Advanced Industrial Organization II
Problem Set 3

Jiarui Liu and Timothy Schwieg

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Due on March 12th 11:59 pm CST. Please upload a zip file containing your code and a pdf with your answers to canvas. You can have one partner in completing this problem set.

This problem set asks you to replicate some results from Asker (2010) using the ps3.csv data provided. This is a sub-sample of the real data set posted on the author's website [1], so we expect the results might be different from those in the paper. We will grade on whether you implement the methods correctly rather than the numbers you get, so make sure you describe what you have done in detail.

1 Data

1. Read the data section to familiarize yourself with the data structure.
2. Replicate Table 1 and Table 2. You don't have to exclude certain auction house when you do the summary statistics, since the auction houses are anonymized in the data set. Discuss what you observe from these tables.
3. Remove all auctions from the data where there are more than 2 ring-members bidding in a knockout auction.

2 Introductory Questions

1. Explain why the structure of the knockout auction causes the bids of the ring-members to be biased upwards.
2. Familiarize yourself with equation (2).
   (a) What does this equation give?
   (b) Read Lemma 2. What concern does Lemma 2 raise with identification?
   (c) What assumption is made to ensure this problem does not apply to our estimation?
3. Why is the analysis limited to only knockout auctions between two ring members.

[1] `http://www.johnasker.com/Pubs.html`

4. Describe qualitatively the welfare effects caused by the existence of the ring to each of the participants—Sellers, non-ring bidders and ring members. There is no need to solve for the exact welfare gains and losses for each participant.

5. Reproduce Table 5 and Figure 1. Discuss.

3 Structural Analysis

Assume there is no auction-level unobserved heterogeneity (i.e. assume $\epsilon_k = 1$).

3.1 Step 1

1. Describe Lemma 3 (Page 744) in words.

2. Using $\Gamma(x) = \exp(x_k'\gamma)$ perform the following first stage regression and collect the normalized bids.

$$\log b_{ik} = x_k'\gamma + \eta_{ik} + \sigma_{ik} \tag{1}$$

   Where $i \in \{1, 2, \text{target}\}$; η is a set of dummies for for target auction and individual ring members; and x_k contains estimated minimum and maximum values, catalog estimate, min and max quality grades, and dummies for both lots with exclusively US stamps and lots with no value estimates.

3.2 Step 2

1. Read Equation (4)

2. Assume $\epsilon_k = 1$, What is the mapping from the observed normalized bid distribution $\hat{b}_{ik}$ to the bid function $\beta(\nu_{ik})$?

3. What is the expectation of the normalized bid distribution? When $\epsilon_k = 1$, does assumption U.a hold?

3.3 Step 3

The following definitions may be helpful, as the notation can be very cumbersome.

- r The highest value by the non-ring bidders
- H, h - Valuation distribution of the non-ring bidders
- $\bar{H}$ - The observed bids by the non-ring bidders (These are equal to valuations conditional on the ring winning the auction).
- g_m - the distribution of the maximum bids by the ring

1. What causes selection bias in r?

2. Identify the distribution of non-ring bidders by isolating the distribution of non-ring bidders valuations from the following definition of selected non-ring bids. (Hint: See page 747):

$$\bar{H}_r = \frac{\int_{-\infty}^{r} h_r(x) \int_x^{\infty} g_m(y) dx dy}{\int_{-\infty}^{\infty} h_r(x) \int_x^{\infty} g_m(y) dy dx} \tag{2}$$

3. Nonparametrically estimate the selected bid function $\bar{H}_r$, and the distribution of the maximum bid of the ring G_m. Use Silverman's rule of thumb for the bandwidth parameter (Use this bandwidth rule for the rest of the problem set).

4. Estimate the value distribution, H_r, for the non-ring bidders using your nonparametric estimates and identification result.

3.4 Step 4

1. Nonparametrically estimate the bid function for each ring member. Use a Gaussian Kernel.

2. Estimate α_k—the probability that each ring member participates in an auction using the empirical participation frequencies.

3. Construct G_{-i} and its associated pdf g_{-i}, the cdf of the bid function for each ring member's opponents, using α_k to weigh a mixture of opponents bid functions.

4. Construct v_{ik}—the distribution of valuations of bidder i.

5. Using your estimates, produce a figure similar to Figure 2 in the paper.

References

Asker, J. (2010). A study of the internal organization of a bidding cartel. *American Economic Review 100*(3), 724–62.