ECO 2403
TOPICS IN ECONOMETRICS

Department of Economics. University of Toronto
Winter 2018

Instructors:

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COURSE DESCRIPTION
This course deals with the following topics in advanced econometrics.
1. Nonparametric and Semiparametric Regression Models (1 week)
2. Bayesian Analysis and Markov Chain Monte Carlo (2 weeks)
3. Introduction to Inference in Partially Identified Models (2 weeks)
4. Unobserved Heterogeneity in Structural Dynamic Discrete Choice Models (4 weeks)
5. Estimation and Inference in Boundary Models (1 week)
6. Econometrics of Matching Models (2 weeks)

PREREQUISITES
ECO2400 and ECO2401

MEETINGS
We will have one meeting per week.
1. Regular class time and location: **Fridays, 2-4pm, BL327**
2. A small portion of lectures may be re-scheduled to **Thursday 1-3pm at GE106** if conflict with econometrics seminars. **Rescheduled lectures will be pre-announced.**

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. The due date of the research paper is **April, 23, 2017**.

Topic 1: 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 2: 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.
- Robert, C. (2007): "The Bayesian Choice: From Decision-Theoretic Foundations to Computational Implementation", Second Edition, Springer-Verlag.
- Burda, M., Harding, M., and Hausman, J. A. (2012): "A Poisson Mixture Model of Discrete Choice", *Journal of Econometrics*, 166(2), 184–203.
- Chib, S. and Basu, S. (2003): "Marginal Likelihood and Bayes Factors for Dirichlet Process Mixture Models", *Journal of the American Statistical Association*, 98, 224-235.
- 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.
- Kleijn, B. and van der Vaart, A.W. (2006): "Misspecification in infinite-dimesional Bayesian statistics", *Annals of Statistics*, 34, 837–877.
- Moon, H. R., and Schorfheide, F. (2012): "Bayesian and Frequentist Inference in Partially Identified Models", *Econometrica*, 80, 2, 755-782.
- 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.

Topic 3: Introduction to Inference in Partially Identified Models
Instructors: Yuanyuan Wan
Outline
1. Introduction:
    A. Motivating Examples
    B. Difference from Conventional Methods
2. Moment Inequality (MI) Models
    A. Unconditional MI models
    B. Conditional MI models
3. Sub-vector Inference
4. Specification Test
5. Bayesian and Quasi-Bayesian Approach

References

- E., Tamer, "Partial Identification in Econometrics," Annual Reviews of Economics, Vol. 2, No.1, 2010, pp. 167-195.
- Ciliberto, Federico, and Elie Tamer. "Market structure and multiple equilibria in airline markets." Econometrica 77.6 (2009): 1791-1828.

- Chernozhukov, Victor, Han Hong, and Elie Tamer. "Estimation and confidence regions for parameter sets in econometric models." Econometrica 75.5 (2007): 1243-1284.
- Imbens, Guido W., and Charles F. Manski. "Confidence intervals for partially identified parameters." Econometrica 72.6 (2004): 1845-1857.
- Andrews, Donald WK, and Gustavo Soares. "Inference for parameters defined by moment inequalities using generalized moment selection." Econometrica 78.1 (2010): 119-157.
- Bugni, Federico A. "Bootstrap inference in partially identified models defined by moment inequalities: Coverage of the identified set." Econometrica 78.2 (2010): 735-753.
- Canay, I.A. (2010): "EL Inference for Partially Identified Models: Large Deviations Optimality and Bootstrap Validity,"
- Menzel, Konrad. "Consistent estimation with many moment inequalities." Journal of Econometrics 182.2 (2014): 329-350.
- Andrews, Donald WK, and Xiaoxia Shi. "Inference based on conditional moment inequalities." Econometrica 81.2 (2013): 609-666.
- Chernozhukov, Victor, Sokbae Lee, and Adam M. Rosen. "Intersection bounds: estimation and inference." Econometrica 81.2 (2013): 667-737.
- Andrews, Donald WK, and Xiaoxia Shi. "Nonparametric inference based on conditional moment inequalities." Journal of Econometrics 179.1 (2014): 31-45.
- Romano, Joseph P., and Azeem M. Shaikh. "Inference for the identified set in partially identified econometric models." Econometrica 78.1 (2010): 169-211.
- Wan, Y. "An integration-based approach to moment inequality models." Manuscript. University of Toronto (2013).
- Kaido, Hiroaki, Francesca Molinari, and Jörg Stoye. "Confidence intervals for projections of partially identified parameters." arXiv preprint arXiv:1601.00934 (2016).
- Bugni, Federico, Ivan Canay, and Xiaoxia Shi. Inference for functions of partially identified parameters in moment inequality models. No. CWP54/15. cemmap working paper, Centre for Microdata Methods and Practice, 2015.
- Bugni, Federico A., Ivan A. Canay, and Xiaoxia Shi. "Specification tests for partially identified models defined by moment inequalities." Journal of Econometrics 185.1 (2015): 259-282.
- Beresteanu, Arie, Ilya Molchanov, and Francesca Molinari. "Sharp identification regions in models with convex moment predictions." Econometrica 79.6 (2011): 1785-1821.
- Moon, Hyungsik Roger, and Frank Schorfheide. "Bayesian and frequentist inference in partially identified models." Econometrica 80.2 (2012): 755-782.
- Kline, Brendan, and Elie Tamer. "Bayesian inference in a class of partially identified models." Quantitative Economics 7.2 (2016): 329-366.

