

Advanced Econometrics I

Nonparametric and Semiparametric Methods & Panel Data Models

Lectures: Tue. and Thu., 11:30am – 1:00pm, 171 Lorch
Instructor: Yoonseok Lee (365C Lorch Hall, 615-0177, yoollee@umich.edu)
Office Hours: Tue. 2:00pm – 4:00pm or by appointment

Course Description¹

This is a graduate level advanced course in econometrics. Accompanying with Econ 679, this course is designed for students planning to take the field exam in econometrics. The pre-requisites are Econ 600, 671 and 672 or their equivalents. Knowledge of linear algebra and graduate level of statistics and econometrics is essential.

This is a course in econometric theory introducing the statistical foundation of the nonparametric and semi-parametric models in econometrics. Recent developments in panel data models are also covered. The course involves a development of the asymptotic distribution theory in depth. Selected current research topics will be also covered depending on time and interest.

The class web page is available at <http://ctools.umich.edu>. Announcements and additional reading materials will be posted there, so make sure to visit the site frequently.

Course Requirements

The main requirement of this course is four problem sets (50%) and the final exam (50%). The due date of each problem set will be announced when it is posted; no late submissions will be accepted. Students can form study groups and collaborate with other students to work on problem sets. You have to, however, write up and submit your own solutions. *The final exam is scheduled on Monday, April 23, 1:30pm - 3:30pm, in the regular class room.*

¹If you believe you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Office of Services for Students with Disabilities to help us determine appropriate accommodations. I will treat any information you provide as private and confidential.

Textbooks

There is no required textbook for the course. The following references, however, will be frequently cited during the lecture. Additional readings will be provided during the lecture.

- [A] ARELLANO, M. (2003). *Panel Data Econometrics*, Oxford University Press.
- [HL] HÄRDLE, W., AND O. LINTON (1994). Applied Nonparametric Methods, *Handbook of Econometrics*, R. Engel and D. McFadden, eds., Vol. 4, p.2295-2339.
- [HMSW] HÄRDLE, W., M. MÜLLER, S. SPERLICH, AND A. WERWATZ (2004). *Nonparametric and Semiparametric Models*, Springer.
- [HS] HSIAO, C. (2003). *Analysis of Panel Data*, 2nd ed., Cambridge University Press.
- [PU] PAGAN, A. AND A. ULLAH (1999). *Nonparametric Econometrics*, Cambridge University Press.
- [P] POWELL, J. (1994). Estimation of Semiparametric Models, *Handbook of Econometrics*, R. Engel and D. McFadden, eds., Vol. 4, p.2443-2521.
- [W] WOOLDRIDGE, J. (2002). *Econometric Analysis of Cross Section and Panel Data*, MIT Press.

Pagan and Ullah (1999) will be the main reference for the non-/semi-parametric model part; Arellano (2003) and Hsiao (2003) will be the main reference for the panel model part. Härdle, Müller, Sperlich and Werwatz (2004) discusses non-/semi-parametric models in less technical language than Pagan and Ullah (1999). The handbook chapters by Härdle and Linton (1994) and Powell (1994) briefly summarize non-/semi-parametric models. Wooldridge (2002) is a standard Econ 672 level textbook but it is also a good reference for panel data models.

All those books are on reserve at the Shapiro Science Library and the handbook chapters can be downloaded from www.sciencedirect.com/science/handbooks/15734412.

Course Outline

I. Nonparametric Models

1. Nonparametric Density Estimation ([HMSW] Ch 3; [PU] Ch 2; [HL] Ch 2, 4): Kernel Density Estimators, Asymptotic Properties of the Kernel Density Estimator, Choice of Smoothing Parameters, Multivariate Kernel Density Estimators
2. Nonparametric Regression Estimation ([HMSW] Ch 4; [PU] Ch 3, 4; [HL] Ch 3): Kernel Estimators, Local Polynomial Estimators, Series Estimators, k -Nearest Neighbor Estimators, Spline Estimators, Choice of Smoothing Parameters, Confidence Intervals, Nonparametric Estimation of Derivatives

II. Semiparametric Models

1. Single Index Models and Average Derivative Estimator ([HMSW] Ch 6; [PU] Ch 5; [HL] Ch 6)
2. Partially Linear Models ([HMSW] Ch 7; [PU] Ch 5; [HL] Ch 6)
3. Additive Models ([HMSW] Ch 8; [PU] Ch 5; [HL] Ch 6)
4. Other Examples ([PU] Ch 7-9; [P] Ch 3): Semiparametric Discrete Choice Models (Maximum score estimator, Maximum rank correlation estimator, Efficient semiparametric binary choice estimator), Semiparametric Censored and Truncated Regression Models (Censored least absolute deviations estimator)
5. Additional Topics*: Nonparametric Specification Test, Semiparametric Efficiency

III. Panel Data Models

1. Static Panel Regression Models ([A] Ch 1-5; [HS] Ch 3): Unobserved Heterogeneity; Fixed Effect Models (First-difference vs. With-transformation, Robust standard error estimation); Random Effect Models (FGLS, QMLE, Between-group and Within-group decomposition); Choosing Between FE and RE Models (Hausman test)
2. Dynamic Panel Regression Models ([A] Ch 6; [HS] Ch 4): Review of Time Series; Initial Conditions; Within-Group Estimation (Nickell bias, Bias correction); First-Difference and GMM Estimation (Unit root problem, Empirical likelihood vs. GMM); Large N and T Asymptotics
3. Nonlinear Panel Models ([HS] Ch 7, 8): Panel Binary Choice Models, Panel Limited Dependent Variable Models
4. Cross Sectional Dependence*: Factor Structure, Spatial Econometrics

*(Note: * These topics will be covered if time permits.)*