ECO 2403
TOPICS IN ECONOMETRICS

Department of Economics. University of Toronto
Winter 2016

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COURSE DESCRIPTION

This course deals with the following topics in advanced econometrics.

1. (Partial) Identification of heterogeneous Treatment effects
2. Nonparametric and Semiparametric Regression Models
3. Identification and Estimation of Nonparametric Finite Mixture Models
4. Empirical Analysis of Auction Models
5. Bayesian Analysis and Markov Chain Monte Carlo

PREREQUISITES

ECO2400 and ECO2401

MEETINGS

We will have one meeting per week on **Fridays, at 2:00-4:00pm**, in **Room WW 119**.

EVALUATION

The evaluation will be based on an original research paper that each student will submit by the end of the course. The paper should be related to some of the topics covered in the course, and its main contribution can be either empirical or methodological.

Topic 1: (Partial) Identification of heterogeneous Treatment effects: Recent developments and challenges

Instructor: Ismael Mourifié

Outline

1. Introduction to Potential Outcome Model (POM).
2. Instrumental Variable (IV) estimand and LATE.
3. Local Instrumental Variable (LIV) and marginal treatment effect (MTE).
4. Sharp bounds on various treatment effects.
5. Testing IV assumptions.
6. (Partial) Identification of causal effect with Imperfect Instrument.
7. Discussion on the challenges and problems.

References:

- Chenozhukov, V., S. Lee, and A. M. Rosen (2013): "Intersection Bounds: Estimation and Inference," Econometrica, 81(2), 667–737.
- Deaton, A. S., J. J. Heckman, and G. W. Imbens (2010): Forum on the Estimation of Treatment Effects," The Journal of Economic Literature, 48, 356--455.
- Carneiro, P., Heckman, J. J., and E. Vytlacil (2011): Estimating Marginal Return to Education: American Economic Review 101, October 2011: 2754--2781.
- Imbens, G. W., and J. D. Angrist (1994): Identification and Estimation of Local Average Treatment Effects," Econometrica, 62(2), 467--475.
- Heckman, J. J., and E. Vytlacil (2005): Structural Equations, Treatment Effects, and Econometric
  Policy Evaluation," Econometrica, 73(3), 669--738.
- Heckman, J. J. (2010): Building Bridges between Structural and Program Evaluation Approaches to Evaluating Policy, Vol 48(2) 356--398.
- Heckman and Vytlacil's notes classes on Heterogenous treatment effects. (Will be sent by email to the students).
- Manski, C. F. (1990): Nonparametric Bounds on Treatment Effects, American Economic Reviews, Papers and Proceedings of the Hundred and Second Annual Meeting of the American Economic Association, 80(2), 319--323.
- Manski, C. F., and J. Pepper (2000): Monotone Instrumental Variables: With an Application to the Returns to Schooling," Econometrica, 68, 997--1010.
- Mourifie, I., M. Henry, and R. Meango (2015): Sharp Bound for the Roy Model, Unpublished manuscript.
- Mourifie and Wan (2015): (Partially) identifying potential outcome distribution in weakly

monotone non-separable triangular system: a survey. In process
- Kitagawa, T: A test for instrumental Validity, Econometrica Vol. 83 (5), 2043--2063.
- Mourifie and Wan (2014): Testing Local Average Treatment effect assumptions, Unpublished manuscript.
- Kedagni and Mourifie (2015): Sharp Instrumental Inequalities: Testing IV independence assumption, Unpublished manuscript.
- Nevo, A., and A. M. Rosen (2012): "Identification with Imperfect Instruments," The Review of The Review of Economics and Statistics, 94(3), 659--671.

Topic 2: Nonparametric and Semiparametric Regression Models

Instructor: Adonis Yatchew

Outline

1. Overview of nonparametric and semiparametric regression
2. Estimation of nonparametric, partial linear and index models
3. Treatment of endogenous variables
4. Testing procedures, constrained estimation and shape similarity
5. Models where data on derivatives are available
6. Applications and estimation in R

References:

- Yatchew, A., 2003, Semiparametric Regression for the Applied Econometrician, Themes in Modern Econometrics, Cambridge University Press
- Newey W., 2013, "Nonparametric Instrumental Variable Estimation, American Economic Review", 103:3, 550-556.
- Hall, Peter and A. Yatchew 2007: "Nonparametric Estimation When Data on Derivatives are Available", Annals of Statistics, 35:1, 300-323.
- Hall, Peter, and Joel L. Horowitz. 2005. "Nonparametric Methods for Inference in the Presence of Instrumental Variables." Annals of Statistics 33 (6): 2904–29.

