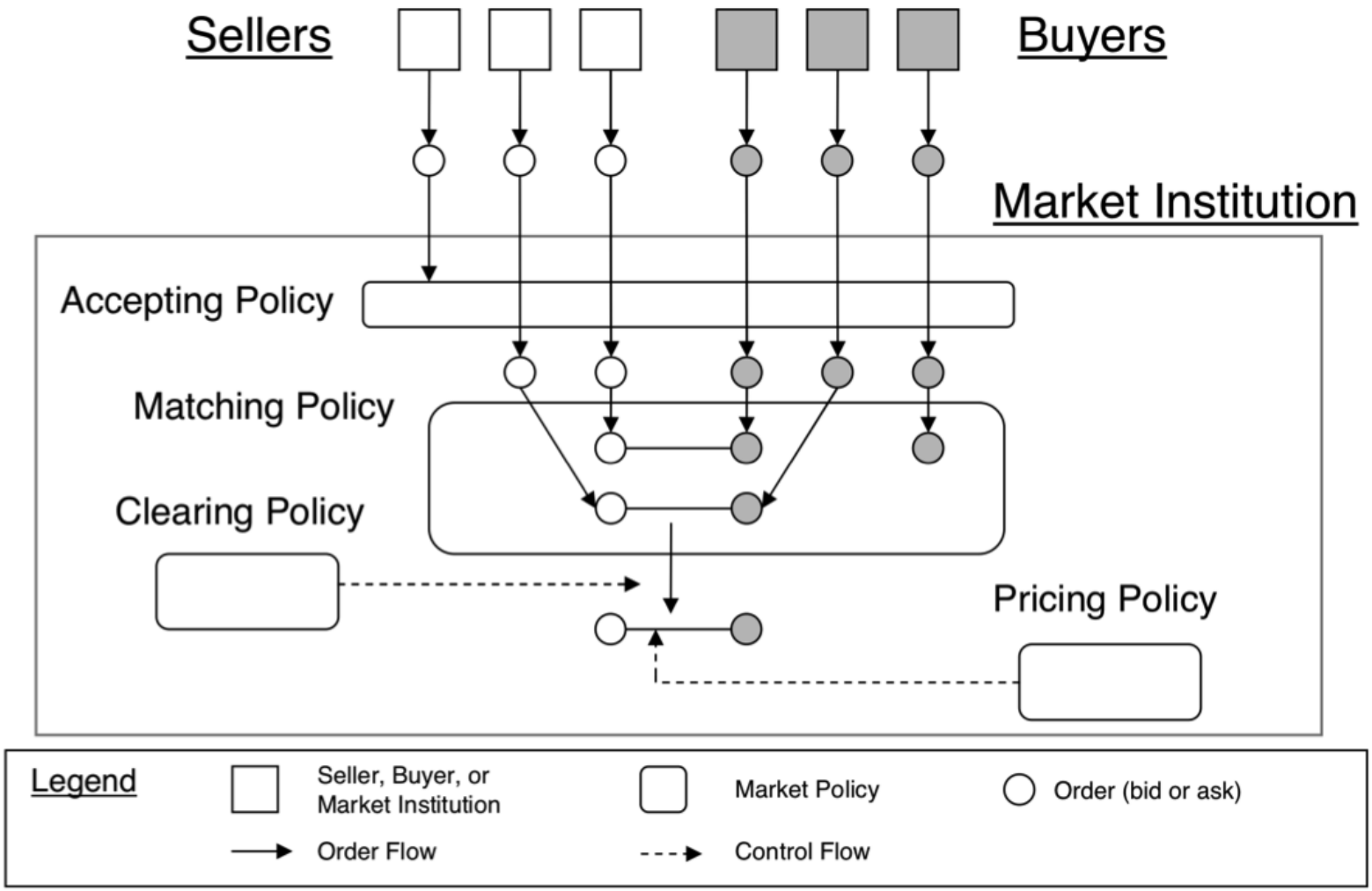
Double auction mechanisms

- A double auction is an auction mechanism that allows buyers and sellers submit bids/asks simultaneously.
- Double auction markets usually feature a large number of buyers and sellers, and thus participants tend to incur lower transaction costs.
- Most financial markets, such NYSE and NASDAQ, use double auction mechanisms.