Topic 4: Unobserved Heterogeneity in Structural Dynamic Discrete Choice Models
Instructor: Victor Aguirregabiria and Jiaying Gu
Outline
1. Introduction and examples. [1], [5], [6], [13]
2. Random effects (RE) models and methods
   a. Finite mixture – Full solution – Maximum likelihood method (Keane & Wolpin). [18]
   b. EM algorithm (Arcidiacono & Miller). [4]
   c. Nonparametric methods (Kasahara & Shimotsu). [17]
3. Fixed effects (FE) methods
   a. Sufficient statistics – Conditional MLE method in non-structural models (Chamberlain). [3], [8], [9], [10], [14], [15]
   b. Bias reduction methods in non-structural models. [7]

c. Sufficient statistics – Conditional MLE in structural models (Aguirregabiria-Gu-Luo). [2], [12]
d. Bias reduction methods structural models.
e. Identification of marginal effects and counterfactuals (Chernozhukov et al). [11], [16]

References:

[1] Aguirregabiria, V. and P. Mira (2010): "Dynamic Discrete Choice Structural Models: A Survey," *Journal of Econometrics,* 156(1), 38-67.

[2] Aguirregabiria, V., J. Gu, and Y. Luo (2017): "Sufficient Statistics for Unobserved Heterogeneity in Dynamic Structural Logit Models," manuscript.

[3] Andersen, E (1970): "Asymptotic Properties of Conditional Maximum Likelihood Estimators," Journal of the Royal Statistical Society, Series B, 32, 283-301.

[4] Arcidiacono, P., and R. Miller (2011): "Conditional choice probability estimation of dynamic discrete choice models with unobserved heterogeneity," Econometrica, 79(6), 1823-1867.

[5] Arellano, M., and S. Bonhomme (2011): "Nonlinear Panel Data Analysis", Annual Review of Economics, 3, 395-424.

[6] Arellano, M., and B. Honoré (2001): "Panel Data Models: Some Recent Developments," in J. J. Heckman and E. Leamer (eds.) Handbook of Econometrics, Volume 5, Chapter 53, North-Holland, 3229-3296.

[7] Bonhomme, S., Lamadon, T. and E. Manresa (2017), Discretizing Unobserved Heterogeneity, manuscript.

[8] Chamberlain, G. (1980): "Analysis of Covariance with Qualitative Data," Review of Economic Studies, 47(1), 225-238.

[9] Chamberlain, G. (1985): "Heterogeneity, Omitted Variable Bias, and Duration Dependence," in Longitudinal Analysis of Labor Market Data, edited by J. J. Heckman and B. Singer. Cambridge: Cambridge University Press.

[10] Chamberlain, G. (2010): "Binary response models for panel data: Identification and information," Econometrica, 78(1), 159-168.

[11] Chernozhukov, V., I. Fernandez-Val, J. Hahn, and W. Newey (2013): "Average and Quantile Effects in Nonseparable Panel Models," *Econometrica*, Vol. 81, No. 2 (March, 2013), 535–580.

[12] Chintagunta, P., E. Kyriazidou, and P. Perktold (2001): "Panel Data Analysis of Household Brand Choices," Journal of Econometrics, 103(1), 111-153.

[13] Heckman, J. (1981): "The incidental parameters problem and the problem of initial conditions in estimating a discrete time - discrete data stochastic process," in C. Manski and D. McFadden (eds.), Structural Analysis of Discrete Data with Econometric Applications. MIT Press.

[14] Honoré, B. , and E. Kyriazidou (2000): "Panel data discrete choice models with lagged dependent variables," Econometrica, 68(4), 839-874.

[15] Honoré, B. , and E. Kyriazidou (2017): "Panel Vector Autoregressions with Binary Data," manuscript. Princeton University.

[16] Honoré, B. E. and Tamer, E. (2006), Bounds on Parameters in Panel Dynamic Discrete Choice Models. Econometrica, 74: 611–629.

[17] Kasahara, H., and K. Shimotsu (2009): "Nonparametric Identification of Finite Mixture Models of Dynamic Discrete Choices," Econometrica, 77(1), 135-175.

[18] Keane, M. and K. Wolpin (1997): "The career decisions of young men," Journal of Political Economy, 105, 473-522.

