University of Colorado - Department of Economics
Econ 8828 - Seminar in Econometrics - Fall 2015
Professor Carlos Martins-Filho

Office. Economics Building 105

Meetings. Tuesdays and Thursdays from 2:00 PM - 3:15 PM in ECON 5.

Office hours. Tuesdays 3:15 PM - 5:15 PM and by appointment. For appointment send an email to carlos.martins@colorado.edu.

Class URL. http://spot.colorado.edu/∼martinsc/Econ_8828.html

Prerequesites. ECON 7828 (or equivalent) or consent of instructor.

Objectives. This is the first course of the sequence Econ 8828-8838. This sequence is the core of a Ph.D. field in Econometrics. The course objectives are:

- to introduce you to the fundamental tools and concepts from probability theory needed for a rigorous study of the limiting properties of estimators for parametric and nonparametric statistical/econometric models

- to provide a general asymptotic characterization of a broad set of parametric estimators commonly used in econometrics, including method of moments, minimum distance, least squares and maximum likelihood.

- to introduce you to nonparametric estimators for density and regression

Grades. Your course grade depends on four homework sets and a final examination. Relevant dates are given below.

Evaluation	Points	Date
Homework sets	70	TBA in class
Final examination	30	December 17, 1:30 PM - 4:00 PM

Support and Reference Books.

A. Mathematics, Probability, Statistics and Asymptotic Theory

1. Apostol, T., 1974, Mathematical Analysis, Addison Wesley, New York.

2. Bartle, R., 1966, Elements of Integration, John Wiley and Sons, New York.

3. Davidson, J., 1994, Stochastic Limit Theory, Oxford University Press, Oxford.

4. Jacod, J. and P. Protter, 2000, Probability Essentials, Springer, Berlin.

5. Resnick, S. I., 2005, A Probability Path, Birkhauser, Boston.

B. Econometrics and Statistics

1. Amemiya, T., 1985, Advanced Econometrics, Harvard University Press, Cambridge, MA.

2. Davidson, R. and MacKinnon, J. G., 2003, Estimation and Inference in Econometrics, Oxford University Press.

3. Newey, W. and McFadden, D., 1994, Large sample estimation and hypothesis testing. In Handbook of Econometrics IV, R. Engle and D. McFadden Editors, Chapter 36.

4. Tsybakov, A., 2009, Introduction to Nonparametric Estimation, Springer, New York.

5. van der Vaart, A., 1998, Asymptotic Statistics, Cambridge University Press, Cambridge.

6. I will distribute class notes. Read them carefully. They reflect my view of what are the most important concepts and results we cover in the course.

Topics.

1. Probability

   (a) Probability spaces
   (b) Continuity of probability measures
   (c) Conditional probability, independence and Bayes Theorem
   (d) Borel-Cantelli Lemma
   (e) Construction of probability measures: π and λ systems, Dynkin's Theorem
   (f) The distribution function induced by a probability measure

2. Random elements

   (a) Measurable functions and random elements
   (b) Probability measures induced by random elements
   (c) σ-algebras generated by random variables
   (d) Independent random variables

3. Expectation

   (a) Measurability Theorem
   (b) Expectation of simple functions and extensions to general functions
   (c) Properties of expectations
       i. Monotone convergence theorem
       ii. Inequalities: Modulus, Markov's, Chebyshev's
       iii. Dominated convergence theorem
   (d) Riemann vs. Lebesgue integral
   (e) Product spaces and joint measures
   (f) Conditional expectation
   (g) Radon-Nikodym derivative

4. Convergence

   (a) Almost sure convergence
   (b) Convergence in probability
   (c) L_p convergence

(d) Uniform integrability

(e) Moment inequalities: Schwartz's, Hölder's, Minkowski's, Jensen's, Lyapounov's

(f) Convergence in distribution

    i. Scheffé's Lemma

    ii. Skorohod's Theorem

    iii. Delta method and the Continuous Mapping Theorem

    iv. Characteristic functions: uniqueness and continuity theorems

    v. Portmanteau Theorem

(g) Weak Law of Large Numbers for IID sequences

(h) Central Limit Theorem for IID sequences

(i) Convergence of Moments

(j) Lindeberg-Feller Theorem

5. Parametric models

(a) Identification

(b) Loss functions and Extremum (M) estimation

    i. Linear and nonlinear least squares (LS)

    ii. Maximum likelihood (ML)

    iii. Method of moments (MM)

    iv. Minimum distance (MD)

(c) Z-estimation

(d) Consistency: LS, ML, MM, MD

(e) Stochastic equicontinuity and uniform convergence

(f) Asymptotic Normality: LS, ML, MM, MD

(g) Estimation of Covariances of Asymptotic Distributions

(h) Asymptotic Efficiency

(i) Feasible estimation

(j) Two-Step estimation

6. Hypothesis testing for parametric models

(a) Basic concepts: level, asymptotic power functions, relative efficiency

(b) Likelihood ratio tests

(c) Wald and Score tests

7. Nonparametric and semiparametric models

(a) Kernel density and distribution estimation

(b) Kernel regression estimation

(c) Partially linear regression models

Important information.

- If you qualify for accommodations because of a disability, please submit a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail dsinfo@colorado.edu.

  If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with me.

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  See full details at www.colorado.edu/policies/fac_relig.html.

- Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See polices at www.colorado.edu/policies/classbehavior.html. and at www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code.

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