
A Survey of Auction Types

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Two categories of auctions

- Single dimensional
 - The only bid dimensions are price and quantity of a single good
- Multi-dimensional

Single-dimensional auctions we'll cover

1. one sided

1.1 English

1.2 Dutch

1.3 Japanese

1.4 Sealed bid

1.5 Elimination

1.6 Hybrid

2. two sided

2.1 Continuous double auction (CDA)

2.2 Call market (periodic clear)

Single-unit English auction

- Bidders call ascending prices
- Auction ends at a fixed time / when no more bids
- Final bidder pays his bid

Multi-unit English auction are less straightforward

- Different pricing scheme
 - lowest accepted (uniform pricing, confusingly sometimes called “Dutch”)
 - highest rejected (uniform pricing)
 - pay-your-bid (discriminatory pricing)
- Different tie-breaking rules
 - price
 - quantity
- Different restrictions on quantity change
 - descending rule
 - the problem with this rule
 - 10 units available; reserve price (and price quote) is \$1
 - A bids \$5/unit for 10 units (not AON); price quote is \$6
 - B bids \$6 for 2; price quote is still \$6
 - A (re)bids \$6 for 1; A’s commitment dropped to from \$40 to \$6; price quote is \$1

Dutch (“descending clock”) auction

- Auctioneer calls out descending prices
- First bidder to jump in gets the good at that price
- With multiple units: bidders shout out a quantity rather than “mine”. The clock can continue to drop, or reset to any value.

Japanese auction (name not universal)

- Auctioneer calls out ascending prices
- Bidders are initially “in”, and drop out (irrevocably) at certain prices
- Last guy standing gets it at that price
- Multi-unit version: bidders call out quantities rather than simple “in” or “out”, and the quantities decrease between rounds. Auction ends when supply meets or exceeds demand. (Note: what happens if exceeds?)

Sealed bid auctions

- Each bidder submits a sealed bid
- (Usually) highest bid wins
- Price is
 - first price
 - second price
 - k'th price
- Note: Can still reveal interesting information during auction
- In multiple units: similar pricing options as in English

Elimination (aka survival) auction

- New auction type invented at Stanford
- Motivation: the best of English/Japanese and sealed bid
- Process: Multiple sealed-bid rounds. In each round the lowest bidder drops out and their bid becomes the (revealed) reserve price for next round
- Can have more than one drop out at each round; the bid of the *lowest* drop-out is the new reserve price
- Can generalize to multiple units

Multi-phase auctions

- English to sealed bid
- Sealed bid to English
- *etc.*

Note reversal in reverse (buy-side) auctions

- English descending
- Dutch ascending
- Japanese descending
- Elimination descending

Two-sided (double) auctions

- Continuous double auction (CDA)
 - every new order is matched immediately if possible
 - otherwise, or remainder, is put on the order book
 - NASDAQ-like
- Call (“periodic clear”) market
 - orders are matched periodically
 - Arizona stock exchange (AZX) -like

Multi-dimensional auctions we'll cover (briefly)

