3818 - Introduction to Statistics
Summer 2015 Online
Syllabus/Course Information

Course Description

Econ 3818 is a first course in the theory and methods of statistics. Applications will be taken from topics in economics, and other areas. Both simulated and real data will be used in these examples.

Instructor

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Teaching Assistant

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Instructor Short Biographies

Donald Waldman is a professor in the Economics Department. Both his teaching and research concentrate on statistical methods (econometrics) and applied microeconomics (environmental economics, nonmarket valuation, labor economics, industrial organization). He has taught the classroom version of this course many times.

Ben Zhang is an advanced Ph. D. student in the Economics Department. He has taken the statistics/econometrics course offerings of the Department, some with Professor Waldman.

Prerequisites

The most important background to bring into this course is ability to think abstractly. In addition, students will find it easier if they have a good understanding of algebra at the level of high school Algebra II. Differential and integral calculus play a smaller role in

that comprise an introductory statistics course.[1] Unlike a classroom lecture, where each lecture must be the same length of time, the segments will vary in length depending upon the topic. They should be watched sequentially. The recordings can be started and stopped at will, so that you will be able to view as long or as little as you like and repeat sections if necessary.

Quizzes and problem sets will follow groups of segments, and will be due each day, Tuesday through Friday. There will be two recitations per week, using online video conferencing software (Zoom.us), hosted by the course teaching assistant. During the recitation sessions material will be presented relevant to the problem sets, and questions can be answered about the problem sets.

Course Outline

The following is a list of topics/segments, by week. This list may be useful for you to see where we are in the text, but I expect it will have little meaning to you at this point.

Week 1

- Research in “Hard” and “Soft sciences
- Introduction to probability. Axioms; Venn diagrams
- Addition and complement rules of probability
- Conditional probability
- Tree diagrams
- Independence and mutual exclusivity
- Bayes' law
- Urn problems
- Bayes' Law for partitions

Week 2

- Random variables and probability distributions
- Discrete random variables; the probability mass function
- Bernoulli, binomial, and Poisson random variables
- Mathematical expectation
- Expectation of a function of random variables; variance
- Continuous random variables; the probability density function
- The power, exponential, and standard normal distribution
- Bivariate, marginal, and conditional distributions
- Conditional expectation and variance
- Covariance and correlation

[1] I am a pretty good lecturer (you are free to disagree at the end of the course), but a pretty lousy film editor. The videos for this course were not professionally recorded. Rather they are actual, live classroom recordings (for the most part), then edited by me. Please excuse occasional pauses (for example, where I edited out student questions), some starting and stopping, some problems, and other gaffs. The content is all good. Thanks.

Week 3

- The general normal distribution
- From probability to statistics - population and sample
- Sampling theory - the distribution of the sample mean
- The Central Limit Theorem
- The chi-squared distribution
- Point estimation
- Unbiasedness as a property of an estimator
- Relative efficiency and best (minimum variance estimation)
- Examples from portfolio theory
- Comparing biased and unbiased estimators--mean-squared error
- Maximum likelihood estimation
- Confidence intervals

Week 4- hypothesis testing

- Introduction - the State of Nature and the outcome of a test
- Type I and Type II errors. The power of the test
- Testing hypotheses about the population mean - classical method
- p-value and the p-value method of testing hypotheses
- Using confidence intervals
- Testing hypotheses about the population proportion
- Some caveats in testing hypotheses

Week 5- the classical, normal, linear regression model

- Model specification and assumptions
- Estimation and hypothesis testing

Student Responsibilities/Assessment

This is a one-semester course in statistics. In a typical 15 week semester, there are three 50 minute lectures, which means there are 15 weeks 3 lectures/week 50 minutes/lecture # #&! minutes of lecture time. This summer session course is five weeks long, with nominally four days of "contact" time per week. Therefore, if you wish to view the lectures only on Monday - Thursday each of the five weeks, this would require you to view # #&!Î& , %Ñ œ ""#Þ& minutes of lecture each day.

In addition, in my experience, for a student with average mathematical ability and background, an additional hour to an hour and a half per day will be required to read the text and work out assignments to fully understand the course material.

Assessment

Like many courses but unlike, perhaps, a "topics-in something" course, this course is sequential in nature. That is, Week 2 material will likely be unintelligible unless Week 1 material has been mastered. In fact, Wednesday's segments may not make sense unless Monday's and Tuesday's segments have been viewed and understood.

Therefore, to make understanding material easier, answers to quizzes and problem sets will be made available shortly after their due date and time. This means strict deadlines on when quizzes, and problem sets (and midterms) can be completed. All of this is another way of saying:

this is not a "self-paced" course!

To get credit for assignments, they must be done in the allotted time window.

There will be:

- Four 10 minute, multiple choice quizzes each week. The quiz for material covered Monday must be completed by 11 am Tuesday, after which solutions will be available. The quiz for material covered on Tuesday must be completed by 11 am on Wednesday, and again, after that time, solutions will be available. Similarly for Wednesday's and Thursday's quizzes.

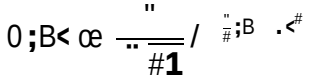
- Four problem sets per week. The problem set for material covered Monday and Tuesday must be completed by 11 pm on Friday, after which solutions will be available. The problem set for material covered Wednesday and Thursday must be completed by 11 pm on Sunday, and again after that time solutions will be available.

- Three online midterm exams, one each at the conclusion of weeks two, three, and four.

- A comprehensive online final exam given after the last day of class.

Submitting Written Work :

All written work: final and midterm exams, and problem sets, will be completed either using a word processor or hand-written, then scanning to a .pdf file and uploading to the course Dropbox before the due date and time. Since much of your written assignments will require mathematical notation, for example



Students with Disabilities and the Honor Code

Notice for students with disabilities

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and www.Colorado.EDU/disabilityservices

Disability Services' letters for students with disabilities indicate legally mandated reasonable accommodations. The syllabus statements and answers to Frequently Asked Questions can be found at www.colorado.edu/disability services

Honor Code Policies

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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 http://www.colorado.edu/policies/honor.html and at http://www.colorado.edu/academics/honorcode/