Topic 3: Identification and Estimation of Nonparametric Finite Mixture Models

Instructor: Victor Aguirregabiria

Outline

1. Introduction and Examples of NPFM
2. Identification of Cross-Sectional NPFM
3. Identification and Tests for the Number of Mixtures
4. Estimation Methods for Cross-Sectional NPFM
5. Identification of Markov NPFM
6. Estimation Methods for Markov NPFM
7. Two-Step estimation of structural models and NPFM

8. The 'matching-types' identification problem

References:

- Hall, P., and X. Zhou (2003): "Nonparametric Estimation of Component Distributions in a Multivariate Mixture," Annals of Statistics, 31(1), 201-224.
- Hall, P., A. Neeman, R. Pakyari, and R. Elmore (2005): "Nonparametric Inference in Multivariate Mixtures," Biometrika , 92, 667-678.
- Allman, E. S., Matias, C., and Rhodes, J. A. (2009): "Identifiability of parameters in latent structure models with many observed variables," The Annals of Statistics, 37, 3099-3132.
- Kasahara, H., and K. Shimotsu (2014): "Nonparametric Identification and Estimation of the Number of Components in Multivariate Mixtures," Journal of the Royal Statistical Society - Series B, 76(1), 97-111.
- Kasahara, H., and K. Shimotsu (2015): "Testing the Number of Components in Normal Mixture Regression Models," Journal of the American Statistical Association (Theory and Methods), forthcoming.
- Kasahara, H., and K. Shimotsu (2009): "Nonparametric Identification of Finite Mixture Models of Dynamic Discrete Choices," Econometrica, 77(1), 135-175.
- Bonhomme, S., K. Jochmans, and J-M Robin (2016): "Estimating Multivariate Latent-Structure Model," *Annals of Statistics*, forthcoming.
- Bonhomme, S., K. Jochmans, and J-M Robin (2016): "Nonparametric Estimation of Finite Mixtures From Repeated Measurements," *Journal of Royal Statistical Society, Series B*, forthcoming.
- Bajari, P., H. Hong, and G. Ridder (2011): "A Note on Semiparametric Estimation of Finite Mixtures of Discrete Choice Models with Application to Game Theoretic Models", International Economic Review, 52, 807-824.
- Aguirregabiria, V., and P. Mira (2015): "Identification of Games of Incomplete Information with Multiple Equilibria and Unobserved Heterogeneity," manuscript.

Topic 4: Empirical Analysis of Auction Models

Instructors: Yuanyuan Wan and Yao Luo

Outline

1. Introduction: auction types, solution concepts, parameter of interest, revenue equivalence, early parametric approaches
2. Nonparametric identification and estimation of bench mark models
3. Extensions
    a. Risk averse bidders
    b. Asymmetric bidders
    c. Unobserved auction-level heterogeneity
    d. Auction with endogenous entry
    e. Affiliated values
4. Testing in auction models

a. Testing common value against private value
b. Testing Affiliation
c. Testing exogenous participation
d. Testing Monotone bidding strategy
e. Testing Collusion
f. Testing entry model

5. Common value auctions
6. Partial identification in auction models
7. Multi-unit and multi-object auctions

References:

- Krishna, V. (2009): "Auction theory", Academic press.
- Paarsch, H. J., & Hong, H. (2006): "An introduction to the structural econometrics of auction data", MIT Press Books
- Athey, S., & Haile, P. A. (2007): "Nonparametric approaches to auctions", *Handbook of Econometrics*, 6, 3847-3965.
- Milgrom, P. R., & Weber, R. J. (1982): "A theory of auctions and competitive bidding", *Econometrica*, 1089-1122.
- Donald, S. G., & Paarsch, H. J. (1996): "Identification, estimation, and testing in parametric empirical models of auctions within the independent private values paradigm," *Econometric Theory*, 12(03), 517-567.
- Paarsch, H. J. (1992): "Deciding between the common and private value paradigms in empirical models of auctions", *Journal of econometrics*, 51(1), 191-215.
- Brendstrup, B., & Paarsch, H. J. (2006): "Identification and estimation in sequential, asymmetric, English auctions", *Journal of Econometrics*, 134(1), 69-94.
- Guerre, E., Perrigne, I., & Vuong, Q. (2000): "Optimal Nonparametric Estimation of First-Price Auctions," *Econometrica*, 68(3), 525-574.
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- Li, T., Perrigne, I., & Vuong, Q. (2000): "Conditionally independent private information in OCS wildcat auctions", *Journal of Econometrics*, 98(1), 129-161.
- Campo, S., Guerre, E., Perrigne, I., & Vuong, Q. (2011): "Semiparametric estimation of first-price auctions with risk-averse bidders", The *Review of Economic Studies*, 78(1), 112-147.
- Li, T., Perrigne, I., & Vuong, Q. (2002): "Structural estimation of the affiliated private value auction model", *RAND Journal of Economics*, 171-193.
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- Hendricks, K., Pinkse, J., & Porter, R. H. (2003): "Empirical implications of equilibrium bidding in first-price, symmetric, common value auctions", *The Review of Economic Studies*, 70(1), 115-145.
- Li, T., & Zhang, B. (2010): "Testing for affiliation in first price auctions using entry behavior", *International Economic Review*, 51(3), 837-850.
- Haile, P. A., & Tamer, E. (2003): "Inference with an incomplete model of English auctions", *Journal of Political Economy*, 111(1), 1-51.
- Jofre-Bonet, M., & Pesendorfer, M. (2003): "Estimation of a dynamic auction game", *Econometrica*, 71(5), 1443-1489.
- Hong, H., & Shum, M. (2002): "Increasing competition and the winner's curse: Evidence from procurement", *Review of Economic Studies*, 871-898.
- Jun, S. J., Pinkse, J., & Wan, Y. (2010): "A consistent nonparametric test of affiliation in auction models," *Journal of Econometrics*, 159(1), 46-54.
- De Castro, L. I., & Paarsch, H. J. (2010): "Testing affiliation in private-values models of first-price auctions using grid distributions", *The Annals of Applied Statistics*, 2073-2098.
- Liu, N., & Luo, Y. (2014): "A Nonparametric test of exogenous participation in first-price auctions".
- Luo, Y., & Wan, Y. (2015): "Integrated-quantile-based estimation for first price auction models".
- Marmer, V., Shneyerov, A., & Xu, P. (2013): "What model for entry in first-price auctions? A nonparametric approach", *Journal of Econometrics*, 176(1), 46-58.
- Marmer, V., & Shneyerov, A. (2012): "Quantile-based nonparametric inference for first-price auctions", *Journal of Econometrics*, 167(2), 345-357.
- Aryal, G., & Gabrielli, M. F. (2013): "Testing for collusion in asymmetric first-price auctions", *International Journal of Industrial Organization*, 31(1), 26-35.
- Shneyerov, A., & Wong, A. C. L. (2011): "Identification in first-price and Dutch auctions when the number of potential bidders is unobservable", *Games and Economic Behavior*, 72(2), 574-582.
- Hill, J. B., & Shneyerov, A. (2013): "Are there common values in first-price auctions? A tail-index nonparametric test", *Journal of Econometrics*, 174(2), 144-164.
- An, Y., Hu, Y., & Shum, M. (2010): "Estimating first-price auctions with an unknown number of bidders: A misclassification approach", *Journal of Econometrics*, 157(2), 328-341.
- Hu, Y., McAdams, D., & Shum, M. (2013): "Identification of first-price auctions with non-separable unobserved heterogeneity", *Journal of Econometrics*, 174(2), 186-193.
- Lu, J., & Perrigne, I. (2008): "Estimating risk aversion from ascending and sealed-bid auctions: the case of timber auction data", *Journal of Applied Econometrics*, 23(7), 871-896.
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- Haile, P. A., & Tamer, E. (2003): "Inference with an incomplete model of English auctions", *Journal of Political Economy*, 111(1), 1-51.