1. Multi-attribute

2. Multi-good

2.1 Combinatorial

2.2 Composite auctions

2.2.1 global variables

2.2.2 synchronization

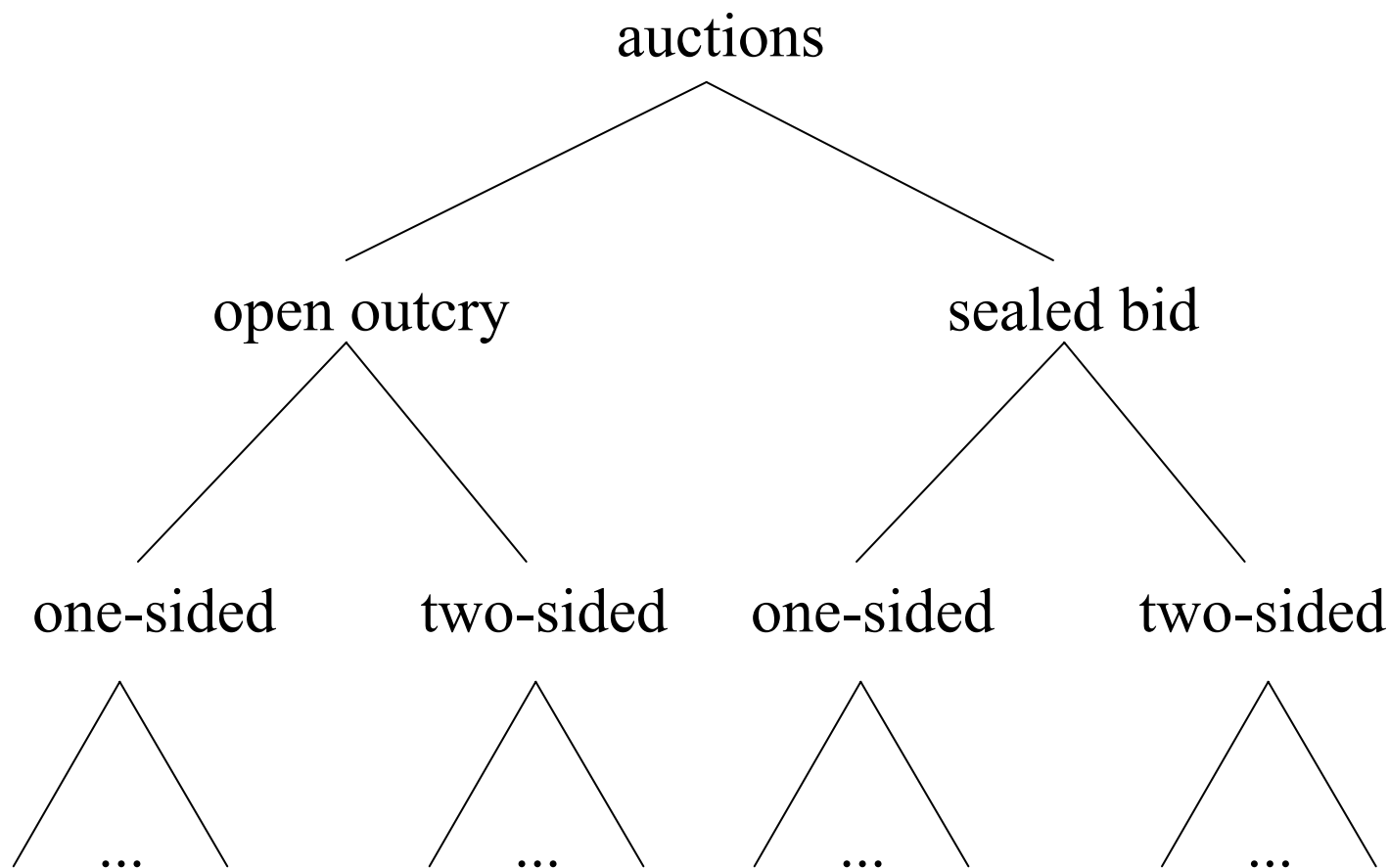
2.2.3 global clear

2.2.4 example: Simultaneous Ascending Auction (SAA)

Intuitive comparison of the basic four auctions

	English	Dutch	Japanese	sealed bid
regret				
duration				
disclosure				
monitoring				
price discovery				

What we've done so far: zoological categorization



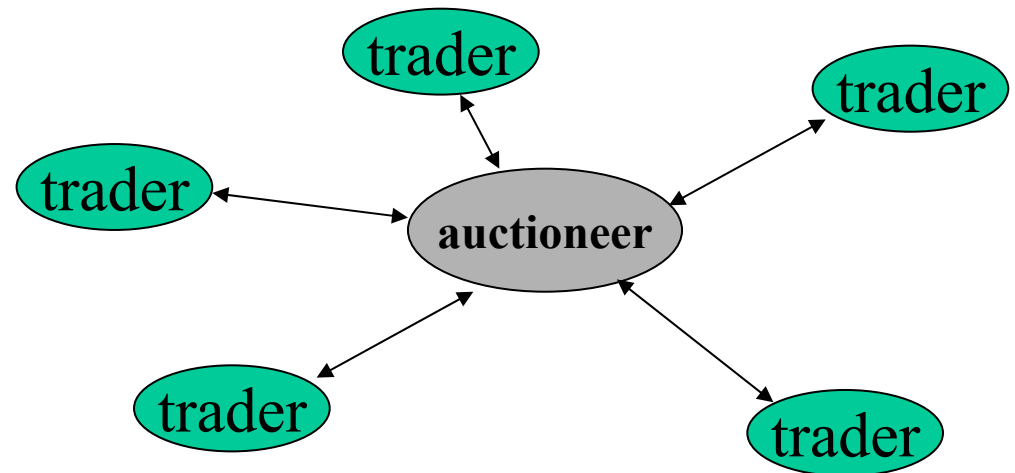
A deeper look at what auctions really are

Definition: An auction is any negotiation mechanism that is:

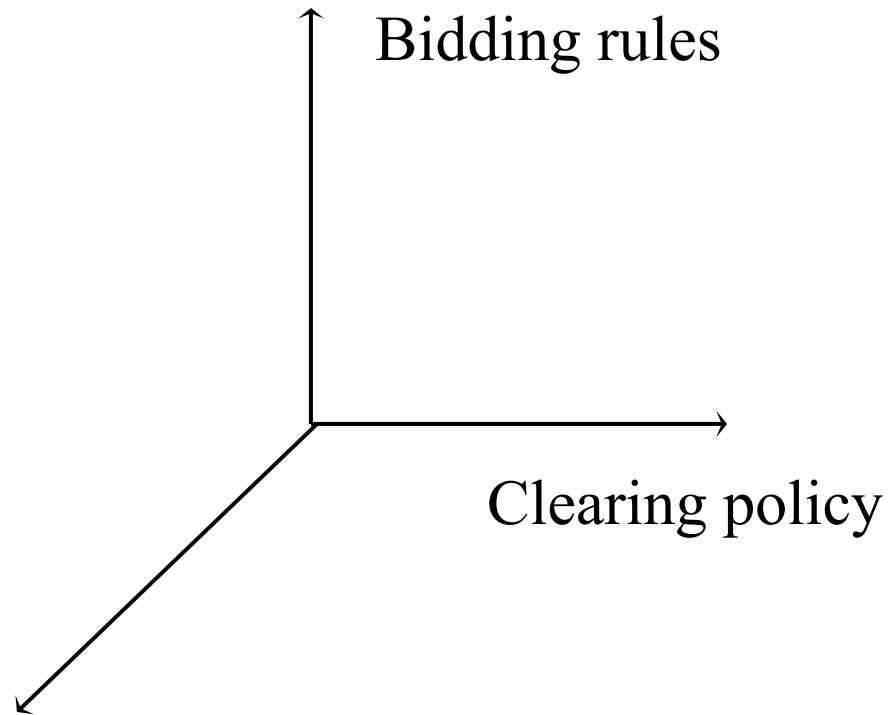
- Mediated
- Well-specified (runs according to explicit rules)
- Market-based (determines an exchange in terms of standard currency)

Auctioneer activities

- Receive Bids
- Disseminate Information
- Arrange trades (clear market)

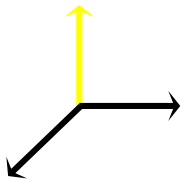


Auction Dimensions



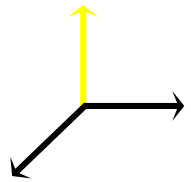
Information revelation policy

Bidding Rules



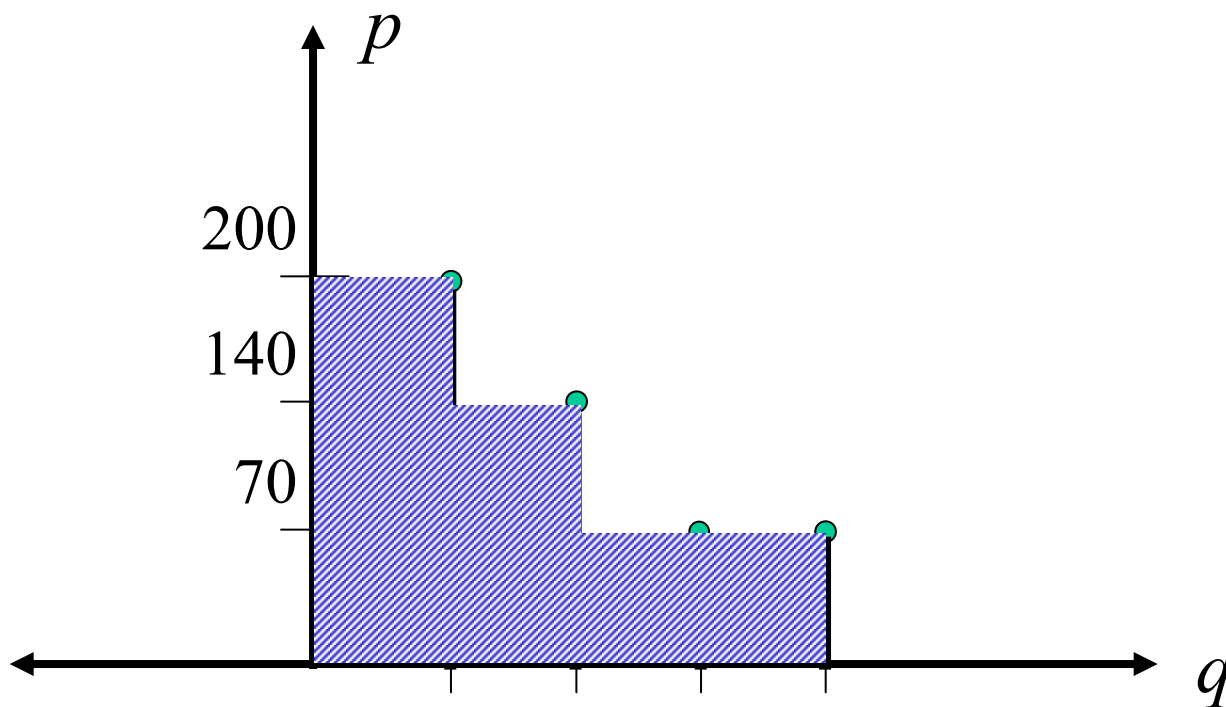
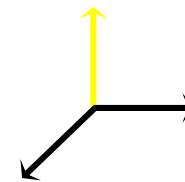
- Who can bid, when
- What is form of bid
- Restrictions on offers, as a function of
 - Trader's own previous bid
 - Auction state (everyone's bids)
 - Eligibility (e.g., financial)
 - ...
- Expiration, withdrawal, replacement

