

**USC, Fall 2014**

**Econ 611, Probability and Statistics**

## **1 Instructor**

Instructor

Geert Ridder

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Office hours: Thu 12-1pm or by appointment.

TA

This class will have no TA

## **2 Organization of the course**

There are two lectures: Tuesday and Thursday, 10-11.50pm in KAP 147

There will be weekly assignments that do not count towards the grade. I will post answers to the assignments. We will discuss questions that you may have about the problems and posted answers.

The grade for this course will be based on a midterm (50%) and a final (50%). The date and time of the final will be posted on the USC website. The date of the midterm is Thursday October 9 during class.

This course has a web site on blackboard. I will post lecture notes, assignments etc. on the site.

## **3 Textbook**

You have a choice of two textbooks

George Casella and Roger L. Berger

Statistical Inference

Duxbury Press, ISBN 0-534-11958-1

or

Larry Wasserman  
All of Statistics  
Springer, ISBN 0-387-40272-1

I will not follow either of these books to the letter, but you should have a reference. These books appeal to different audiences. Casella and Berger is comprehensive and has more material, but some of you may prefer the more direct and concise approach of Wasserman.

In the probability theory part of the course the level of discussion will be more advanced than in either book. If you need another source besides my lecture notes you may consult

Jeffrey S. Rosenthal  
A First Look at Rigorous Probability Theory, Second Edition  
World Scientific, ISBN 981-270-370-5

Those of you with a strong math background may find it useful to study

David Pollard  
A User's Guide to Measure Theoretic Probability  
Cambridge University Press, ISBN 0-521-00289-3

I will provide a full set of lecture notes.

## 4 Brief overview

This course gives an introduction to probability theory and mathematical statistics. This is not a course on data analysis. The goal is to provide the necessary background for subjects that require knowledge of probability and statistics. Obviously, econometrics is such a subject, but economic theory also relies on probability and statistics, as it often considers behavior under uncertainty. Knowledge of advanced calculus is a prerequisite. I will also use mathematical analysis concepts, and you will have a real advantage in this course if you have taken real analysis. For instance, you should know what open and closed sets of real numbers/vectors are. Some of the distribution theory will use matrix/vector multiplication and some other elementary matrix operations.

The course consists of two parts. The first part gives an introduction to probability theory. I will deviate from the usual rather informal treatment of that subject and introduce it using the mathematical theory of measure and integration. Some knowledge of measure and integration theory is important to understand the asymptotic approximations that are extensively used in econometrics and other fields.

The second part of the course deals with mathematical statistics. The emphasis is on concepts and not on recipes. Probability theory is about the description and analysis of probability models, while mathematical statistics is about learning about a probability model using data generated by that model. By the end of the course you should understand the concepts of sampling and sampling distributions and how these concepts are used in statistical inference, i.e. the learning of features of the assumed probability model.

Overview of lectures

1. An introduction to probability theory
2. Random variables and expectation
3. Densities and distributions
4. Independence
5. Conditioning
6. Special probability distributions
7. Sampling and sampling distributions
8. Summarizing sample data
9. Point estimation
10. Hypothesis testing and confidence intervals