Topic 5: Estimation and Inference in Boundary Models

Instructor: Yao Luo

Abstract. In structural models, when the decisions of economic agents are endogenized, their supports often change with respect to the parameters. For instance, in auction models, the maximum bid depends on the parameters of the value distribution. This violates the usual regularity conditions of maximum likelihood estimation. Similar issues also arise in other models such as the reserve wage in search models, the maximum output in frontier production functions and the range of prices and qualities offered in nonlinear pricing models.

References:

- Schmidt, Peter. "On the statistical estimation of parametric frontier production functions." The review of economics and statistics 58, no. 2 (1976): 238-39.
- Greene, William H. "On the estimation of a flexible frontier production model." Journal of Econometrics 13, no. 1 (1980): 101-115.
- Flinn, Christopher, and James Heckman. "New methods for analyzing structural models of labor force dynamics." Journal of Econometrics 18, no. 1 (1982): 115-168.
- Donald, Stephen G., and Harry J. Paarsch. "Piecewise pseudo-maximum likelihood estimation in empirical models of auctions." International Economic Review (1993): 121-148.
- Smith, Richard L. "Nonregular regression." Biometrika 81, no. 1 (1994): 173-183.
- Chernozhukov, Victor, and Han Hong. "Likelihood estimation and inference in a class of nonregular econometric models." Econometrica 72, no. 5 (2004): 1445-1480.
- Hirano, Keisuke, and Jack R. Porter. "Asymptotic Efficiency in Parametric Structural Models with Parameter-Dependent Support." Econometrica 71, no. 5 (2003): 1307-1338.
- Li, Tong. "Indirect inference in structural econometric models." Journal of Econometrics 157, no. 1 (2010): 120-128.

Topic 6: Econometrics of matching models

Instructor: Ismael Mourifié

Abstract: Many questions in economics can be fruitfully analysed in the framework of matching models, for instance: marriage market, worker–employee, college admissions, roommate assignments, market design, kidney exchanges etc. While those two-sided matching models have been widely studied in micro-theory, until recently, empirical work has lagged far behind theory in this area. I will survey some recent developments that have considerably expanded the range of matching models that can be taken to the data. I will have a stronger focus on the applications in marriage matching.

Outline

TBA

References:

- Choo, E. (2015): Dynamic Marriage Matching: An Empirical Framework," Econometrica, 83(4), 1373--1423.
- Choo-Siow (2006b): Who Marries Whom and Why?," Journal of Political Economy , 114(1), 175--201.
- Chiappori, P (2017): The Economics of love and marriage.
- Chiappori, P.-A., and B. Salanié (2015): The econometrics of matching models," Forthcoming

in the Journal of Economic Literature.
- Galichon, A., S. Kominers, and S. Weber. (2016): Costly Concessions: An Empirical Framework for Matching with Imperfectly Transferable Utility," unpublished manuscript.
- Galichon, A., and B. Salanié (2015): Cupid's Invisible Hand: Social Surplus and Identification in Matching Models," unpublished manuscript.
- Galichon. A (2017): Optimal transfer method in Economics.
- Menzel, K. (2015): Large Matching Markets as Two-Sided Demand Systems," Econometrica, 83(3), 897--941.
- Mourifié, I., A marriage matching function with flexible spillover and substitution patterns, unpublished manuscript.
- Mourifié, I., and A. Siow (2017): The Cobb Douglas Marriage Matching Function: Marriage matching with peer effects," unpublished manuscript.
- Peski, Marcin (2017): Utility and entropy in social interactions, unpublished manuscript.

SCHEDULE OF LECTURES

WEEK	DATE	TOPIC
Week 1:	Fri. Jan. 5	Topic 1: Nonparametric & Semiparametric Regression
Week 2:	Fri. Jan. 12	Topic 3: Bayesian Analysis and MCMC
Week 3:	Fri. Jan. 19	Topic 3: Bayesian Analysis and MCMC
Week 4:	Fri. Jan. 26	Topic 2: Inference in Partially Identified Models
Week 5:	Fri. Feb. 2	Topic 2: Inference in Partially Identified Models
Week 6:	Fri. Feb. 9	Topic 4: Unobserved Heterogeneity in Structural DDC Models
Week 7:	Fri. Feb. 16	Topic 4: Unobserved Heterogeneity in Structural DDC Models
Week 8:	Fri. Feb. 23	Topic 4: Unobserved Heterogeneity in Structural DDC Models
Week 9:	Fri. Mar. 2	Topic 4: Unobserved Heterogeneity in Structural DDC Models
Week 10:	Fri. Mar. 9	Topic 5: Estimation and Inference in Boundary Models
Week 11:	Fri. Mar. 16	Topic 6: Econometrics of Matching Models
Week 12:	Fri. Mar. 23	Topic 6: Econometrics of Matching Models

Note: Some lectures may be rescheduled to Thursdays and will be announced in advance.