Single-Good Offers



- General form
 - schedule: [$q_1@p_1, q_2@p_2, q_3@p_3, \dots$]
 - “willingness” interpretation
- Common restrictions
 - Single price/quantity point [$q@p$]
 - Single unit [$1@p$]
 - Monotonicity
 - Divisibility (all-or-none)

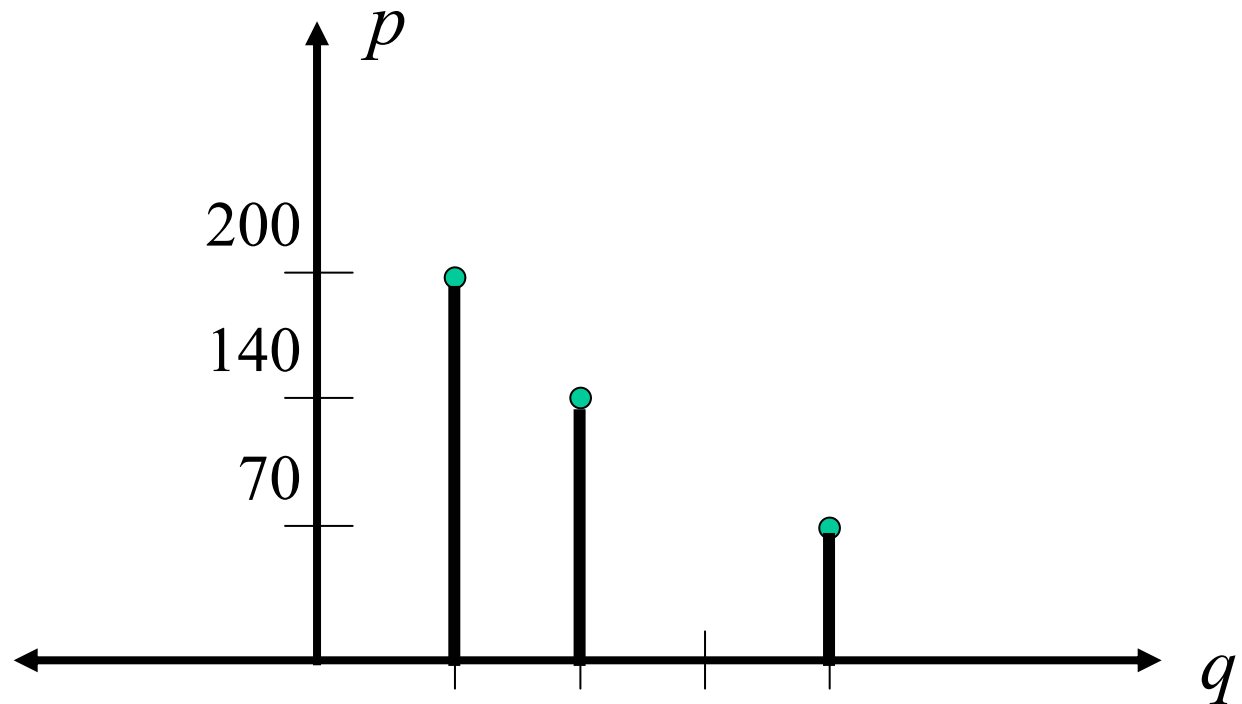
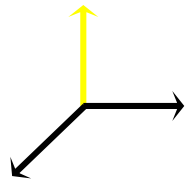
Price-Quantity Schedule



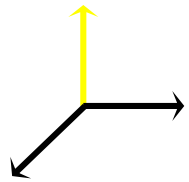
Offer: [1@200, 2@140, 4@70]

[10@200, 20@140, 40@70]

