

Fall 2004 Auction: Theory and Experiments An Outline of A Graduate Course, Johns Hopkins University.

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Short Course Description: Auctions are among the oldest and robust institutions for exchange. In the last twenty-five years we have seen an unprecedented interest in auctions from theoretical and practical perspectives. The use of auctions increased dramatically both in scope and volume of transactions. Auctions are now routinely used to sell spectrum rights, privatization schemes, finance national debt and over the Internet (between producers and consumers as well as between business to business). In this course we start with Vickrey's 1961 seminal work and build upon it by using modern tools of game theory with incomplete information. We will derive and characterize equilibria of the various auctions, analyze and compare their performances in terms of allocation efficiency and/or revenues capabilities.

Many economists regard auction theory as the best application of game theory to economics. As such, auctions are (or ought to be) of interest also to the non specialists as they provide a model (canvas) to address many of the most fundamental questions in economics such as: price formation, information aggregation by non-centralized institutions, public policy issues (e.g., choice of auctions, providing additional information, helping "weak" bidders, allowing joint bidding) as well as behavioral and bounded rationality aspects.

The use of experimental methods in economics started modestly in the 1960's, experiencing a very fast growth after the 1980's. It is now a recognized and respected methodology and field with its own journals and scientific society. In spite limitations, as any other methodology have, it provides excellent opportunities for research that was not possible earlier. For several (good) reasons most of the early work in this field and a significant portion of present research is cast in auction markets. Being a "player" in both fields of research I'll present (sometimes integrate between) the two approaches and highlight areas and issues where theorists and experimentalist had and are having a dialog.

It is impossible to be conclusive and do "justice" to this area in microeconomic theory in a series of 13 lectures. We will start at the "beginning" and cover many of the baseline models. But then, my selection will be biased toward areas that I have researched over the years. Immediately following this short description an outline of topics to be covered in our meetings is presented. The relevant readings are marked with a number from the list of references next to each topic. The reference list is produced for the interested

students mainly for future reference. The more direct and relevant papers (or parts of them) will be covered in class and they are marked by an asterisk, *.

We will cover a lot of ground thus, I strongly recommend attending all classes. My contact information is above. I plan to “be around” and available. I welcome and encourage students to see me.

Lecture I (Wednesday, September 1, 2004, 09:00-11:00).

1. Course Organization and Structure.

Readings; Home Assignments; Exam/Presentations(?); Grades.

2. Introduction.

A brief history, motivation and importance of Auctions.

- One of the oldest mechanism/institution of selling and/or buying (exchange), Robust.
- Best application of GT (games with incomplete Information).
- Volume of transaction, “billions and billions”: Spectrum rights (FCC); mineral rights (e.g., OCS oil drilling rights in the Gulf of Mexico); traditional auctions (e.g., fish, flowers, art and antiques); government securities (financing the debt, T-bills); More recent, internet auctions B2C and B2B (eBay Amazon); privatization schemes in general and particularly in emerging democracies. Trading pollution rights.

3. A short review of some issues addressed in the litterateur.

Equilibrium existence and uniqueness; Characterization and comparative Statics; Theoretical predictions prediction and actual behavior in the real world and in the laboratory; Comparing auctions’ performance in terms of allocation efficiency and or seller’s revenue; Optimal auction design. The use of explicit and/or secret reserve price (minimum bid); The use of dynamic vs. Static auctions, pros and cons. Allowing or disallowing joint bidding. How auction multiple-units with or without synergies. Combinatorial (package) auctions, the pros and the cons.

4. A way to think about the literature:

Rules of the Game × Information Structure × Bidders' Preference.
(show matrix). Eg., FPA × independent signals × risk neutral bidders with private values.

5. Rules of some of the “standard/simple” Auctions.

- **Sealed-Bid First-Price-Auction (SBFPA).**
- **Sealed-Bid Second-Price-Auction (SBSPA).**
- **English Auction.**
- **Dutch Auction.**
- **Sealed-Bid K^{th} -Price-Auction (SBKPA).**

6. Information Structure:

- **I.I.D Signals.**
- **Correlated Signals.**

7. Bidders' Valuation / (Preferences).

- **Private Values.**
- **Interdependent Valuation**
- **Common Values/General.**

Reading for Week 1: {B: [1],[5],[6] and [7]}; {S: [3],[4],[5] and [6]};
{A: [18]}.

