Empirical Industrial Organization: Implementing Frontier Methodologies in Matlab

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Course Description. This seminar will cover two papers in empirical industrial organization in detail to show how frontier methodologies can be implemented in Matlab. By the end of the class, the students will be able to adapt and extend the methodologies to new problems. We will begin with the estimation of complete information, static, *discrete* games. Then, we will consider the estimation of complete information, static, game with *discrete and continuous decisions*. Each lecture will consist of two parts: in the first part we will go over selected parts of the articles, where the article makes the fundamental methodological advances; in the second part we will go in detail over how the methodological advances are actually implemented in Matlab. The unifying theme in the two papers is how to use moment inequalities to estimate models of strategic competition.

Prerequisites. Econometrics and Industrial Organization at an advanced undergraduate level. The required knowledge of these subjects is at the level of: "Econometric Analysis of Cross Section and Panel Data" by J. M. Wooldridge (2002, MIT) for econometrics and of "Industrial Organization: Markets and Strategies" by P. Bellaflamme and M. Peitz (2010, Cambridge University Press). Knowledge of programming in Matlab is recommended, but not required.

Outline and References

Day 1 Topic: Estimation of Complete Information, Static, Discrete Games.
On the first day of this course we will cover in detail the paper by Ciliberto, F. and E. Tamer (2009): "Market Structure and Multiple Equilibria in Airline Markets," *Econometrica*, 77(6), 1791-1828. This paper provides a practical method to estimate the payoff functions of players in complete information, static, discrete games. The method allows for general forms of heterogeneity across players without making equilibrium selection assumptions. The identified features of the model are sets of parameters (partial identification) such that the choice probabilities predicted by the econometric model are consistent with the empirical choice probabilities estimated from the data. We will first illustrate the basic idea behind the proposed methodology, which consists of minimizing an appropriately defined distance between the empirical choice probability of each equilibrium outcome and the smallest and largest probability that the theoretical model predicts that that equilibrium outcome can occur; then, we will investigate the type of exogenous variation needed to identify the parameters of the model; next, we will go over the simulation strategy; finally, we will go in detail over how the simulation strategy is implemented in Matlab.

Few selected references that will be covered in detail in class:
Ciliberto, Federico, Amalia Miller, Helena Skyt Nielsen, and Marianne Simonsen. 2010, "Playing the Fertility Game At Work," CEPR Discussion Paper 9429, International Economic Review, Volume 57, Issue 3, August 2016, pages 827-856.
Ciliberto, Federico, Jäkel, Ina, "Superstar Exporters: An Empirical Investigation of Strategic Interactions in Danish Export Markets," working paper.

Other key references:
Bresnahan, T., and P. Reiss (1990): "Entry in Monopoly Markets", *Review of Economic Studies*, 57, 531-553.
Berry, S. (1992): "Estimation of a Model of Entry in the Airline Industry," *Econometrica*, 60(4), 889-918.
Seim, Katja. 2006. "An empirical model of firm entry with endogenous product-type choices." *RAND Journal of Economics*, 619-640.
Tamer, E. (2003): "Incomplete Simultaneous Discrete Response Model with Multiple Equilibria," *Review of Economic Studies*, 70(1), 147-165.

Day 2 Topic: Estimation of Complete Information, Static, Games with Discrete and Continuous Choices.

On the second day of this course we will cover in detail the paper by Ciliberto, F. , Murry, C., and E. Tamer (2016): "Market Structure and Competition in Airline Markets." This paper provides an econometric framework for estimating a game of simultaneous entry and pricing decisions in oligopolistic markets while allowing for correlations between unobserved fixed costs, marginal costs, and demand shocks. Firms' decisions to enter a market are based on whether they will realize positive profits from entry. We use our framework to quantitatively account for this selection problem in the pricing stage. We estimate this model using cross-sectional data from the US airline industry. We find that not accounting for endogenous entry leads to overestimation of demand elasticities. This, in turn, leads to biased markups, which has implications for the policy evaluation of market power. Our methodology allows us to study how firms optimally decide entry/exit decision in response to a change in policy. We simulate a merger between American and US Airways and we find: i) the price effects of a merger can be strong in concentrated markets, but post-merger entry mitigates these effects; ii) the merged firm has a strong incentive to enter new markets; iii) the merged firm faces a stronger threat of entry from rival legacy carriers, as opposed to low cost carriers.

A crucial part of this class will be to go over how the simulation strategy is implemented in Matlab. The objective is to allow the students to get the methodology to the data as soon as possible.

Few selected references.

Eizenberg, Alon. 2014. "Upstream Innovation and Product Variety in the US Home PC Market*." *The Review of Economic Studies*.

Ho, Katherine. 2008. "Insurer-Provider Networks in the Medical Care Market." *American Economic Review*.

Pakes, Ariel, J Porter, Joy Ishii, and Kate Ho. 2015. \Moment Inequalities and Their Application." *Econometrica* 83:315-333.