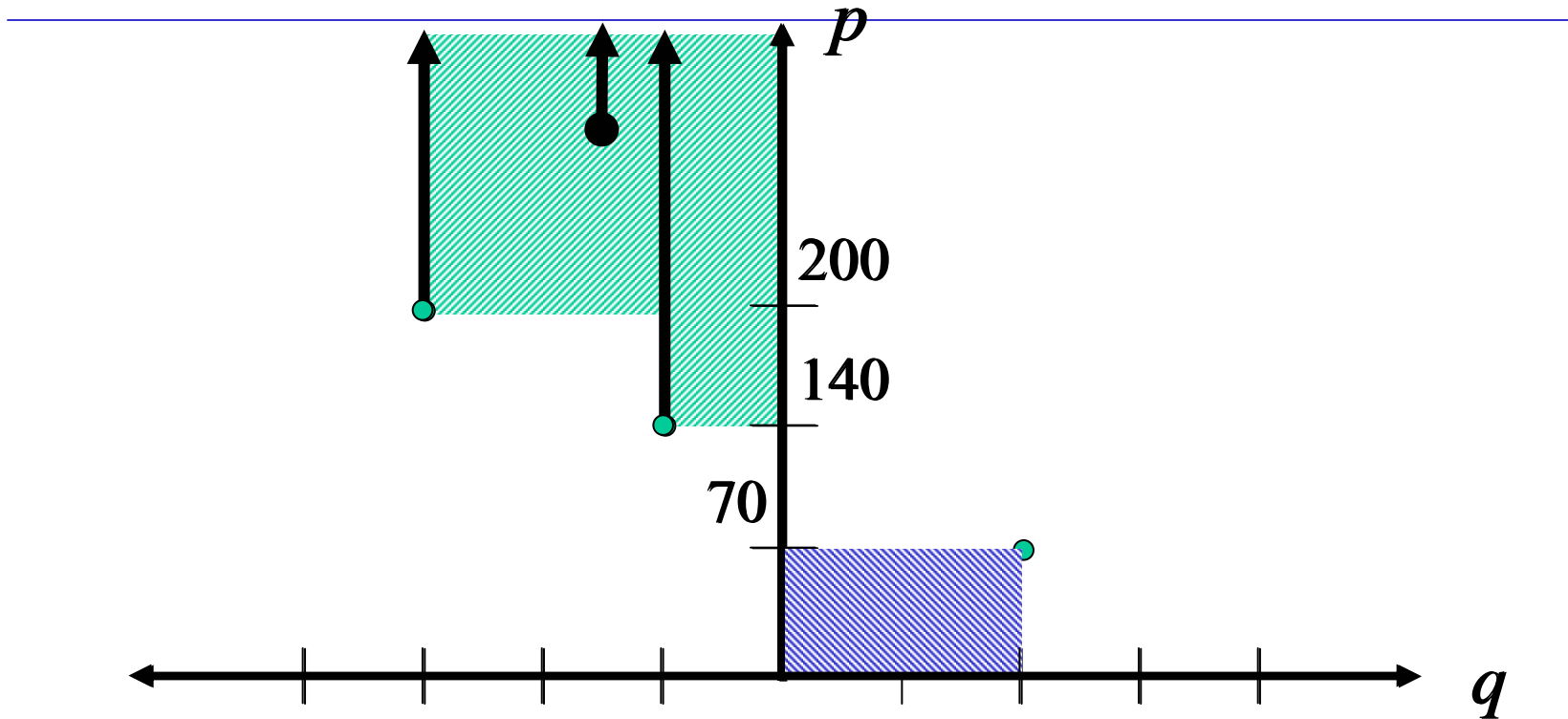
Indivisibility (All-or-None)