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- Hortacsu, A., & McAdams, D. (2010): "Mechanism choice and strategic bidding in divisible good auctions: An empirical analysis of the Turkish treasury auction market", *Journal of Political Economy*, 118(5), 833-865.
- Hendricks, K., & Porter, R. H. (2007): "An empirical perspective on auctions", *Handbook of Industrial Organization*, 3, 2073-2143.
- Kastl, J. (2011). "Discrete bids and empirical inference in divisible good auctions", *The Review of Economic Studies*, 78(3), 974-1014.
- Cassola, N., Hortaçsu, A., & Kastl, J. (2013): "The 2007 subprime market crisis through the lens of European central bank auctions for short-term Funds", *Econometrica*, 81(4), 1309-1345.
- Hortaçsu, A., & Kastl, J. (2012): "Valuing dealers' informational advantage: a study of Canadian Treasury auctions", *Econometrica*, 80(6), 2511.
- Hickman, B. R., Hubbard, T. P., & Sağlam, Y. (2012): "Structural econometric methods in auctions: A guide to the literature", *Journal of Econometric Methods*, 1(1), 67-106.

Topic 5: Bayesian Analysis and Markov Chain Monte Carlo

Instructor: Martin Burda

Outline

1. Fundamentals of Probability and Bayesian Analysis
2. Hierarchical Modeling
3. Nonparametric Infinite Mixture Models
4. Posterior Asymptotics and Bernstein von Mises Theorem
5. Model Diagnostics
6. Markov Chain Monte Carlo
7. Hamiltonian Monte Carlo
8. Sequential Monte Carlo and Particle Filtering

References:

- Berger, J. O. (1993): "Statistical Decision Theory and Bayesian Analysis", Springer.
- Brooks, S., Gelman, A., Jones, G. L., and Meng, X.-L. (2011): "Handbook of Markov Chain Monte Carlo", Chapman & Hall/CRC.
- Geweke J. (2005): "Contemporary Bayesian Econometrics and Statistics", Wiley.
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- Durham, G., and Geweke, J. (2014): "Adaptive Sequential Posterior Simulators for Massively Parallel Computing Environments", in *Advances in Econometrics*, vol. 34, 1-44, Poirier, D. and Jeliazkov, I. (eds), Emerald Group Publishing Limited.
- Geweke, J., and Amisano, G. (2011): "Hierarchical Markov Normal Mixture Models with Applications to Financial Asset Returns", *Journal of Applied Econometrics*, 26(1), 1-29.
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- Neal, R. M. (2003): "Slice Sampling", *Annals of Statistics,* 31 (3): 705–767.
- Norets, A., and Pelenis, J. (2014): "Posterior Consistency in Conditional Density Estimation by
- Covariate Dependent Mixtures," *Econometric Theory*, 30(3), 606-646.

SCHEDULE OF LECTURES

WEEK	DATE	TOPIC
Week 1:	Fri. Jan. 15	Topic 1: Identification of heterogeneous Treatment effects
Week 2:	Fri. Jan. 22	Topic 1: Identification of heterogeneous Treatment effects
Week 3:	Fri. Jan. 29	Topic 2: Nonparametric & Semiparametric Regression
Week 4:	Fri. Feb. 5	Topic 2: Nonparametric & Semiparametric Regression
Week 5:	Fri. Feb. 12	Topic 3: Nonparametric Finite Mixture Models
Week 6:	Fri. Feb. 19	Topic 3: Nonparametric Finite Mixture Models
Week 7:	Fri. Feb. 26	Winter Break
Week 8:	Fri. Mar. 4	Topic 4: Empirical Analysis of Auction Models
Week 9:	Fri. Mar. 11	Topic 4: Empirical Analysis of Auction Models
Week 10:	Fri. Mar. 18	Topic 4: Empirical Analysis of Auction Models
Week 11:	Fri. Mar. 25	Topic 4: Empirical Analysis of Auction Models
Week 12:	Fri. Apr. 1	Topic 5: Bayesian Analysis and MCMC
Week 13:	Fri. Apr. 8	Topic 5: Bayesian Analysis and MCMC