

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/~bsorensen

TA: The TA is Xiaolin Yang, (xyang52@CougarNet.UH.EDU)

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.

Required Language for All Courses

Mental Health and Wellness Resources:

The University of Houston has a number of resources to support students mental health and overall wellness, including CoogsCARE and the UH Go App. UH Counseling and Psychological Services (CAPS) offers 24/7 mental health support for all students, addressing various concerns like stress, college adjustment and sadness. CAPS provides individual and couples counseling, group therapy, workshops and connections to other support services on and off-campus. For assistance visit uh.edu/caps, call 713-743-5454, or visit a Lets Talk location in-person or virtually. Lets Talk are daily, informal confidential consultations with CAPS therapists where no appointment or paper-work is needed. Need Support Now? If you or someone you know is struggling or in crisis, help is available. Call CAPS crisis support 24/7 at 713-743-5454, or the National Suicide and Crisis Lifeline: call or text 988, or chat 988lifeline.org.

Title IX/Sexual Misconduct

Per the UHS Sexual Misconduct Policy, your instructor is a responsible employee for reporting purposes under Title IX regulations and state law and must report incidents of sexual misconduct (sexual harassment, non-consensual sexual contact, sexual assault, sexual exploitation, sexual intimidation, intimate partner violence, or stalking) about which they become aware to the Title IX office. Please know there are places on campus where you can make a report in confidence. You can find more information about resources on the Title IX website at <https://uh.edu/equal-opportunity/title-ix-sexual-misconduct/resources/>. Reasonable Academic Adjustments/Auxiliary Aids The University of Houston is committed to providing an academic environment and educational programs that are accessible for its students. Any student with a disability who is experiencing barriers to learning, assessment or participation is encouraged to contact the Justin Dart, Jr. Student Accessibility Center (Dart Center) to learn more about academic accommodations and support that may be available to them. Students seeking academic accommodations will need to register with the Dart Center as soon as possible to ensure timely implementation of approved accommodations. Please contact the Dart Center by visiting the website: <https://uh.edu/accessibility/> calling (713) 743-5400, or emailing jdcenter@Central.UH.EDU. The Student Health Center offers a Psychiatry Clinic for enrolled UH students. Call 713-743-5149 during clinic hours, Monday through Friday 8 a.m. - 4:30 p.m. to schedule an appointment. The A.D. Bruce Religion Center offers spir-

itual support and a variety of programs centered on well-being. The Center for Student Advocacy and Community (CSAC) is where you can go if you need help but don't know where to start. CSAC is a home away from home and serves as a resource hub to help you get the resources needed to support academic and personal success. Through our Cougar Cupboard, all students can get up to 30 lbs of FREE groceries a week. Additionally, we provide 1:1 appointments to get you connected to on- and off-campus resources related to essential needs, safety and advocacy, and more. The Cougar Closet is a registered student organization advised by our office and offers free clothes to students so that all Coogs can feel good in their fit. We also host a series of cultural and community-based events that fosters social connection and helps the cougar community come closer together. Visit the CSAC homepage or follow us on Instagram: @uh_CSAC and @uhcupbrd. YOU belong here.

Women and Gender Resource Center

The mission of the WGRC is to advance the University of Houston and promote the success of all students, faculty, and staff through educating, empowering, and supporting the UH community. The WGRC suite is open to you. Stop by the office for a study space, to take a break, grab a snack, or check out one of the WGRC programs or resources. Stop by Student Center South room B12 (Basement floor near Starbucks and down the hall from Creation Station) from 9 am to 5 pm Monday through Friday.

Academic Honesty Policy

High ethical standards are critical to the integrity of any institution, and bear directly on the ultimate value of conferred degrees. All UH community members are expected to contribute to an atmosphere of the highest possible ethical standards. Maintaining such an atmosphere requires that any instances of academic dishonesty be recognized and addressed. The UH Academic Honesty Policy is designed to handle those instances with fairness to all parties involved: the students, the instructors, and the University itself. All students and faculty of the University of Houston are responsible for being familiar with this policy.

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability. Recording of Class Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that

you need to record class-related activities, please contact the Justin Dart, Jr. Student Accessibility Center. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructors recordings for their own studying and notetaking. Instructors recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

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. You are supposed to know what has been taught in class and only what has been taught in class, so do not get bogged down in sections or even paragraphs that I did not cover.

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. (You may want to consult other books, but do NOT read material that we don’t cover, unless you feel that you are so far ahead that you can absorb non-exam stuff.)

Other much-used 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.

AI: You can use ChatGPT or similar if you want—it is sometimes pretty useful—but if I ask

in a homework to explain something (rather than solve), you have to use your own words. There will be no AI available for you for the exams. (It can also be wrong sometimes.)

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 density.
- 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.