Empirical Industrial Organization: Implementing Frontier Methodologies in Matlab

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Course Description. This seminar will over 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 dynamic models of strategic interaction with *incomplete* information, with a particular focus on discrete choice dynamic models. 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.

Grading. The final grade would be based on a research paper proposal assignment. The proposal must not exceed 5 pages and should clarify: (1 – one page) What is the research question, and why is it important? (2 – one page) Which are the two or three key references for this question? (3 – one page) What data/industry do you plan to use and why? (4 – 2 pages) What is the empirical strategy, and in particular, what are the exogenous and endogenous variables in your analysis, and what do you expect to be the biggest challenge?

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.
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.
Ciliberto, Federico, Amalia Miller, Helena Skyt Nielsen, and Marianne Simonsen. 2010, "Playing the fertility game at work." Forthcoming in the International Economic Review.
Eizenberg, Alon. 2014. \Upstream Innovation and Product Variety in the US Home PC Market*." The Review of Economic Studies.
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.

D**ay 2 Topic: Estimation of Incomplete Information, Dynamic Models of Strategic Interaction.**

We will cover the paper by Bajari P., Benkard C.L., Levin J. (2007), “Estimating Dynamic Models of Imperfect Competition,” Econometrica, Volume 75 (5), 1331–1370. This paper provides a two-step algorithm for estimating dynamic incomplete information games under the assumption that behavior is consistent with Markov perfect equilibrium and under the assumption that there is a unique equilibrium. First, the method requires that the policy functions and the law of motion for the state variables are estimated. Next, the remaining structural “dynamic” parameters are estimated under the assumption that the observed policy function used by the firms is optimal. The second step estimator is a simple simulated minimum distance estimator. We will first define Markov strategies and a Markov perfect equilibrium; then, we will go over the basic idea of this methodology and how the parameters of the models are identified; next, we will go over the simulation strategy and we will see how it is implemented in Matlab applying the methodology to the problem studied in “Optimal Replacement of GMC Bus Engines: An Empirical Model of Harold Zurcher,” by Rust J., Econometrica , Vol. 55 (5), 1987, 999-1033.

Few selected references.

Aguirregabiria, V. and Mira, P. (2002), “Swapping the Nested Fixed Point Algorithm: A Class of Estimators for Discrete Markov Decision Models,” Econometrica, 70 (4), 1519–1543.
Ericson R. and Pakes A. (1995), “Markov-Perfect Industry Dynamics: A Framework for Empirical Work,” The Review of Economic Studies , 62 (1) 53-82.
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.