Lecture II (Wednesday, September 8, 2004, 09:00-11:00).

Theory of single unit, Private-Values-Auctions

1. The Independent-Private-Values (IPV) Model:

- The assumptions and the model.
- **Deriving equilibria of the “standard” auctions.** (Use other trans.)
- Strategic equivalence; Revenue Equivalence; Optimal Auctions.
- **The role of Risk-Aversion and The number of Bidders:**
- Theoretical predictions from First-Price, Second-Price, and Third-Price auctions.

Reading for Week 2: {A: [5*], [6], [29**], [32*] and [39]}.

Lecture III (Wednesday, September 15, 2004, 09:00-11:00).

- 1. A short introduction to Experimental Economics**
- 2. Single unit, Private-Values-Auctions, Experimental Evidence.**
- 3. Are auctions’ rules important?** {Al Roth’s work with colleagues, e.g., [34*].}

Behavior in first Second and Third Price auctions”

Issues: Equilibrium, RA, Revenue Equivalence and, Overbidding (?)

Reading for Week 3: {B: [2] and [3]}; {S: [1*] and [2*]};
{A: [16], [12**], [34*] [36] and [38*]}.

Lecture IV (Wednesday, September 22, 2004, 09:00-11:00).

- **The Independent-Interdependent-Values (IIV) Model:**

First encounter with the *Winner's Curse* (WC), or “When and Why not to Auction.”

- **The Common-Values Model:** Introduction, Equilibrium, and the WC.
- **Experimental evidence.**

Reading for Week 4: {A: [7], [8], [10**], and [23]}.

Lecture V & VI (Wednesdays, September 29, and October 6, 2004, 09:00-11:00).

- **Common-Value Auctions and the Winner's Curse: Experimental Evidence and Discussion.**
- What is the WC and how to measure it? (What theorists mean? What experimentalists mean?)
- Evidence: From auctions other areas.
- The Acquiring a Company Game.
- The Origin of the WC: Psychological and Economic Explanations. (Charness & Levin).
- Learning and Persistence.
- Implications: Public Policy/Public Information.
- Behavior in First-Price, Second-Price and English Auctions.

Reading for Week 5&6: {B: [4]}; {S: [2*]}; {A: [11**], [KLH] and [21*]}.

Lecture VII (Wednesday, October 13, 2004, 09:00-11:00).

- **The Common-Values Model** (once more): Equilibrium, Information aggregation.
- **Convergence.**
- **The General Affiliation Model:** Affiliation, the *linkage principle*
- Public Information: An application of the linkage principle.

Reading for Week 7: {B: [4]}; {S: [2*]}; {A: [30], [31**] and [40*]}.

Lecture VIII (Wednesday, October 20, 2004, 09:00-11:00).

- **Almost Common-Value model.**
- Importance, Relevance (Entry and number of bidders).
- Theory: How robust? Second-Price-Auctions with many bidders. English auctions.
- Experimental Evidence: Modeling and testing a bounded rationality in such environment.

Reading for Week 8: {A: [3*], [4], [19*], [22*] and [33]}.

Lecture IX (Wednesday, October 27, 2004, 09:00-11:00).

- **Stochastic number of bidders.**
- The risk aversion approach with EU bidders: A risk-averse bidder perspective; a risk-neutral seller facing RA bidders perspective.
- The ambiguity aversion approach with MMEU bidders: A MMEU bidder perspective; a risk-neutral seller facing MMEU bidders perspective.
- Experimental Evidence.

Reading for Week 9: {A: [25]; [27]; [28]; [HKL] and [DKL]}.

Lecture X (Wednesday, November 3, 2004, 09:00-11:00).

- **Endogenous entry.** {[21]*}. Theory/Experiments.

Two models of Endogenous entry: “Screening” equilibrium with cutoffs and mixed strategy equilibrium with Symmetric bidders at entry time.

Predictions. Is equilibrium number of entrants optimal, when and why?

Experimental work in this area.

Reading for Week 10: {A: [24**], [KLH] and [21*], [35]}.

Lecture XI & XII (Wednesdays, November 10, and 17, 2004, 09:00-11:00).

