SIMPLE AUCTION TYPES

What is an auction?

- Concerned with *traders* and their allocations of:
  - Units of an indivisible *good*; and
  - Money, which is divisible.
- Assume some initial allocation.
- *Exchange* is the free alteration of allocations of goods and money between traders
- Each trader has a value that they place on the good.
  - *Private value* or *limit price*
- A buyer who exchanges more than their limit price for a good makes a loss.
- A seller who exchanges a good for less than their limit price makes a loss.

- A *market institution* defines how the exchange takes place.
  - Defines what messages can be exchanged.
  - Defines how the final allocation depends on the messages.
- The change of allocation is market *clearing*.
- Difference between allocations is *net trade*.
  - Component for each trader in the market.
  - Each trader with a non-zero component has a *trade* or *transaction* price.
  - Absolute value of the money component divided by the good component.
- Traders with positive good component are *buyers*
- Traders with negative good component are *sellers*
- *One way traders* are either buyers or sellers but not both.

Yes, but what is an auction?

An *auction* is a market institution in which messages from traders include some price information—this information may be an offer to buy at a given price, in the case of a *bid*, or an offer to sell at a given price, in the case of an *ask*—and which gives priority to higher bids and lower asks.

This definition, as with all this terminology, comes from Dan Friedman.


SELLING
SOLD
FARMERS
COOPERATIVE
TULSA

The zoology of auctions

- We can split auctions into a number of different categories.
- Being good computer scientists, we draw up a taxonomy.
  - This gives us a handle on all the kinds there might be.
  - It suggests parameterization.
  - It can help us to think about implementation.
- This particular classification is a bit zoological, but it is a good place to start.

Single versus multi-dimensional

- Single dimensional auctions
  - The only content of an offer are the price and quantity of some specific type of good.
  - "I'll bid $200 for those 2 chairs"
- Multi dimensional auctions
  - Offers can relate to many different aspects of many different goods.
  - "I'm prepared to pay $200 for those two red chairs, but $300 if you can deliver them tomorrow."

Single versus double-sided

- Single-sided markets
  - Either one buyer and many sellers, or one seller and many buyers.
  - The latter is the thing we normally think of as an auction.
- Two-sided markets
  - Many buyers and many sellers.
- Single sided markets with one seller and many buyers are "sell-side" markets.
- Single-sided markets with one buyer and many sellers are "buy-side".

Open-cry versus sealed-bid

- Open cry
  - Traders announce their offers to all traders
- Sealed bid
  - Only the auctioneer sees the offers.
- Clearly as a bidder in an open-cry auction you have more information.
- In some auction forms you pay for preferential access to information.

Single-unit versus multi-unit

- How many units of the same good are we allowed to bid for?
- Single unit
  - One at a time.
  - Might repeat if many units to be sold.
- Multi-unit
  - Bid both price and quantity.
- "Unit" refers to the indivisible unit that we are selling.
  - Single fish versus box of fish.

First price versus *k*th price

- Does the winner pay the highest price bid, the second highest price, the *kth* highest price?

Single item versus multi-item

- Not so much quantity as heterogeneity.
- Single item
  - Just the one indivisible thing that is being auctioned.
- Multi-item
  - Bid for a bundle of goods.
  - "Two red chairs and an orange couch, or a purple beanbag."
  - Valuations for bundles are not linear combinations of the values of the constituents.

Standard auction types

- We will look at the four "standard" auctions:
  - English auction
  - Dutch auction
  - First-price sealed bid auction
  - Vickrey auction
- Also the so-called *Japanese* auction.

English auction

- This is the kind of auction everyone knows.
- Typical example is sell-side.
- Buyers call out bids, bids increase in price.
- In some instances the auctioneer may call out prices with buyers indicating they agree to such a price.
- The seller may set a *reserve price*, the lowest acceptable price.
- Auction ends:
  - at a fixed time (internet auctions); or
  - when there is no more bidding activity.
- The "last man standing" pays their bid.