Double auction market structure



Shouts

- shout: either a bid (for buying) or an ask (for selling)
- bid shout: the highest price to buy
- ask shout: the lowest price to sell.
- match: An ask shout p_a and a bid shout p_b is matchable if $p_a \leq p_b$
- cleaning price: the transaction price for a matched pair. Can be anything in $[p_a, p_b]$.
- Example:
  1. asks: 50, 44, 52, 80, 55, 48, 60
  2. bids: 34, 36, 52, 40, 63, 47, 48
  3. Matched shouts: (50, 52), (44, 63). Any more matches?
  4. Clearing price for (50, 52) can be anything in between, say 52.

Traders utility

- Traders: buyers and sellers.
- Each trader i has a private value of the trading good v_i.
- For a successful transaction, if the clearing price is p, then the utility of trader i (profit margin) is
  1. $u_i = p - v_i$, if the trader is a seller
  2. $u_i = v_i - p$, if the trader is a buyer
- Trader's utility does not rely on his bidding price if the shout is transacted. However, bidding price determines whether a shout can be matched.
- Bidding prices are determined by the trader's bidding strategies.

Auctioneers revenue

The auctioneer of a double auction market creates his revenue by:

- charging market registration fees
- charging shout fees
- charging transaction fees
- sharing with the traders profit:
  - for ask shout, profit = clearing price - ask price
  - for bid shout, profit = bid price - clearing price

Design a double auction market

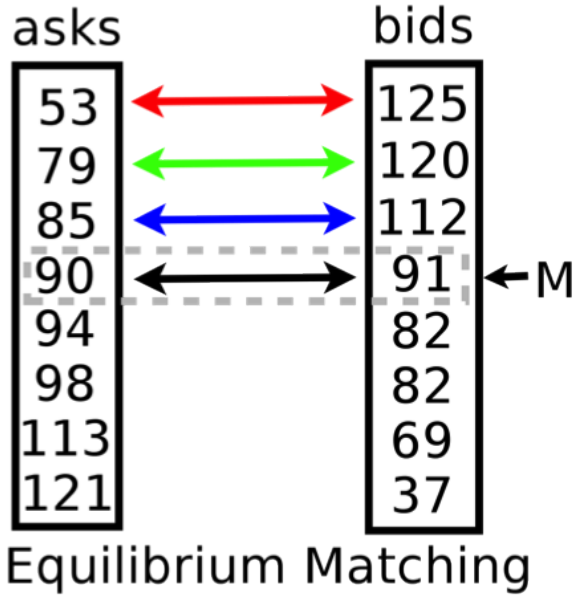
Design of a double auction market is to specify the following market policies:

- accepting policy: Determine if a shout from a trader should be accepted for further processing.
- matching policy: Determine which two shouts are matched for transaction
- pricing policy: Determine the transaction price for the matched shouts
- clearing policy: Determine when to clear the shouts.
- charging policy: Determine how to charge traders for market services.

Design a matching policy

Matching can be designed in different ways depending on design criteria:

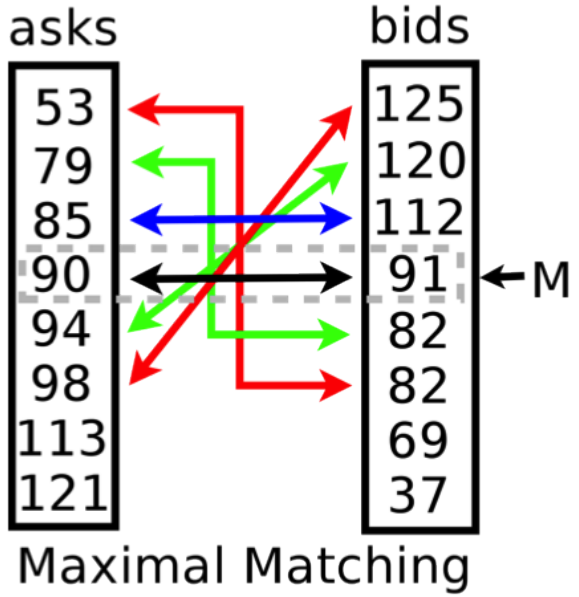
- Equilibrium matching: maximise auctioneer's profit.
- Maximal matching: maximize liquidity.



Equilibrium Matching

market profit $= 141$

market liquidity $= 4$



Maximal Matching

market profit $= 113$

market liquidity $= 6$

Design a trader

- Trader's trading strategies:
  - Biding strategy: determine which price to bid.
  - Market selection strategy: determine which market to go.
- Typical bidding strategies:

ZI: Zero Intelligence [Gode and Sunder, 1993]
ZIP: Zero Intelligence Plus [Cliff and Bruten, 1997]
GD: Gjerstad and Dickhaut [Gjerstad and Dickhaut, 2001]
RE: Roth and Erev [Erev and Roth, 1998]