

Prof. Xiaodong Liu

Office: ECON 202
Voice: 303-492-7414
Email: xiaodong.liu@colorado.edu

Location: ECON 5
Meeting Times: TTH 12:30-1:45
Office Hours: TTH 10:30-12:00

Course Description:

This is the second course of the sequence Econ 8828-8838. Built on the fundamental concepts and tools covered in Econ 8828, the first half of this course introduces the M-estimators and their application in discrete choice models and multivariate models. The second half of the course introduces the theory of stochastic processes with the corresponding laws of large numbers and central limit theorems for dependent processes, and its application in time series and spatial analysis.

Prerequisite: Econ 8828.

Text:

1. Davidson, R. and J. G. Mackinnon, 2004, *Econometric Theory and Methods*.
2. Davidson, J., 1994, *Stochastic Limit Theory*.
3. Davidson, J., 2000, *Econometric Theory*.

Assessment:

There will be a midterm exam, a final exam, and periodic problem sets.

1. Homework assignments (20%)
2. Midterm examination (40%)
3. Final Examination (40%)

Tentative Course Outline:

Part I M-Estimators

1. The Generalized Method of Moments
 - a. GMM estimators for linear regression models
 - b. HAC covariance matrix estimation
 - c. Tests based on the GMM criterion function
 - d. GMM estimators for nonlinear models
 - e. The method of simulated moments

2. The Method of Maximum Likelihood
 - a. Asymptotic properties of ML estimators
 - b. The covariance matrix of the ML estimator
 - c. Hypothesis testing
 - d. The asymptotic theory of the three classical tests
 - e. ML estimation of models with autoregressive errors
3. Discrete and Limited Dependent Variables
 - a. Binary response models
 - b. Models for unordered multiple choices
 - c. Models for count data
 - d. Models for censored and truncated data
 - e. Sample selectivity
 - f. Duration models
4. Multivariate Models
 - a. Seemingly unrelated linear regressions
 - b. Systems of nonlinear regressions
 - c. Linear simultaneous equations models
 - d. Nonlinear simultaneous equations models
5. Methods for stationary time-series data
 - a. Autoregressive and moving-average processes
 - b. Single-equation dynamic models
 - c. Vector autoregressions

Part II Stochastic Processes

1. Theory of Stochastic Processes
 - a. Stochastic Processes and Dependence
 - i) Basic concepts and convergence
 - ii) Independence and stationary
 - iii) Ergodicity and mixing
 - iv) Strong and uniform mixing
 - b. Mixing
 - i) Mixing sequences and mixing inequalities
 - ii) Sufficient conditions for strong and uniform mixing

- c. Martingales
 - i) Sequential conditioning and martingale convergence
 - ii) Martingale inequalities
- d. Mixingales and Near-Epoch Dependence (NED)
- 2. Laws of Large Numbers
 - a. Stochastic Convergence
 - b. Weak and Strong LLNs for Stochastic Processes
 - i) Weak LLNs for martingales and mixingales
 - ii) Strong LLNs for martingales and mixingales
 - iii) NED and mixing processes
 - c. Uniform Stochastic Convergence
 - i) Stochastic equicontinuity
 - ii) Uniform LLNs
- 3. Central Limit Theorems
 - a. Martingales
 - b. Mixing and NED
 - c. Bernstein's Blocking Method
- 4. Spatial Dependence
 - a. Spatial Autoregressive (SAR) Models
 - b. Spatial Mixing and NED

University Policies:

University policies regarding classroom behavior are available at <http://www.colorado.edu/policies/classbehavior.html> and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

Information regarding the University Honor Code is available at <http://www.colorado.edu/policies/honor.html> and at <http://www.colorado.edu/academics/honorcode>. The Honor Code Council can be contacted by email at honor@colorado.edu or by telephone at 303-725-2273.

University policies regarding disabilities are available at <http://www.colorado.edu/disabilityservices>. Disability Services can be contacted by telephone at 303-492-8671, or in person at Willard 322.

University policies regarding religious practice are available at http://www.colorado.edu/policies/fac_relig.html.

University policies regarding Sexual Harassment and Amorous Relationships are available at <http://www.colorado.edu/odh/>. The Office of Discrimination and Harassment can be reached by telephone at 303-492-2127. The Office of Judicial Affairs can be reached at 303-492-5550.