University of Colorado - Department of Economics
Econ 7818 - Mathematical Statistics for Economists - Fall 2019
Professor Carlos Brunet Martins-Filho

Office. Economics Building 105

Meetings. Tuesdays and Thursdays from 9:30 AM - 10:45 AM in ECON 119.

Office hours. Tuesdays 3:00 PM - 4:30 PM and by appointment. For appointment send an email to carlos.martins@colorado.edu.

Class URL. http://spot.colorado.edu/~martinsc/Brunet/7818.html

Pre-requesites. Successful completion of ECON Math Camp or consent of instructor.

Objectives. This is the first course of your first year two-course Ph.D. sequence in Econometrics. The course objectives are:

- to introduce you to fundamental tools and concepts from probability and asymptotic theory needed for a rigorous study of the limiting behavior of estimators and test statistics that emerge form the study of statistical/econometric models
- if time permits, to introduce you to the classical linear regression model and accompanying estimators and test statistics

Grades. Your course grade depends on your performance in four homework sets, a midterm and a final examination. Relevant dates and points are given below.

Evaluation	Points	Date
Homework sets	40	TBA in class
Midterm examination	20	October 22, in class
Final examination	40	December 14, 1:30 PM - 4:00 PM

Support material and reference books.

A set of class notes are available for this course. They will be available as PDFs on the class website. Study them carefully. In addition, the following books have very good presentations of some of the material we will cover.

A. Mathematics, Probability 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. Dhrymes, P., 1989, Topics in Advanced Econometrics: Probability Foundations, Springer Verlag, New York.
5. Grimmett, G.R. and D.R. Stirzaker, 1992, Probability and Random Processes, Oxford University Press, Oxford.

6. Jacod, J. and P. Protter, 2000, Probability Essentials, Springer, Berlin.
7. Resnick, S. I., 2005, A Probability Path, Birkhauser, Boston.

B. Econometrics

1. Amemiya, T., 1985, Advanced Econometrics, Harvard University Press, Cambridge, MA.
2. Davidson, J., 2000, Econometric Theory, Blackwell Publishers, Oxford, UK.
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.

Topics.

1. Probability
   (a) Probability spaces
   (b) Construction of probability measures and their properties
   (c) Distribution functions
   (d) Continuity of probability measures
   (e) Conditional probability and independence of events
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) Integration and expectation of random elements
   (b) Properties of expectations
   (c) Lebesgue's monotone and dominated convergence theorems
   (d) Independence and expectation
   (e) Markov's inequality
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. Skorohod's Theorem
      ii. Delta method and the Continuous Mapping Theorem
      iii. Characteristic functions: uniqueness and continuity theorems

iv. Portmanteau Theorem

(g) Laws of Large Numbers for IHD sequences

(h) Central Limit Theorems for IHD sequences

5. Conditional expectation

6. Linear regression models

(a) Identification

(b) Loss functions and Extremum (M) estimation

i. Least squares (LS)

ii. Maximum likelihood (ML)

iii. Method of moments (MM)

(c) Consistency and limiting distributions: LS, ML, MM

(d) Asymptotic Efficiency

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.

- Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, if the midterm, final or homework due dates prevent/inhibit you from exercising your rights to religious observance, please inform me by August 28, 2012 so that reasonable accommodations can be made.

  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.

- All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at www.colorado.edu/policies/honor.html and at www.colorado.edu/academics/honorcode/.

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