

"A two-stage approach to structural econometric analysis of first price auctions"

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Description

The paper addresses the following issues of robustness in the estimation and testing of auction models: Parametric estimation of the distribution of bidder valuations imposes a distributional assumption on those valuations. It then estimates how a list of observed auction (item) characteristics impact the parameters of this distribution. Typically, distribution parameters, such as the mean, are assumed to be a linear function of those observed characteristics. Unobserved auction (item) characteristics are incorporated in these models by assuming that this unobserved heterogeneity takes a specific distributional form. Further, the distributional assumption on bidder valuations can not be tested independently of the relationship between observed characteristics and the distribution parameters.

In this paper we show how to obtain consistent estimates of the parameters of the relationship between observed auction characteristics and the parameters of the distribution of bidder valuations without imposing any assumptions on the distribution of unobserved heterogeneity. [The only assumption imposed is that unobserved heterogeneity is independent of observed characteristics, which is the standard linear regression assumption.] We also show how to test the distributional assumption on bidder valuations independently of the assumptions of how the distribution parameters depend on auction characteristics. Our proposed methodology is applicable when the distribution of bidder valuations belongs to the location-scale class of distributions (i.e., it can be characterized by its mean and variance). It also requires that all the submitted bids are observed.

The approach relies on the observation that for this class of distributions the bids can be written as a linear function of the distribution parameters. First, the distribution parameters for each auction are estimated from the bids submitted in this auction. [the first stage.] Then, the relationship between the distribution parameters and auction characteristics is estimated using the estimated auction-by-auction estimates of these parameters as data. [the second stage.] The paper shows that this method of estimation is consistent and robust to the distribution of unobserved heterogeneity. Testing of the distributional assumptions can be carried out using the auction-by-auction estimates of the distribution parameters obtained in the first stage.

Effectively, the two-stage approach collapses the bidder dimension of the data to obtain parameter estimates for each auction. It then estimates the relationship between those parameters and auction characteristics from the auction dimension of the data.

A side benefit is that the computational burden is reduced to near zero (after an one-time fixed cost of calculating a table of distribution specific parameters is incurred). Further, the estimation routines can be "canned" for

use in standard software packages. This allows the researcher to estimate a number of different specifications with the same ease that he would estimate linear regressions.

This approach is demonstrated by estimating the distribution of bidder valuations for second hand real estate loans sold by the Resolution Trust Corporation, a government agency entrusted with the liquidation of the assets of bankrupt Savings and Loans Institutions.

We are currently working on estimating the model with a random number of bidders, i.e., relaxing the assumption that bidders know how many competitors they face when submitting their bids.