Offer: [10@200, 20@140, 40@70] **AON**



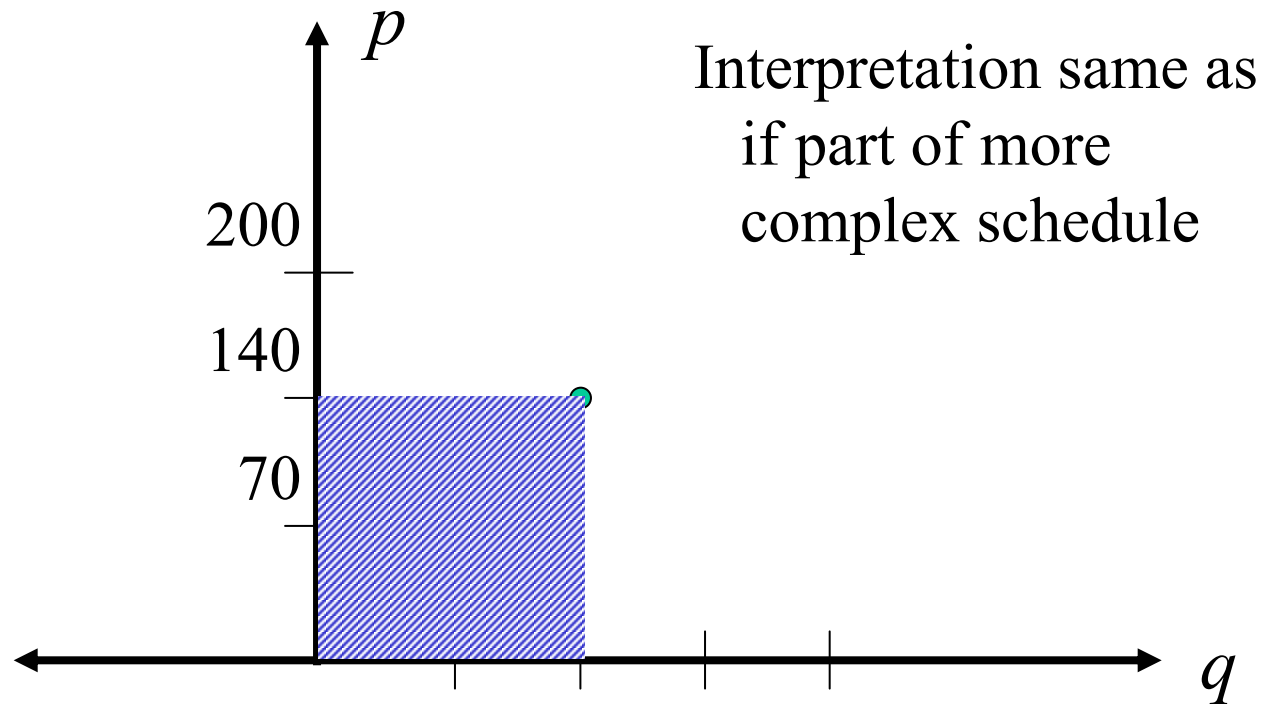
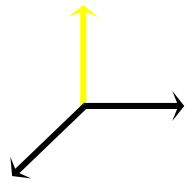
Sell Offers



Offer: [-3@200, -1@140]

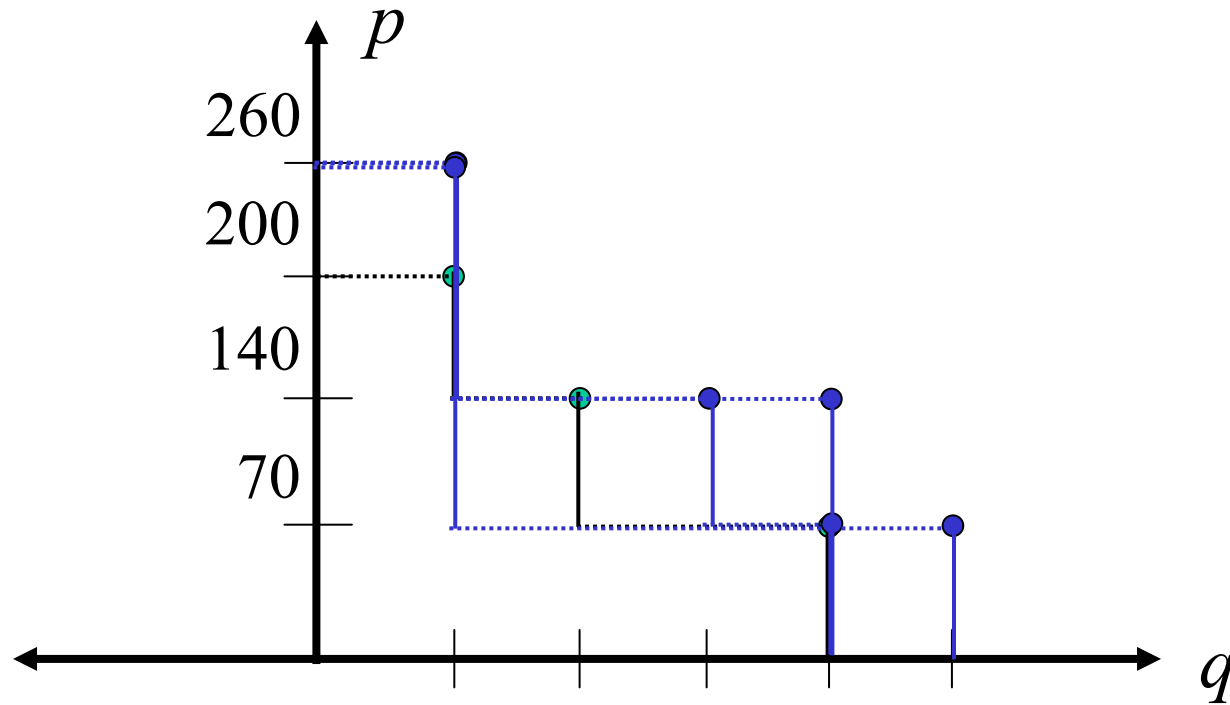
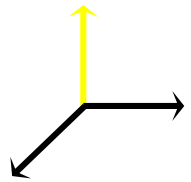
[-3@200, -1@140, 2@70]

