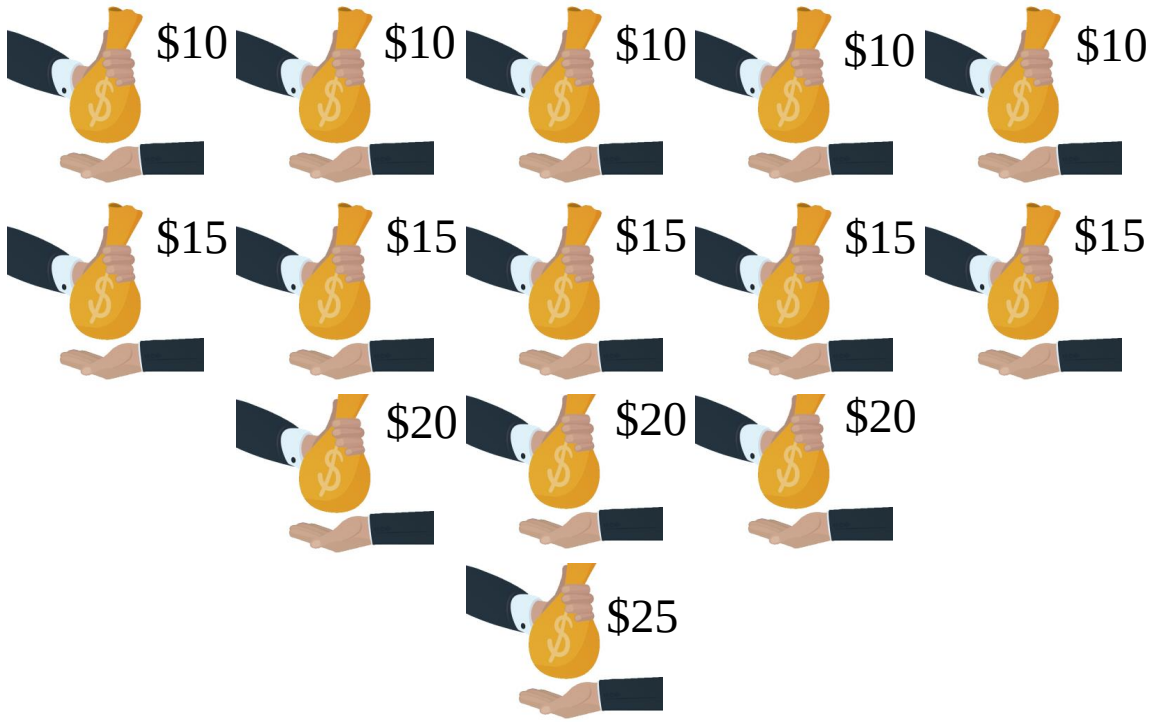

Rethinking investor protection

Ethereum POS validation process

1. Users enter transactions into a private or public ques (mempool)
2. Builders select transactions with the maximum value (MEV) and bid
3. Proposer accepts the block with the highest bid and sends it to attestors
4. Attestors vote to validate the block and add it to the chain

Rethinking investor protection

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Rethinking investor protection

Builders select transactions with the maximum value (MEV) and bid

- Second price auction

- The value of a block is difficult to observe

Block value - Private mempool fees, sandwich attacks, liquidations, etc.

How is the block value shared between the users and builders?

Should these users be protected?

