Data Science for Economists

A Quick Primer on Auctions

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class: inverse, center, middle name: intro

Motivation

Auction Theory has been one of the successes of economics in the past 30-40 years.

Since auctions are very common in the real world, economists who study empirical auctions have also cropped up to estimate the models the theorists have developed.

While we will not delve too deeply into auctions, I do need to give you just enough information for the problem set.

Auction Models

The way we model auctions is that bidders have some *valuation* v_i that comes from some distribution F_v.

The valuations could be iid or iid conidtional on observables or have correlated valuations.

Bidders then know the rules of the auction and submit bids. They bid in such a way that maximizes their expected utility:

$$\max_{b_i} v_i \Pr(\text{win with } b_i) - E[p(b_i)|b_i]$$

I am keeping this vague because there are different auction formats and not all require paying the exact bid you submitted e.g. second price auctions.

Some auction formats:

1. First-Price Sealed Bid
2. English (Ascending)
3. Dutch
4. Second-Price Sealed Bid
5. All-Pay

Auction Models (Cont.)

Once a bidder has her valuation, we think that she forms some optimal bidding strategy $b^*(v_i)$ that maps her valuation to a bid. We denote the observed bid b_i and we say that $b_i = b^*(v_i)$ with equilibrium bidding.

In empirical auctions, the goal is to be able to recover v_i or F_v from a bunch of bidding data $(b_i)_{i=1}^N$, information about how the auction was ran, and assumptions about bidding behavior.

For the problem set, the only auction format that we need to talk about are English Auctions.

English Auctions start at 0 and bidders will continue to call out new prices until only one bidder remains.

- Sometimes there are minimum bid increments.
- In reality, there always is a minimum bid increment: the lowest denomination of currency e.g. a penny with US currency.