Lecture 8b

Auctions: Continued

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Lecture Outline

- The Independent, Private Values Assumption
- Optimal behavior In Auctions
  - second price auctions
  - first price auctions
- Equivalence of FP and Dutch Auctions
- "Equivalence" of SP and English Auctions
- "Equivalence" of Expected Revenues
- The Winner's Curse and the Dependence of Values.

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Independent Private Values

- Suppose you are bidding for a new version of a Wii game on eBay.
- You have an idea of what the most you would be willing to pay (“valuation”) is but the seller does not know
- Would you change your valuation if you learned the valuation of other bidders?
- If not, then your valuation is “private”
- When your valuation is high, is the valuation of other bidders high or are other bidders’ valuations “independent” of yours?

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Independent Private Values

- When each bidder’s valuation is private to the bidder and each bidder’s true valuation is independent of the valuation of any other bidder, then we say the auction is an Independent private value auction.
- Counterexample: sometimes the differences in bidder valuations is just due to different expectations:
  - Oil firms care equally about how much oil is in a tract but might differ in their estimates of how much oil there is.
- Sometimes, even though valuations are private, they move together:
  - bidders might have private tastes for a new CD but because they all listen to the same radio station, when one bidder likes a new song, it is more likely other bidders also like the new song. (Their valuations are correlated.)

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Assume IPV for now

- Both auctions with Independent Private Values and those with “Common Values” can occur, so we will consider both cases
- To start with, we assume IPV.

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Second Price Auctions Have a Dominant Strategy.

- Suppose you have a value of, say, $100 for a case of wine.
- When would you be happy winning? Obviously, when the price is anything less than $100.
- When the price is >$100, you would rather not win.
- The trick is to focus on the highest bid of your rivals, call it B.
  - When B<$100, you want to win (and pay B)
  - When B>$100, you would rather “lose”
- A bid of $100 guarantees that you win when B<100 and lose when B >100.
- This is true no matter what reasoning led your rival to bid B

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Bid Your Value in Second Price Auctions

- Observe that your own bid cannot affect the price you pay.
- It only affects whether or not you win.
- That is why bidding your value is best. It makes sure you win exactly when you want to – that is, when the price you will pay is below your value.
- Notice that when bidders play their dominant strategies in a second price auction, the winning price should be the value of the second highest bidder.

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Example

- Suppose there are n=2 bidders with values equally likely between 0 and 100.
- average value of second highest bidder is 1/3*100=33.3 (or (n-1)/(n+1)*100).
  – so with 3 bidders it is 50
  – 4 bidders it is 60
  – 9 bidders it is 80
  – 99 bidders it is (98/100)*100=98.
  – Try it with a spreadsheet.

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First Price Auction

- How should bidding go in a First Price Auction?
- First note that if you bid your own value here you guarantee yourself zero.
- If you "shade" your bid, you at least have a chance at winning the object for less than you value it

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Shading Bids

- How much should you shade your bid?
- It is a trade-off – the more you shade, the lower the price when you win but the lower the chance of winning.
- Example:
  - Suppose you are one of two bidders each with values equally likely between 0 and 100.
  - Suppose your opponent always bids one-half his value (So his bids are equally likely between 0 and 50).
  - If you bid $p<50$, the probability you win is $p/50$. So your payoff is $(v-p)*p/50=(vp-p*p)/50$

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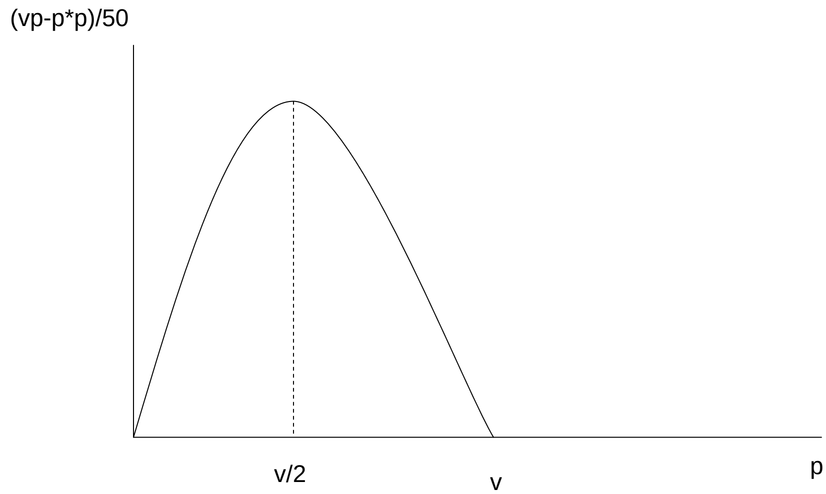
A picture



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A Nash Equilibrium

- Therefore, your best bid response to an opponent who always bids half his value is to bid one-half your value.
- We have computed an equilibrium to the game where each bidder shades his bid by one-half
  - (exact shading special to equal likely assumption and two bidder example)
- Average value of highest bidder is n/(n+1) or 2/3 for the two bidder case.
- That bidder bids half his value so average winning bid is 2/3*1/2*100=33.3
- Compare to second price auction

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Equivalent Auctions

- Recall the "English Auction"
  - Bidders continue to hold up paddle as price rises, then drop out. When second to last bidder drops out, price stops and last remaining bidder wins at that price.
- What is your best strategy?
  - If price is below value, keep paddle up.
  - When price reaches you value, drop it.
- When does price stop? When price reaches value of second highest bidder.
  - If you had a proxy bidder in an English auction, what you tell her to do?
- Compare to second price auction.
- With IPV, best strategy in English auction is equivalent to best strategy in second price auction.

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Equivalent Auctions

- Recall Dutch auction:
  - Price clock starts high and drops until a bidder stops it and claims object at that price.
- What is your only decision? What price to claim the good.
- As price falls, price you pay falls (good) but chance another bidder claims is rises (bad)
- Sound familiar?
- Best strategy in Dutch auction is equivalent to best strategy in First price auctions.

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Revenue Equivalence

- Which of the four auctions should an auctioneer choose?
- From our discussion above, it is clear that revenue from a First price auction =revenue from a Dutch auction
- and revenue from Second price auction=revenue from an English auction
- What about revenue from First versus second price auctions?

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Revenue Equivalence

- Two opposing effects:
  - Bidders bid more in second price auctions than in first price auctions (no bid shading in second price auctions)
  - but highest bid is selected in first price auction and only second highest bid in second price auction
- With IPV, the remarkable result is that these two effects exactly cancel each other out!

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Which To Choose?

- If each auction gives same revenue, which should you choose if you are a seller?
- Competing features:
  – Second price auction is strategically simpler – no bid shading
  – First price auction is more familiar, less vulnerable to bid rigging
- Later, we will see that without IPV, second price auction can also raise more revenue.

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