- Classified in the terms we used above:
  - Single-dimensional
  - Single-sided
  - Open-cry
  - Single unit
  - First-price
  - Single item
- Around 95% of internet auctions are of this kind.
- Classic use is sale of antiques and artwork.


SOTHEBY'S

An example

- We will now run an English auction.

Results

- We ran two English auctions.
- As for all these experiments, the distribution of private values was:

  25, 50, 75, 100, 125, 150, 175, 200, 225, 250.
- In the first auction, thanks to some confusion about the experimental setup, the sale price was 170 (with a profit of 5).
- In the second, the sale price was 235 (a profit of 15), and the two previous high bids were 225 and 230.
- This second outcome is in pretty good agreement with the theory.

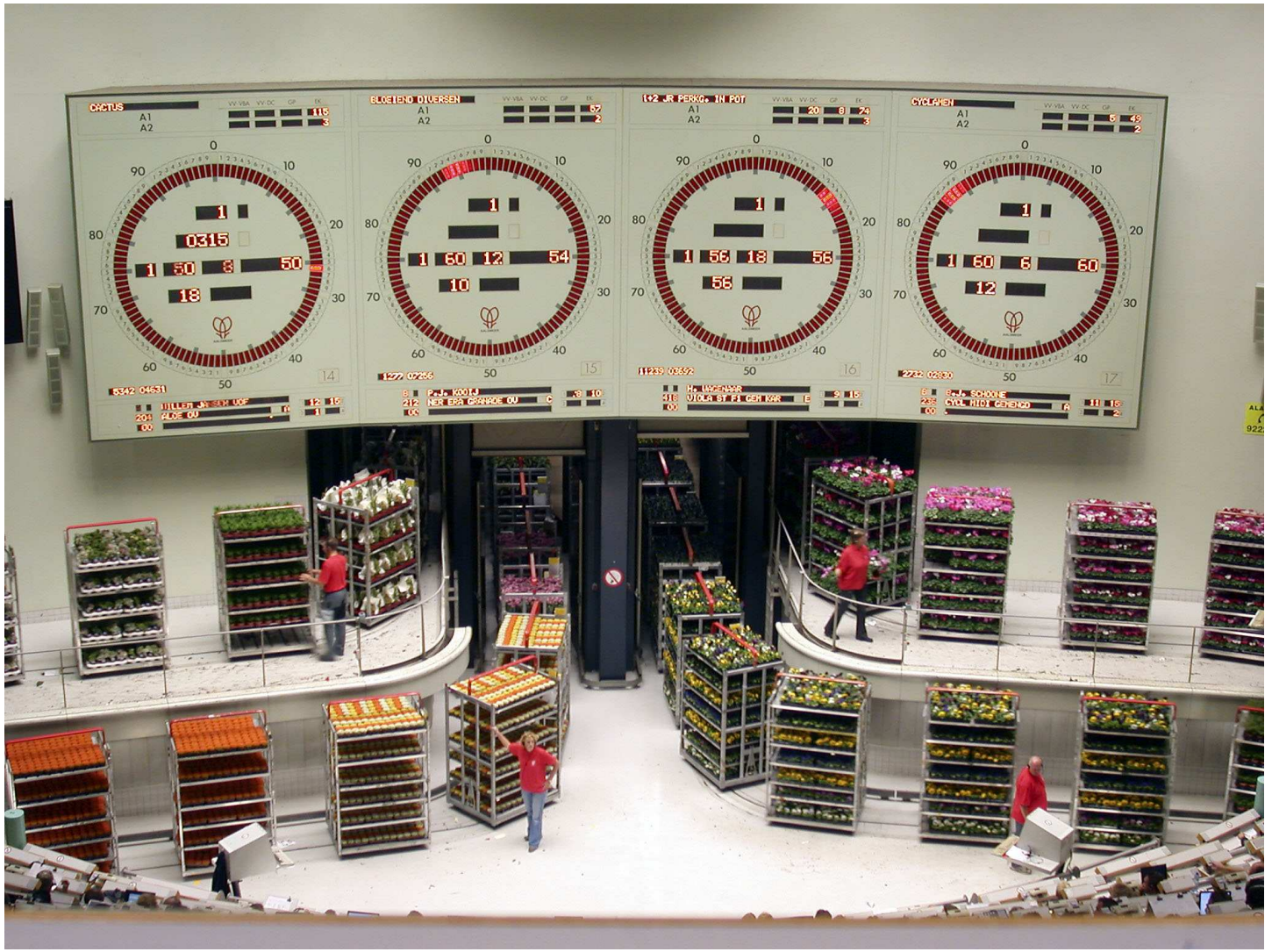
Unlikely tales

The former president of Parke-Benet reports that a dealer attending a sale of eighteenth-century French furniture had arranged to unbutton his overcoat whenever he wished to bid; buttoning the overcoat again would signal that he had ceased bidding. The dealer, coat unbuttoned, was in the midst of bidding for a Louis XVI sofa when he saw someone outside to whom he wished to speak and suddenly left the room. The auctioneer continued to bid for the dealer who, when he returned to the room, found he had become the owner of the sofa at an unexpectedly high price. An argument then followed as to whether an unbuttoned coat not in the auction room is the same as an unbuttoned coat in the auction room.

Dutch auction

- Also called a "descending clock" auction
  - Some auctions use a clock to display the prices.
- Starts at a high price, and the auctioneer calls out descending prices.
- One bidder claims the good by indicating the current price is acceptable.
- Ties are broken by restarting the descent from a slightly higher price than the tie occurred at.
- The winner pays the price at which they "stop the clock".

