ECON 7330— Quantitative Economic Analysis: Probability and Statistics

Instructor: Bent E. Sørensen
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webpage: the class webpage will be accessible from my home-page: www.uh.edu/~bsorense

TA: The TA is Hanieh nasrollahi (haniehnasrollahi1996@gmail.com)

Hours: By appointment, preferably by email. It is essential for serious study that you ask me or the
TA when something seems unclear to you. **University Required Notes:**

Mental Health and Wellness Resources:
The University of Houston has a number of resources to support students mental health and o
The Student Health Center offers a Psychiatry Clinic for enrolled UH students. Call 713-743-
The A.D. Bruce Religion Center offers spiritual support and a variety of programs centered
Need Support Now?
If you or someone you know is struggling or in crisis, help is available. Call CAPS crisis s

Academic Honesty Policy:
High ethical standards are critical to the integrity of any institution, and bear directly

Title IX/Sexual Misconduct:
Per the UHS Sexual Misconduct Policy, your instructor is a responsible employee for reportin

Reasonable Academic Adjustments/Auxiliary Aids:
The University of Houston is committed to providing an academic environment and educational

Excused Absence Policy:
Regular class attendance, participation, and engagement in coursework are important contribu
Recording of Class
Students may not record all or part of class, livestream all or part of class, or make/distr

Learning Outcomes:

- Students will learn, through lectures, homeworks, and TA-sessions, to master probability and
  statistical theory at a level that, in conjunction with other core-classes, enables the students
  to read research articles in leading journals.

- Students will develop their mathematical maturity to the level expected in graduate economics
  programs.

- Students will develop the methods of probability theory that are necessary in order to do independent research in most fields of specialization within economics.

Course Description:

Readings:

Textbooks: Bruce Hansen: Probability and Statistics for Economists, Princeton University Press 2022. I plan follow the book quite closely, but I may also post notes.

This book is written by an econometrician and it therefore aims directly at preparing you for econometrics. In terms of difficulty it is somewhat uneven—it aims to cover the statistics that economists *should* know, whether it is "hard" or not. You need to understand the concepts covered in class—it is less essential that you understand every word in the book. (Do NOT read material that we don't cover.)

You may also consult other books, for example, William Greene: Econometric Analysis. Prentice-Hall. (This is a mainstream econometrics book used numerous places as the main introduction to graduate econometrics. One major goal of the course is to give you the background for texts like that. The book has introductory chapters the list the statistical theory underlying econometrics—the theory this class covers. Greene's summary may be a useful compact source to consult.) There are also "classic" books on statistics written for beginning statisticians, ask if want some suggestions.

Notes Supplementary notes may (likely will) be posted on the class webpage, where I also post homeworks and all other class information. Please give me feedback: if something seems obscure in the book, I may write a more detailed note.

Material covered: (We may deviate a little as we go along.) I go by the order of the book:

- Chapter 1, Basic Probability.Section 1.1 to 1.10 are all essential. You will encounter combinations and permutations, but I won't ask you to derive them.

- Chapter 2, Random Variables is what you will use during your time at UH. 2.1 to 2.18 are essential.

- Chapter 3, Distributions. The Normal is absolutely essential. We will also thoroughly study the Bernoulli, the uniform, the exponential, the log-normal, the binomial (Meaning that I expect you to know the densities/distribution functions). Other distributions you should know is the chi-square, the F-, the t-distribution, the extreme value distribution, and others. Some we will mention, some we need to know more how to use, but not remember the densisty.

- Chapter 4, Multivariate Distributions. In particular, you have to know the Normal multivariate distribution and the concepts of marginal and conditional distributions. Also, the law of iterated expectations is essential.

- Chapter 5, Normal and Related Distributions. We will do most of 5.1-5.9, which is all essential for testing in the linear OLS model in econometrics.

- Chapter 6. Sampling. 6.1-6.14.

- Chapter 7. Somewhat briefly. It is super important that you know "the" Law of Large Numbers (LLN). (There are several versions, but for applied work, this is not usually paid attention to.)

- Chapter 8. Somewhat briefly. It is super important that you know "the" Central Limit Theorem (CLT). (There are several versions, but for applied work, this is not usually paid attention to.)

- Chapter 10. Maximum Likelihood in detail. 10.1-10.15.

- Chapter 13. Hypothesis testing. Concepts of size and power.

Grading and assignments: There will be 2 midterms, a final, and 6–8 homework assignments. Grades will be based on the mid-terms (20% each), home-works (20%), and a final (40%).

General advice: Make sure you understand the material after each topic is covered (don't suffer from the illusion that you will understand it better when exam-time draws near). If the point of some topic is not clear, ask questions in class and *see me in my office*—this is part of good study habits and without good study habits graduate studies don't go far. You can also email questions to me. There really is only one dumb question, and that is the un-asked question. Why spend hours on something the teacher may be able to clear up in 2 minutes? I could go on, but you should consider it your duty to yourself to seek advice.