Single PQ Points



Offer: [2@140]

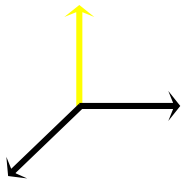
Bid Dominance



Current offer: [1@200, 2@140, 4@70]

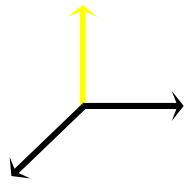
New offer: [1@260, 3@140, 4@70]

Dominance Special Cases



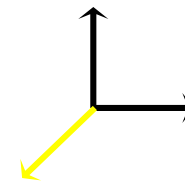
- Single PQ Point
 - Higher price and quantity
 - Higher price, same quantity
 - Same price, higher quantity
- Single Unit
 - Higher price

Dominance Fine Points, Issues



- Can require increase (NE) or decrease (SW)
- Can distinguish buy and sell side
 - Increase *strengthens* buy, *weakens* sell
 - Need increase on both sides to ensure price progression
- Adding AON weakens offer, dropping strengthens

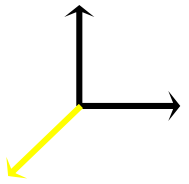
Information Revelation



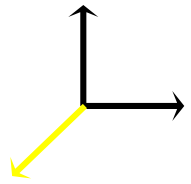
- When to reveal information
- What information
- To whom



Price Quotes

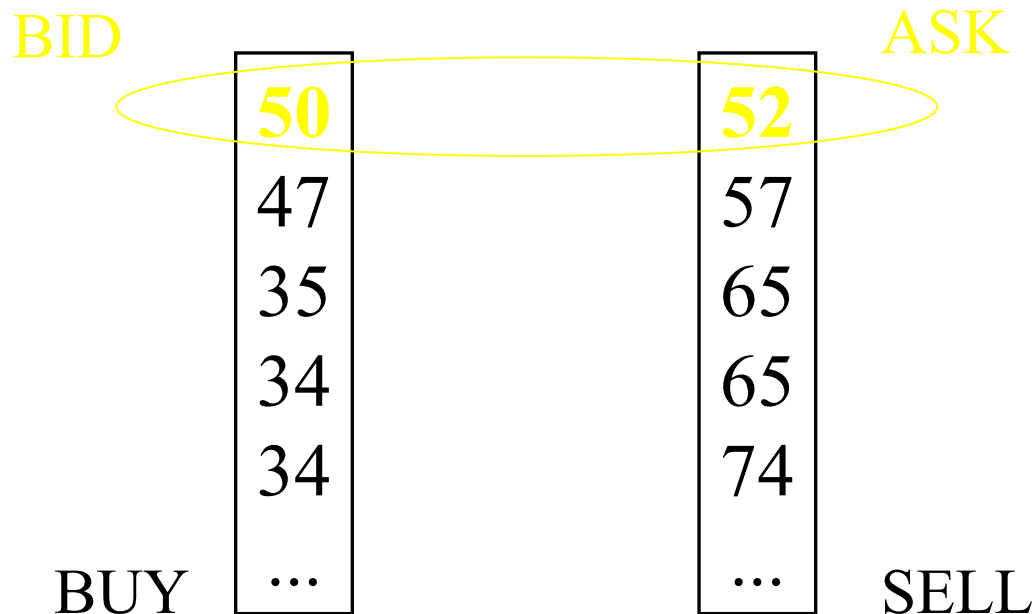


- Generic term for auction summary info revealed at periodic or event-driven times
- “Current Price”
 - ASK quote: Amount buyer would have to offer to be a winner, in current state
 - BID quote: Analogous, for seller
- Other info: quantities, trader IDs, etc.

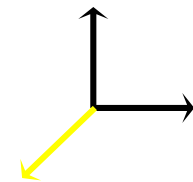


“Bid-Ask” Spread

- Terminology comes from familiar CDA, as in financial exchanges.

