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Duke University
Department of Economics
Federico A. Bugni

ECON 703 - Fall 2013
First year graduate econometrics

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1 Contact information

My contact information is as follows:

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> *Homepage:* http://www.econ.duke.edu/∼fb32
> *Office hours:* Tu 3:00pm-5:00pm or by appointment

The TAs of the course are:

> Dan Lee, *E-mail:* dan.lee@duke.edu
> Nicolas-Aldebrando Benelli, *E-mail:* nicolas.aldebrando.benelli@duke.edu
> *Office hours:* (tentative) Dan: Mon 3:00PM-4:00PM, Nicolas: Fr 1:30PM-2:30PM

2 Class time and place

> *Lectures:* Tu,Th 10:05am-11:20am in Social Sciences 136
> *TA sessions with Dan:* Th 6:15PM-7:05PM in Social Sciences 113
> *TA sessions with Nicolas:* Th 7:30PM-8:20PM in Perkins LINK 2-071 Classroom 5
> *Course website:* https://sakai.duke.edu/portal

3 Course Description

Econ 703 is the first course in the graduate sequence in econometrics. The course is composed of two parts: statistics and econometrics. In the first part, statistics, we introduce the necessary tools and techniques that are essential in econometric analysis. In the second part, econometrics, we study the estimation and inference of a several well-known econometric models and estimators. In this process, we will make extensive use of the statistical tools and techniques developed in the first part of the course.

4 References

4.1 Statistics

- Main reference: Casella and Berger (2002) (referred to as "CB").

- Additional references: Billingsley (1995), Resnick (1999), Rice (1995).

4.2 Econometrics

- Main reference: Hayashi (2000) (referred to as "H").

- Additional references: Amemiya (1985), Wooldridge (2002), Stock and Watson (2007), Greene (2012).

5   Grading scheme

- The final course grade is the result of: problem sets (10%), midterm exam (30%), final exam (60%).

- Midterm exam (Tentative!): Thursday, October 17, 10:05am - 11:20am, in the lecture classroom.

- Final exam: Thursday, December 12, 2:00pm - 5:00pm, in the lecture classroom.

6   Problems sets

- There will be a problem set (approximately) every week.

- The problem sets are (typically) due on Thursday before the TA section.

- The problems sets will be discussed in TA sections.

- You are encouraged to work on the problems sets in groups, but individual solutions sets are required.

- The problem sets will contain both theoretical and empirical questions. You are free to use any statistical/econometric software available for empirical questions.

7   Overview of the course

1. Statistics:

   (a) Probability theory, conditional probability, Bayes' theorem, law of total probability, independence
       CB: Chapter 1.1-1.3

   (b) Random variables, distribution functions: joint, conditional, marginal
       CB: Chapter 1.4-1.6, 4

   (c) Properties of random variables: expectation, variance, other moments, independence, correlation
       CB: Chapter 1.5-1.6, 2

   (d) Some selected distributions
       CB: Chapter 3, 4

   (e) Introduction to inference: finite sample inference and large sample inference
       CB: Chapter 5

   (f) Large sample inference
       CB: Chapter 5, 10.1

   (g) Estimators: consistency, asymptotic normality, efficiency, and asymptotic efficiency
       CB: Chapter 7

   (h) An estimator: maximum likelihood estimator (MLE)
       H: Chapters 7, 8

   (i) Hypothesis testing: introduction
       CB: Chapter 8

   (j) Trinity in hypothesis testing: Lagrange multiplier, Wald, and likelihood ratio tests
       CB: Chapter 8.2.1 for Likelihood Ratio test and Engle (1984)

2. Econometrics:

(a) Classical linear regression theory
   H: Chapter 1

(b) Small sample results for the linear regression model
   H: Chapter 1

(c) Large sample results for the linear regression model
   H: Chapter 2

(d) Generalized method of moments (GMM): identification, consistency, asymptotic distribution
   H: Chapter 3

(e) Extremum estimators: identification, consistency, asymptotic distribution
   H: Chapter 7 and McFadden and Newey (1994)

8 Some final remarks...

- This plan (structure of the course, dates, problem sets, required readings, etc.) is subject to revisions.

- Class participation is considered mandatory. Modifications to the plan will be announced in class.

References

AMEMIYA, T. (1985): *Advanced Econometrics*, Harvard University Press.

BILLINGSLEY, P. (1995): *Probability and Measure*, John Wiley and Sons, Inc.

CASELLA, G. AND R. L. BERGER (2002): *Statistical Inference*, Duxbury.

ENGLE, R. F. (1984): "Wald, likelihood ratio, and Lagrange multiplier tests in econometrics," vol. 2 of *Handbook of Econometrics*, chap. 13, 775–826.

GREENE, W. (2012): *Econometric Analysis: Seventh Edition*, Prentice Hall.

HAYASHI, F. (2000): *Econometrics*, Princeton University Press.

MCFADDEN, D. AND W. NEWEY (1994): "Large sample estimation and hypothesis testing," vol. 4 of *Handbook of Econometrics*, 2111–2245.

RESNICK, S. I. (1999): *A Probability Path*, Birkhauser.

RICE, J. (1995): *Mathematical Statistics and Data Analysis*, Wiley.

STOCK, J. AND M. WATSON (2007): *Introduction to Econometrics*, Pearson Education, Inc., 2nd edition ed.

WOOLDRIDGE, J. (2002): *Econometric Analysis of Cross Section and Panel Data*, MIT Press.