University of Colorado - Department of Economics
Econ 7818 - Mathematical Statistics for Economists - Fall 2020
Professor Carlos Brunet Martins-Filho

Meetings. Class meetings will be held remotely, via Zoom, Tuesdays and Thursdays 9:35 AM - 10:50 AM. You will receive an email with a Zoom meeting invitation for each class meeting. All of our meetings will be recorded. You should have your **video turned on** and your **audio turned off**, except of course, when you want to ask a question or when you respond to a question I have asked.

Starting on the second week of this course there will be in-person weekly recitations conducted by Joseph Fry - the Teaching Assistant for this class. The time and location for these recitations will be announced by the end of the first week of classes. Attendance is expected and strongly encouraged.

Office hours. Office hours will be held remotely, via Zoom, Fridays 12:30 PM - 3:00 PM. You will receive an email with a Zoom meeting invitation to join me for office hours. Office hours will not be recorded. If you need an appointment outside these hours send an email to carlos.martins@colorado.edu and I will try to accommodate your request.

Class URL. This course has a Canvas page where you will find this syllabus, class notes, homework sets and recordings of every class meeting. Consult the Canvas page regularly.

Prerequisites. 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 meetings
Midterm examination	20	October 22
Final examination	40	December 13, 7:30 PM - 10:00 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

Important information.

- 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.

- As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements, and public health orders in place to reduce the risk of spreading infectious disease. Required safety measures at CU Boulder relevant to the classroom setting include:

  - maintain 6-foot distancing when possible,
  - wear a face covering in public indoor spaces and outdoors while on campus consistent with state and county health orders,
  - clean local work area,
  - practice hand hygiene,
  - follow public health orders, and
  - if sick and you live off campus, do not come onto campus (unless instructed by a CU Healthcare professional), or if you live on-campus, please alert CU Boulder Medical Services.

  Students who fail to adhere to these requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policies on COVID-19 Health and Safety and classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please see the ?Accommodation for Disabilities? statement on this syllabus. Before returning to campus, all students must complete the COVID-19 Student Health and Expectations Course. Before coming on to campus each day, all students are required to complete a Daily Health Form. Students who have tested positive for COVID-19, have symptoms of COVID-19, or have had close contact with someone who has tested positive for or had symptoms of COVID-19 must stay home and complete the Health Questionnaire and Illness Reporting Form remotely. In this class, if you are sick or quarantined, please inform me via email.

- 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 29, so that reasonable accommodations can be made. See full details at

  www.colorado.edu/policies/fac_relig.html.

- The University of Colorado at Boulder is committed to maintaining a positive learning, working, and living environment. The University of Colorado does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. (Regent Law, Article 10, amended 11/8/2001). The University of Colorado at Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this The University of Colorado at Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, or veteran status. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://hr.colorado.edu/dh/

- 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 http://honorcode.colorado.edu.