

Recent Advances in Auction theory

Syllabus

This is a theory course:

- ◆ Main focus is on auction theory.
- ◆ Examples are trivial and only used to illustrate theory.
- ◆ Since the literature is applied, those examples are fully fledged.
 - Due to analytical complexity, some of the results are shown without proofs.
 - The focus here is on the effects that different aspects of auction models impose on each other.

Learning goals:

- ◆ We will know complications faced by standard auction theory due to selection, signaling, and interdependency of values in auctions.
- ◆ We will know and practice a bit with the tools and methods that have proven to be useful in attacking these problems.
- ◆ We will see how particular market interactions that take place either before or after the auction generate these problems (based on the literature).
- ◆ Finally, we will analyze the effect of market interactions on the bidding behavior and auction efficiency (based on the literature).

Literature:

- ◆ Krishna, V., 2002. Auction Theory, Academic Press.
- ◆ “Selection effects in auctions for monopoly rights”, M.C.W. Janssen, and V.A. Karamychev (2007), JET 137, 576 – 582.
- ◆ “Bidding for the future: signaling in auctions with an aftermarket”, J.K. Goeree (2003), JET 108, 345 – 364.
- ◆ “Patent licensing to Bertrand competitors”, B. Moldovanu and A. Sela (2003), IJIO 21, 1 – 13.
- ◆ “Auctions, aftermarket competition, and risk attitudes”, M.C.W. Janssen and V.A. Karamychev (2009), IJIO 27, 274 – 285.

- ◆ “Do Auctions Select Efficient Firms”, M.C.W. Janssen and V.A. Karamychev (2010), EJ 120(549), 1319 – 1344.
- ◆ “Auctions with flexible entry fees”, M.C.W. Janssen, V.A. Karamychev, E. Maasland (2011), GEB 72, 594 – 601,
- ◆ “Simultaneous Pooled Auctions with Multiple Bids and Preference Lists”, M.C.W. Janssen, V.A. Karamychev, E. Maasland (2010), JITE 166, 286 – 298.

Lecture slides:

- ◆ They also serve as handouts, so that they are somewhat extensive.

Planning:

- ◆ The course is split into several topics (parts), not lectures.
 - 9 Parts.
- ◆ There is a short refresher in the beginning to remind basic (IPV) concepts.
 - Part 1. Textbook.
- ◆ There is also a theory part dealing with interdependent valuation auctions with correlated signals.
 - Part 4. Textbook.
- ◆ Other parts are based on the literature from international economic journals.
 - These are real advances in auction theory.
- ◆ Knowledge of Game Theory helps but is not a necessity.
 - So as differential calculus and ODE (ordinary differential equation) theory.
 - Although it would help a lot!

Course structure

1. **Independent Private Value (IPV) Model - A Refresher.** Here we go over standard IPV auctions and concepts of optimality and efficiency. We use the revelation principle to derive the Revenue Equivalence Theorem. We finish by identifying possible complications that the theory may face.
2. **Selection Aspects of Auctions.** Auctioning an object amongst firms typically results in allocating it to the firm that makes the most profit of the object. Here we study what else determines this allocation when all firms (bidders) are equally profitable. We argue that firms’ attitude towards risk is an important factor in the analysis.
3. **“Bidding for the future” - Signaling Aspects of Auctions.** Bidders’ valuations are often assumed private. Nevertheless, beliefs of the other economy participants about this information also affect the values. This creates bidders’ incentives to overstate or

understate private information in order to affect those beliefs, if bids are revealed. Taking into account this signaling issue, we analyze how auction bids and outcome change.

4. **Interdependent Values Auctions.** We see main complications due to value interdependence and correlations in auctions. We assume affiliation and derive the Revenue Ranking Principle. We analyze standard auctions in some details to see some analytics and ODE at work. We finish by reviewing optimality and efficiency.
5. **Auctions with Negative Externalities.** Standard theory in IDV auctions assumes positive correlation (affiliation) and positive externalities. Although positive correlation is the assumption that is easy to motivate (*e.g.*, the common values assumption), investigating real auctions suggests that the externalities can be (and more often are) negative (so called *ant-common* values). Starting from a negative externality, we analyze the efficiency of the standard auctions. We also derive a non-standard auction that is efficient.
6. **Risk Attitudes and Negative Externalities.** Taking into account bidders' attitudes towards risk leads to a sharp prediction of the auction outcome, provided only one object is licensed. When multiple objects (licenses) are auctioned to such bidders, the outcome is much less clear. Depending on whether the bidders (firms) compete in strategic complements or substitutes and whether the market uncertainty is about demand or supply, the resulting externality can be positive or negative. This, in turn, affects whether the monopoly case (one license) generalizes to oligopoly case, and if not what else the outcome can be. We will identify and study the strategic effect, which is responsible for such result.
7. **Do Auctions Select Efficient Firms?** Although the preceding examples, where the externality results from bidders' attitudes towards risk, are quite representative, the most striking results are obtained when the bidders that have heterogeneous cost compete in an aftermarket. We will see that it is not always true that the most cost-efficient firms win the auction. Even more, we will see that sometimes the winning firms are the firms that are the most cost-ineffective. Here we meet again the same strategic effect.
8. **Avoiding inefficiencies of negative externalities.** Economic literature has identified several reasons why the second price auction and its multi-unit generalizations fail to ensure the efficient allocations. These are entry fees, negative externalities and correlation, signaling issues, asymmetries between the bidders. We will see that in the presence of all these aspects, there is a simple mechanism, which works very similar to

the second price auction, and which is always efficient. Its key feature is the possibility for the bidders to signal their types before the auction rather than during it.

9. **How Not to Auction.** Practitioners are very creative in inventing very complex and obscure mechanisms that, in their view, should have avoided some of the downsides of the standard auctions. Typically, these auctions do not allow for analytical solutions. One of such a mechanism is a simultaneous pooled auction with multiple bids and preference lists. The allocation mechanism we study has been used in practice at least twice: in The Netherlands in 2003 and in Ireland in 2005. Fortunately, this auction format is an exception because it is analytically tractable. We will see that this type of auction does not satisfy elementary desirable properties such as the existence of an efficient equilibrium.