Recent and new Issues:

- **Auctions with an Insider.**

Can a seller benefit from having an insider in an auction? Can “more” Inside information hurt the insider? We address these kinds of questions theoretically and evaluate them experimentally. {A: [9**], [13*], [35]}.

- **Multiple-Units Auctions.**

Demand Reduction. Efficient auctions (static and dynamic). Clinching (Ausubel’s) auctions. {[1], [2], [14], [17], [20], [23] [26*]}.

- **Multiple-Units Auctions with Synergies:** Combinatorial auctions, the threshold and the exposure problems. {[15]}.

Reading for Week 11&12: {A: [1], [2], [9**], [13*], [14], [15], [17], [20], [23], [26*] and [35]}.

Lecture XIII. (Wednesdays, November 24, 2004, 09:00-11:00).

As time permits.

- **Joint Bidding.** [Levin’s Rand September 2004 see my website]
- **Indicative bidding.** [Lixin Ye’s current research and OSU WP]

Possible presentations. [Students and or guest speaker(s)]

References:

I. Books

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- [B2] Davis D. and C. Holt, 1993. Experimental Economics, Princeton University Press
- [B3] Kagel J. and A. Roth (eds), 1995. The Handbook of Experimental Economics, Princeton: Princeton University Press.
- [B4*] Kagel J. and D. Levin, 2002. Common-Value Auctions and the Winner's Curse, Princeton University Press.
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- [B6*] Klemperer P., 2004. Auctions: Theory and Practice, Princeton University Press.
- [B7] Vijay Krishna, 2002. Auction Theory, Academic Press.

II. Surveys:

- [S1*] Kagel, J. H., 1995. "Auctions: A Survey of Experimental Research," in The Handbook of Experimental Economics, J. H. Kagel and A. E. Roth (eds), Princeton University Press.
- [S2*] Kagel, J. H. and D. Levin, 2002. "Bidding in Common Value Auctions: A Survey of Experimental Research," in Common-Value Auctions and the Winner's Curse, Princeton University Press.
- [S3] Klemperer, P., 1999. "Auction Theory: A guide to the Literature," *Journal of Economic Surveys*, 13: 227-260.
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III. Articles:

- [1] Ausubel, L. M., 1997. "An Efficient Ascending-Bid Auction for Multiple Objects," mimeographed, University of Maryland, 1997.
- [2] Ausubel, Lawrence M. and Peter C. Cramton, (1996), "Demand Reduction and Inefficiency in Multi-Unit Auctions," WP # 96-07 University of Maryland.
- [3*] Avery, C. and J. H. Kagel, 1997. "Second-Price Auction with Asymmetric Payoffs: An Experimental Investigation," *Journal of Economics & Management Strategy*, 6, 573-603.
- [4] Bikhchandani, S., 1988. "Reputations in Repeated Second-Price Auctions," *Journal of Economic Theory*, 46, 97-119.
- [5*] Bulow, J. and J. Roberts, 1989. "The simple economics of optimal auctions," *Journal of Political Economy*, 97, 1060-90.
- [6] Bulow, J. and P. Klemperer, 1996 Auctions vs. Negotiations, *American Economic Review*, 86,180-194.
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- [9*] Campbell, C. and D. Levin, 2000. "Can the Seller Benefit from an Insider in Common Value Auctions?" *Journal of Economic Theory*, 91: 106-120.
- [10*] Campbell, C. and D. Levin. 2002. "When and Why not to Auction," forthcoming in *Economic Theory* (posted on my website).
- [11**] Kagel, J. H. and D. Levin, 1986. "The Winner's Curse and Public Information in Common Value Auctions," *American Economic Review*, 76:894-920.
- [12**] Kagel, J. H. and D. Levin, 1993. "Independent private value auctions: Bidder behavior in First-, second-, and third-price auctions with varying numbers of bidders," *Economic Journal*, 103: 868-79.
- [13*] Kagel, J. H. and D. Levin, 1999. "Common Value Auctions with Insider Information," *Econometrica*, 67: 1219-1238.
- [14] Kagel, J. H. and D. Levin, 2001. "Behavior in Multi-Unit Demand Auctions:

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- [21*] Levin, D., J. H. Kagel and J. F. Richard, 1996. “Revenue Effects and Information Processing in English Common Value Auctions” *American Economic Review*, 86:442-460.
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