

# Generalized Top Trading Cycles

An Iterative Approach for Exchange Economies with Money

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# Background: Mechanism Design

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“**Economics** is a social science concerned chiefly with description and analysis of **production, distribution, and consumption of goods** and services.”

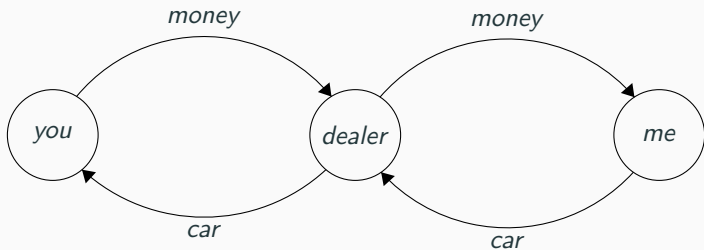
“**Computer Science** is... the feasibility, structure, expression, and mechanization of the **methodical procedures (or algorithms)** that underlie the **acquisition**, representation, processing, storage, communication of, and access to **information.**”

- Intersection of Econ and CS.
- Design of incentive systems with:
  - Rational actors
  - Private information
  - A collective objective
- Famous examples:
  - Auctions
  - Voting systems
  - Lotteries

# **Problem: Discrete Exchange Economies with Money**

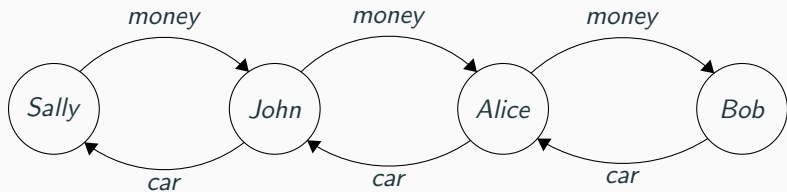
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## An example: intermediated market



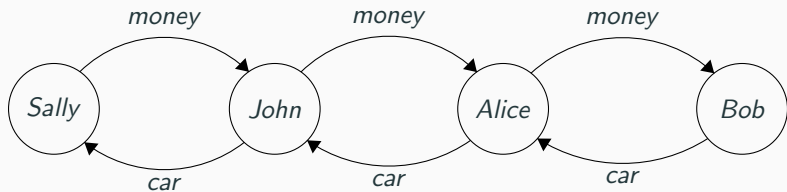


## Happier Example: No Broker



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- This looks good! Trades happen directly.
- But, how did we get here?

# The Formal Setting

An exchange economy model with:

- Indivisible (discrete) items.
- Initial ownership / endowments.
- Money (which is often not allowed).

Desirable properties:

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- Truthful.
- Efficient.
- Cost-free.
- Rational.
- Fair.

## **Solution: NetAscendingClock**

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- Fully-specified agent valuations
- A dynamic auction environment.

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# Mechanism

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## Provisional Revenue Bidding

The auction mechanism is extremely famous (in the field).

Now: allow every person to use the provisional revenue promised to them by current prices to place new bids.

## Convergence and Market Clearing

Provided rules for **price updating** and **trade identification**.

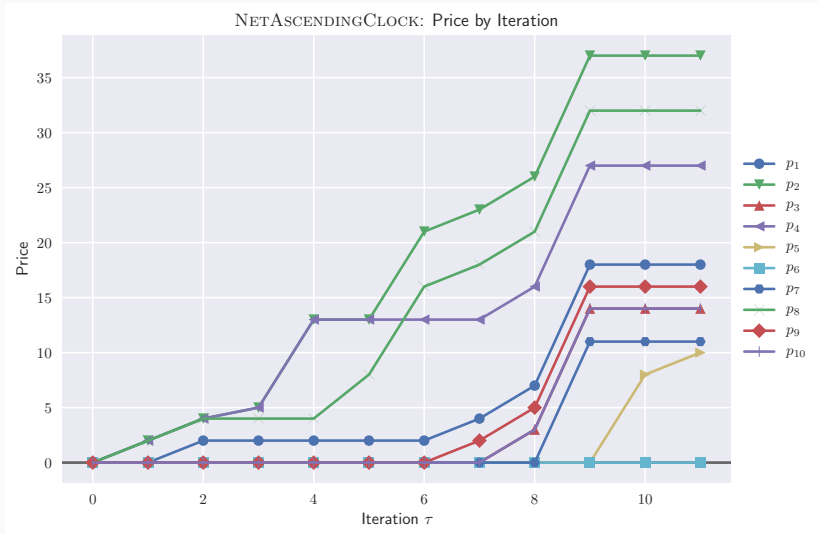
Proved that the auction mechanism converges to a well-defined **competitive equilibrium**.

Proved that the outcome is **exactly efficient**, **cost-free** for the operator, and **rational** for the participants.

Observed strategic intuition.



# NetAscendingClock in Action



**Questions?**