
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

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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)

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Single-unit English auction

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

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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

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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.

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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?)

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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

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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

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Multi-phase auctions

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

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Note reversal in reverse (buy-side) auctions

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

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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

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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)

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Intuitive comparison of the basic four auctions

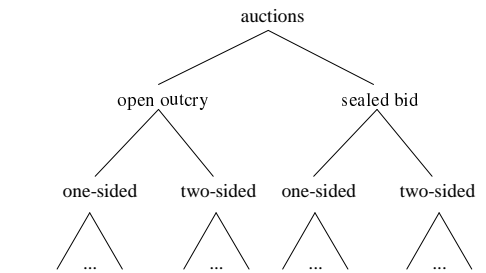
	English	Dutch	Japanese	sealed bid
regret				
duration				
disclosure				
monitoring				
price discovery				

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What we've done so far: zoological categorization



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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)

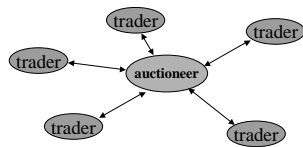
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Auctioneer activities

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

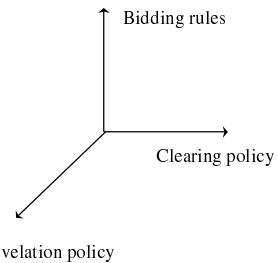


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Auction Dimensions



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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

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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)

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Price-Quantity Schedule

Offer: [1@200, 2@140, 4@70]
[10@200, 20@140, 40@70]

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Indivisibility (All-or-None)

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

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Sell Offers

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

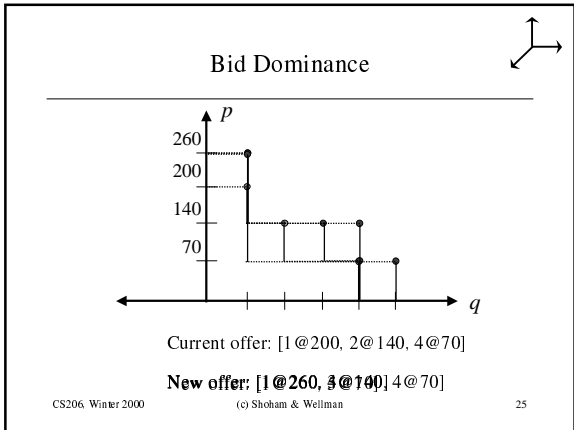
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Single PQ Points

Offer: [2@140]

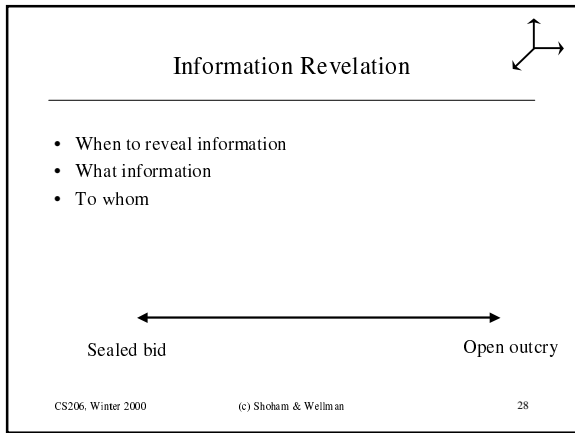
Interpretation same as if part of more complex schedule

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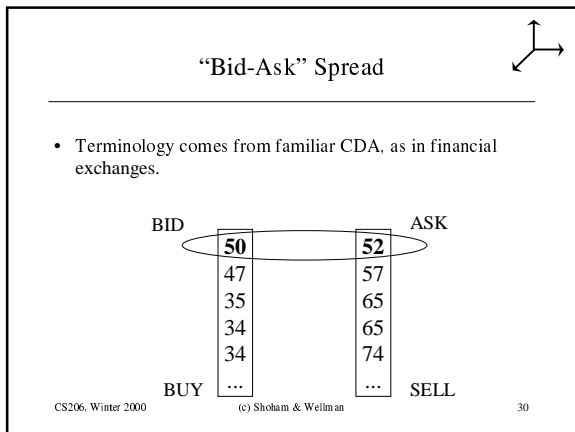


- ### Dominance Special Cases
- Single PQ Point
 - Higher price and quantity
 - Higher price, same quantity
 - Same price, higher quantity
 - Single Unit
 - Higher price
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- ### Dominance Fine Points, Issues
- Can require increase (NE) or decrease (SW)
 - 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
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- ### 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.
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Quotes in Common Auctions

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

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Price Quote Timing

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

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Beat the Quote

- 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).

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Clearing Policy

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

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Clear Timing

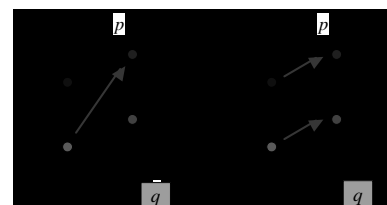
- At specified intervals
- On each bid
- On inactivity
- On other designated events

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Allocation



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Pricing Policy



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

That's it!