- Classified in the terms we used above:
  - Single-dimensional
  - Single-sided
  - Open-cry
  - Single unit
  - First-price
  - Single item
- High volume (since auction proceeds swiftly).
- Often used to sell perishable goods:
  - Flowers in the Netherlands (eg. Aalsmeer)
  - Fish in Spain and Israel.
  - Tobacco in Canada.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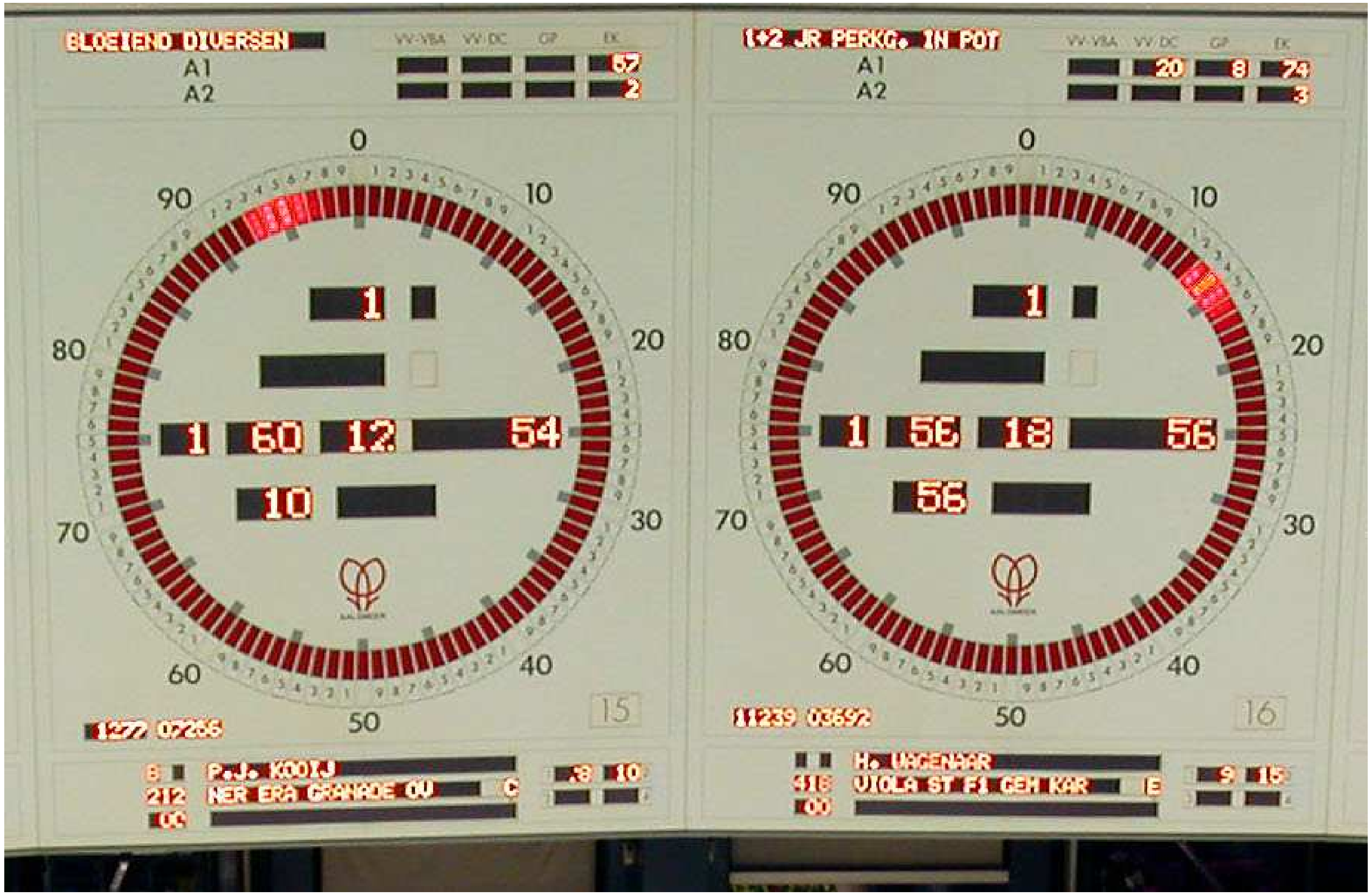
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H. WAGENAAR
VIOLA ST F1 GEM KAR

- *The Guardian* states that the Aalsmeer auction trades

  19 million flowers and 2 million plants . . . every day.

  April 23rd 2008 (page 18–19)

Another example

- A Dutch auction

Results

- We ran two Dutch auctions with the same distribution of values as before.
- The first item sold for 250 (a profit of 0).
- The second item sold for 230 (a profit of 20).
- Again, this is pretty close to what theory suggests will happen.
- In fact both results basically agree with the theory under different assumptions.
  - In one case the item sold for exactly what the bidder with the highest valuation valued it at.
  - In the other case the item sold for the price of the second highest valuation plus the minimum increment (the price was dropping in 10 cent intervals).

First-price sealed bid auction

- In an English auction, you get information about how much a good is worth.
- Other people's bids tell you things about the market.
- In a sealed bid auction, none of that happens
  - at most you know the winning price after the auction.
- In the FPSB auction the highest bid wins as always
- As its name suggests, the winner pays that highest price (which is what they bid).

- Classified in the terms we used above:
  - Single-dimensional
  - Single-sided
  - Sealed-bid
  - Single unit
  - First-price
- Governments often use this mechanism to sell treasury bonds.
  - UK still does.
  - US recently changed to SPSB.
- Property can also be sold this way (as in Scotland).

The Amsterdam auction

- Since medieval time, property in the low countries has traditionally been sold using the "Amsterdam" auction.
- Start with an English auction.
- When down to the final two bidders, start a Dutch auction stage.
- Dutch auction starts from twice the final price of the English auction.

Yet another example

- A first-price sealed bid auction.

