Econ 4020: Auction Theory and Practice

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University of Virginia

Course Outline

Opening Remark

This is an incomplete draft of the syllabus. I will update it as we go on so keep an eye on this document. Meanwhile, read this entire course outline carefully! (This document consists of 3 pages.) Any items, rules, requirements in this course outline may be subject to changes. When this happens I will announce it during the lecture. Announcements in the lecture supersede any information contained in this course outline.

Course Description

Auction Theory and Practice: Auction is a widely used (and an ancient) method used to buy and sell both goods and services. Consider an individual who wants to sell her used car. How should she sell? Should she bargain with potential buyers, or should she post a take-it-or-leave-it price? Or should she use auction? In the span of this course we will show that in fact using auction is (in all likelihood) the best the seller can do. But should the seller set a minimum price below which she commits not sell? If so, what should this minimum price be? There are different kinds of auction formats, e.g. first-price auction where the winner pays her bid and the second-price auction where the winner pays the second-highest bid. So what kind of auction format should the seller choose? It turns out in many relevant cases it does not matter - both lead to the same (expected) revenue for the seller. Now turn the table and consider a potential buyer who goes to online auction sites such as eBay cars to buy a second hand car. She can see few active bidders who are also interested in the same car. What should she bid? How does her bid change with the number of competitors?

So even when the seller does not know how much each buyer is willing to pay for the product/service the seller can guarantee good revenue by exploiting the competition among the buyers. Auction is also used in procurement, where a buyer, usually a government solicits bids from sellers who are willing to sell the product or provide the service. For example, consider the state of Virginia who wants to construct and maintain highways and solicits bids from many construction companies. What should be the auction rules that guarantee that the state of VA selects the most efficient construction company? Now suppose the state also wants to guarantee a minimum quality of the roads. Presumably high quality roads cost more, ceteris paribus. How should the auction rules change to reflect this dual objective? Competition among bidders, which is the key in a well designed auction rule, can be rendered ineffective if the bidders come together and collude. Collusion often leads to higher cost of procurement and inefficient outcome. How will this possibility of collusion affect the auction rules? Are some auction formats easier to collude than others?

The objective of this class is to study Auction Theory as an application of Game Theory with Incomplete Information with an objective of finding answers to these questions.

Textbook/Lectures/Papers

There is no textbook written that is appropriate for us, so learning will be based on three things:

1. My lecture notes (posted in UVACollab).

2. Research papers in the area (UVACollab).

3. Some online lab experiments. (More on this later).

There is a book called "Auction: Theory and Practice," by Paul Klemperer. Click HERE to access it. I will also expect you to know basic statistics. A good introductory book is "Introductory Statistics," Sheldon Ross.

Lectures

There will be two lectures each week. You are expected to attend all of them. Lectures will be held on Tuesday and Thursday in Monroe 110 from 9:30 am-10:45 am.

Instructor and TA

Place and time for office hours.

Name	Gaurab Aryal	Alex Gross
Role	Instructor	TA
	Monroe 334	Monroe Basement
Office Hours	Tuesday	Wednesday
	5:00 pm–6:00 pm, or by appointment	10:00 am–12:00 pm
E-mail	aryalg@virginia.edu	asg3hm@virginia.edu

Grading Policy

The breakup of your final grade (in percentage is as follows): Assignments - problem sets and review of papers (30%), Midterm (March 17th, 30%) and the Final exam (TBD, 40%). There will be four to six problem sets during the semester. No late problem sets will be accepted. The problem sets are due on Fridays by 12 pm. You **must** leave the assignment inside Alex's mailbox (basement of Monroe). Nothing else is acceptable. A default grading scale for undergraduate courses is given in http://its.virginia.edu/sis/grading/gradethresholds.html#undergraduate.

Tentative Course Outline

I expect you to be excited about auction, but that also means I expect you to be comfortable with basic game theory (Nash equilibrium in pure and mixed strategy, Bayesian Nash Equilibrium in pure and mixed strategies), some statistics (conditional density, conditional expectations, integration by parts, correlation), concepts about risk aversion and risk premium. But I also understand that you might need a refresher. Below is a tentative list of topics for this class, and how far we get depends on the pace and interest of the class. I will provide details for each of these topics as we go.

1. Revision:

   (a) Probability densities and expectation.

   (b) What is the distribution of maximum (or minimum) of two random variables?

   (c) Decision under risk.

   (d) Bayesian Nash Equilibrium for static games.

2. Independent private values

   (a) Second-price auction (SPA) or Vickery auction.

   (b) First-price auction (FPA).

   (c) Revenue equivalence theorem and applications of the theorem.

   (d) Ascending, Button, Dutch and Oral auctions and their relation to FPA and SPA.

   (e) Procurements.

   (f) Risk aversion and overbidding.

   (g) Auctions with reserve prices and finding optimal reserve prices.

   (h) Introduction to collusion in auctions.

   (i) Optimal auction design (and its connection to monopoly pricing).

   (j) What is the better for a seller: to haggle, i.e., bargain with the buyer, or to auction?

   (k) All-pay auction: war of attrition, charity auction.

   (l) Auctions with asymmetric bidders.

3. Affiliated (or correlated) values.

   (a) SPA, English auction and FPA with affiliation.

   (b) Revenue comparison.

Scholastic Dishonesty

For the purpose of this class, students may work together on homework provided the following rules are followed: any collaboration must be noted at the end of your homework and each student must individually write up each homework assignment. Identical assignments will receive a zero score. The university has strict rules in relation to academic honesty. The underlying principle is that all work submitted for assessment (assignments, reports, exams, etc.) should be your own original work. Anyone committing scholastic dishonesty on an exam will receive an F for the class. For more on this see http://www.virginia.edu/onmyhonor/honorNetscape.html.