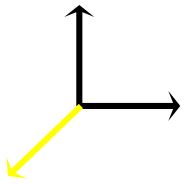


Quotes in Common Auctions



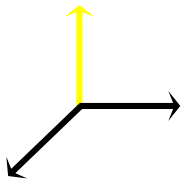
- English
 - BID: highest price so far
 - ASK: + delta
- Dutch
 - BID: undefined
 - ASK: “clock”
- CDA: BID-ASK spread
- Sealed:

Price Quote Timing



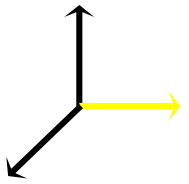
- At specified intervals
- On each bid
- On inactivity
- On market clears

Beat the Quote



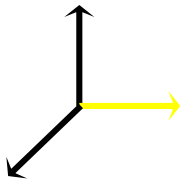
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- General: New offer must increase (or maintain) magnitude of “winning” amount, according to current quote.
 - Single-Unit: Buy offer price must meet or beat ASK (and Sell/BID).
 - Multi-Unit: OK to ignore “out of the money” amounts.
 - Can be applied in conjunction with Beat-your-Own (Dominance).

Clearing Policy



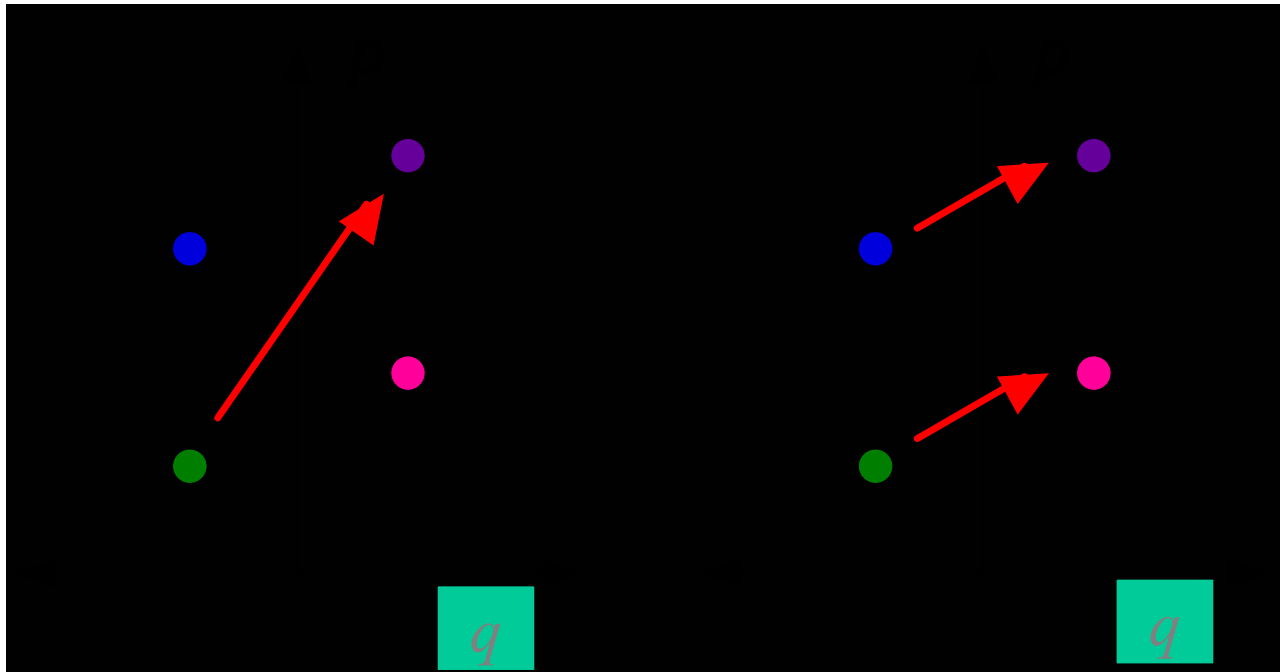
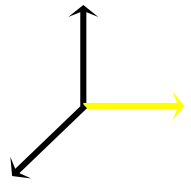
- *Clear*: Translates offers into agreed trades, according to specified rules.
- Policy choices:
 - When to clear
 - Who gets what (*allocation*)
 - At what prices

Clear Timing

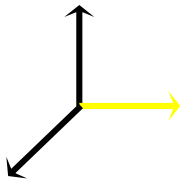


-
- At specified intervals
 - On each bid
 - On inactivity
 - On other designated events

Allocation



Pricing Policy



- Uniform vs. Discriminatory
- First (worst winning) vs. Second (best losing)
- Buyers' vs. Sellers'
- Earliest vs. Latest
- Anywhere in between...

That's it!