Results

- The results in terms of trade price agree with the theory.
- Sales were for 235 and 240 (a tie between two bidders).
- The first was at a profit of 15, and 10 cents above the next highest valuation.
- Again this agrees with the theory.
- One of the second auction winners (we had many items for sale so we rapidly turned this single unit auction into a two unit auction) was at a profit of 10, and again agrees with the theory.
- The second winner was at a loss of 15.
- The winning bidder was playing more strategically than the theory allows for, factoring in her profit from the previous auction.

Vickrey auctions

- The Vickrey auction is a sealed bid auction.
- The winning bid is the highest bid, but the winning bidder pays the amount of the second highest bid.
- This sounds odd, but it is actually a very smart design.
- It gives bidders an incentive to bid their true value.
  - *incentive compatible* in the usual terminology.
- We'll talk more about why later.
- However, it is not a panacea, as the New Zealand government found out.

- Again, classified as above, it is:
  - Single-dimensional
  - Single-sided
  - Sealed-bid
  - Single unit
  - Second-price

Final example

- A second-price sealed bid auction.

Results

- Here the results deviated from what simple theory would predict.
- The first auction was won with a bid of 700, though the price paid was only 255 (still a loss of 80).
- However a number of participants overbid, sometimes by quite a margin.
- In the second auction the winning bid was 400, and the price was 300.

- Again there was significant overbidding, especially by participants with low valuations
- This seems to have been, at least in part, a form of shilling.
- Participants with low valuations were acting as “spoilers”, trying to push up the price that the winner paid.
- These participants don’t seem to have had any serious expectation of winning — the overbids were no more than 250 and by this point all the participants knew what the highest valuations were.

Japanese auction

- Like a mixture of a reverse Dutch auction and and English auction.
- Prices start low, and the auctioneer raises them
  - Some examples use a clock, as for the Dutch auction.
- Initially, everyone is "in".
- As the prices rise, potential buyers drop out one by one.
- As soon as the penultimate bidder drops out, the remaining bidder wins.
- The price on the clock (or last price uttered) is the price paid.

- On our classification it is:
  - Single-dimensional.
  - Open-cry.
  - First-price.
- At least, this is what the literature calls the “Japanese auction”.

Real Japanese auction

- The auction form used to sell fish in Tokyo is different:

  > [The] distinctive aspect [of this auction form] is that all bids are made by prospective buyers at the same time, or approximately the same time, using individual hand signs for each monetary unit. . . . The bidding starts as soon as the auctioneer gives the signal, and the highest bidder, as determined by the auctioneer, is awarded the lot.

- This is thus *simultaneous bidding* and rather like an FPSB auction.
- Ties are "not uncommon[ly]" broken by playing Jan Ken Pon (or "paper, rock, scissors")

Overall Results

- Over all the auctions, the results look pretty good from the viewpoint of maximising social welfare.
- This means the ability of the mechanism to ensure the good goes to the person who values it most.
- This happened in 5 of the 8 cases.
- Another way to look at this: it happened in all the cases other than the misunderstood first English auction and the overly-strategised Vickrey auctions.

- Another measure is how close the actual revenue (sum of sale prices) is to what the revenue would be if the high valuation was paid every time.
- We call this *efficiency*
- Over all auctions, we got 96% of the expected revenue.
- This was distorted by the windfall profits in the Vickrey auctions — without those we got 91% of the expected revenue.
- This includes the losses due to the first auction we ran when everyone was learning exactly how the experiment was running.
- Excluding this first auction, the numbers are 99.7% (with Vickrey) and 95% (without).
- If nothing else, this shows that auctions are a pretty robust form of mechanism.

Summary

- We have looked at the four basic auction types:
  - English
  - Dutch
  - First-price sealed-bid
  - Second-price sealed bid
- We've done a little auctioning.
- Next time we'll look at some of the theory that has been developed to explain what goes on in auctions.