Lecture 8

Auctions

Lecture Outline

- Auctions as a "screening" device
  - example
- The many uses of auctions
- Four examples of "Simple" auctions
- How to bid in a Second Price auction.

A Seller's Problem

- Suppose you would like to sell your econ200 textbook to a next year student
- You know the most the student is willing to pay is one of *{$1,$2,$3,…,$9,$10}*
- The probability of each is 10%.
- Problem of private information. If you knew the willingness of the buyer to pay, what would you get on average?
  - *1*.1+2*.1+…10*.1=$5.50*
- What price should you charge when you do not know?
- Next chart shows that the best you can do is $3 on average.

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A seller's problem

Take it or leave it Price	Probability of Sale	Average Earnings
1	1	1
2	.9 (=Prob [Value >1])	1.8
3	.8 (=Prob [Value >2])	2.4
4	.7	2.8
5	.6	3
6	.5	3
7	.4	2.8
8	.3	2.4
9	.2	1.8
10	.1	1

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Seller's Problem With Two Buyers

- What if there were two possible buyers? Each similar.
- Start at $1 and ask who is willing to pay this much. If only one says yes, give it to him. If both, then raise the price.
- Probability of a sale at $1 is the probability each is willing to pay exactly $1 (probability of this is .1*.1=.01)
- plus the probability one bidder will pay $1 (.10) and the other bidder pays $2 or more (.90) for a Probability =.09
- This can happen two ways (Bidder A can be the high guy or Bidder B can be the high guy) to yield 2*.09= .18.
- Total probability of a sale at $1 is therefore .19
- Can repeat this for probability of a sale at any price 1 – 10.

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Seller's Problem

Current Price	Probability of Sale at this price	Average Revenue at each bid price	Cumulative average revenue as bid price rises
1	.19	.19	.19
2	=.1*.8*2+.01=.17	.34	.53 (=.34+19)
3	=.1*.7*2+.01=.15	.45(=.15*3)	.98(=.45+.53)
4	=.1*.6*2+.01=.13	.52	1.5
5	=.1*.5*2+.01=..11	.55	2.05
6	=.1*.4*2+.01=.09	.54	2.59
7	=.1*.3*2+.01=.07	.49	3.08
8	=.1*.2*2+.01=.05	.40	3.48
9	.03	.27	3.75
10	=.1*.1=.01	.10	3.85

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The Seller's Auction

- The auction screens out the high value buyer by effectively asking him "is he willing to outbid his rival"?
- Total Probability of a sale is 100% (add column 2)
- Probability of a sale at $1 is 19%, at $2 is 17% etc.
- Total average revenue $3.85 > $3.

The Auction Example

- Notice two "nice" features of the auction.
- The textbook is always sold.
- It is sold to the person who values it the most.

Auctions are Frequently Used

- In his "Histories" Herodotus recounts how the Babylonians sold women as wives at auction.
- In the 18th century, the great British auction houses, Sotheby's and Christie's were established to sell rare books, works of art, furniture etc.
- throughout the 19th, 20th and 21st centuries auctions have been used to sell farm produce such as tobacco, cotton, flowers
- Distressed assets (eg. foreclosed homes) are often sold at auction.
- in 1995, the FCC began to use auctions to sell the rights to the use of the radio frequency spectrum
  - http://wireless.fcc.gov/auctions/default.htm?job=auctions_all
  - currently have raised over $45B.
- eBay, electricity auctions, S02 and CO2 emission auctions.

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Four Canonical Auction Forms

- First Price Auctions
- Second Price Auctions
- Dutch or Descending Bid Auctions
- English or Ascending Bid Auctions
- Also
  - all-pay auctions
  - multi-good auctions
  - procurement auctions
  - other variants.

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First-Price Auction

- Sometimes called "Pay your bid" auction
- Bidders privately (simultaneously) submit bids for object to be sold
- Highest bidder obtains object.
- Pays price equal to own bid.
  - if a procurement auction, then lowest bidder wins contract and receives own bid as payment.

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Second-Price Auction

- Sometimes called "Vickrey" auction after Nobel Prize winner William Vickrey
- Bidders privately (simultaneously) submit bids for object to be sold
- Highest bidder obtains object.
- Pays price equal to second highest bid.

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Dutch Auction

- Sometimes called "clock" auction
- So-called because of way flowers were sold in Holland.
- A clock starts at high price. Bidders have buttons to stop clock.
- Clock descends through prices. First bidder to stop clock obtains object at price where clock stops.

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English Auction

- Perhaps the most familiar auction
- Auctioneer starts prices low and gradually raises them
- As price rise, bidders choose to stay in or to exit.
- Price stops when the second to last bidder drops out.

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Auction Formats

- These variants of auctions have raised a variety of questions
  - 1) How should bidders behave in each auction (what are best responses?)
  - 2) What are the similarities across auction forms?
  - 3) Do some auctions raise more seller revenues than others?
- We will address these questions in the next lecture.

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