DEX AMM function

Constant function ensures that the total value of assets remains the same

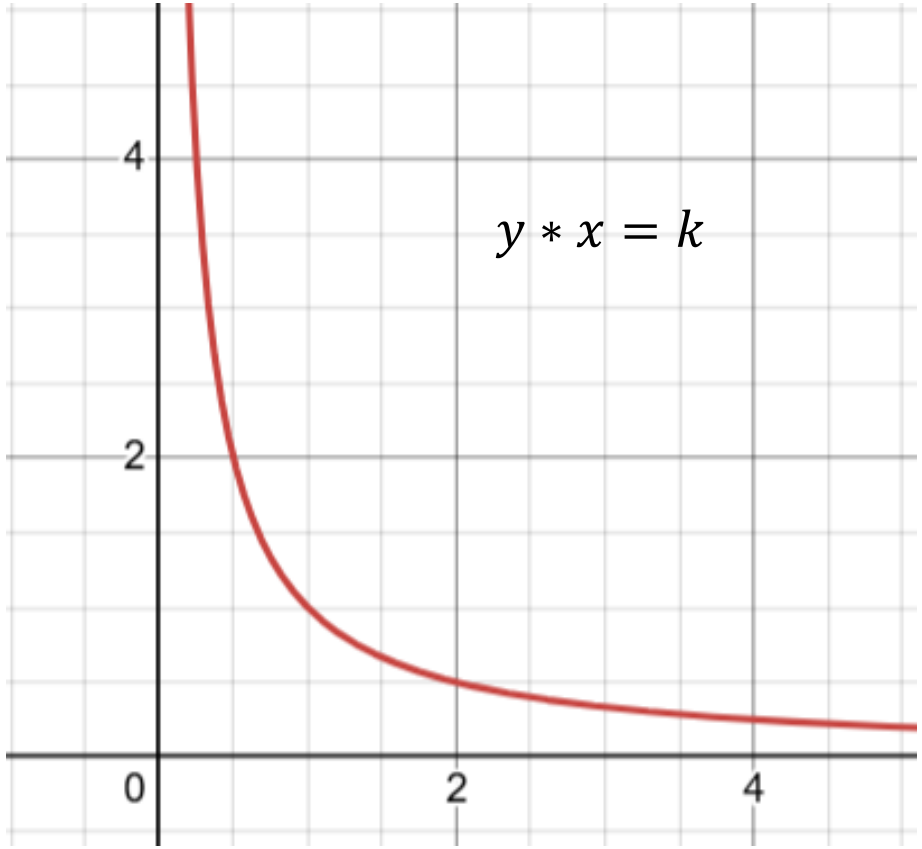
3 BTC and 4 ETH are in the pool

3 x 4 = 12

Buying 1 BTC would require adding 2 ETH

2 x 6 = 12

Therefore, the exchange rate is 1 : 2



An addition to liquidity pool will increase k

DEX AMM function

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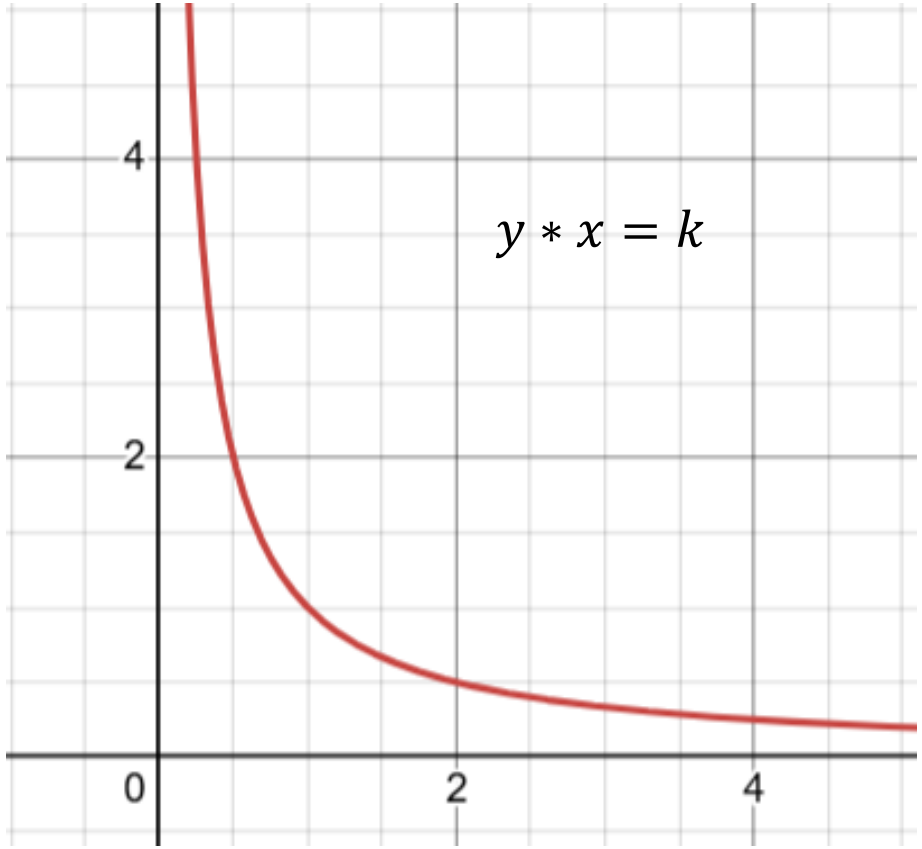

As the number of DEXs increases, $k \downarrow$, the price impact of a trade will increase as well

Optimal degree of fragmentation in DEX

Fee variation leads to greater participation by liquidity providers

Lehar, Parlour, and Zoican (2024) and Hasbrouck, Rivera, and Saleh (2022)

There are costs to fragmentation

Cespa and Vives (2022) – technological entry costs

Foucault, Kozhan, and Tham (2017) – toxic arbitrage, which is a part of MEV in ETH