

Syllabus - Economics 310

Course Description

Economics 310 is a semester long course in probability and statistical inference. Probability is a branch of mathematics which provides us with a method of reasoning about uncertain environments. During the first half of the course, we will study both probability theory and applications of the theory to portfolio selection and gambling, among other topics.

The theory of statistical inference provides the basis for the rigorous analysis and interpretation of numerical data obtained through random samples. The second half of the course will be spent learning how the basic tools of statistical inference work and how to use them, what information statistical testing does and does not provide, and how to be sensitive to statistical abuse and misrepresentation.

Prerequisites

The main prerequisite for is Mathematics 221 or 211 (first-semester calculus). For the most part we will not use mathematics beyond high school algebra, although we will use basic calculus on a few occasions. The main mathematical challenges will arise through our use of mathematical notation and reasoning to talk about probabilistic concepts and statistical procedures. The ability to use mathematics as a language for reasoning about the world is one of the primary skills to be developed in this class.

Reading Materials

The textbook for this class is

William H. Sandholm and Brett Saraniti (2017). *Vital Statistics: Probability and Statistics for Economics and Business*. Preliminary edition. Oxford University Press.

It is available at the University Bookstore.

Readings and Problem Sets

The class is divided into nine units. The topics to be covered, readings, and problem sets for each unit are listed on the next two pages. The chart on the last page shows which lectures correspond to which units. All but the last problem set will be turned in for credit, and the due dates for the problem sets are listed on the chart on the last page. Problem sets can be turned in one lecture late for half-credit. A number of the problem sets will require you to use Microsoft Excel workbooks for some problems.

Exams

There will be a two-hour midterm covering probability and a two-hour final that emphasizes statistics. You are allowed to bring one sheet of paper containing notes to each exam. The midterm is on Monday, October 30 in the evening, and the final is on Friday, December 15 from 2:45–4:45.

If you know that you have a conflict with an exam time and let me know a week in advance, we can try to reschedule the exam at a time which will work for you, and you can still bring a note sheet into the exam. On the other hand, if there is a last-minute emergency which requires you to miss the exam, you can still take it late, but in this case you may not use a note sheet.

Grading

Problem sets will count for 20% of the course grade, with the weight on each problem set being proportional to the length of the unit. The midterm will count for 35% of the course grade, and the final for 45%.

Contact information

The Economics 310 website is

<http://www.ssc.wisc.edu/~whs/teaching/310>

My office is 7436 Social Science. You can reach me by e-mail at whs@ssc.wisc.edu or by phone at 263–3858. My office hours are on Tuesdays and Thursdays from 2:45 to 3:45 and by appointment.

TA Information

Our TAs for this class are Srinivas Arigapudi, Annie Lee, and Diwakar Raisingh.

Srinivas Arigapudi

Sec. 303 (W 4:00-5:55, 5231 SS)

Sec. 305 (Fr 7:45-9:40, 6101 SS)

office hours: W 2:00-3:00, Th 4:00-5:00

office: 6413 SS

arigapudi@wisc.edu

Diwakar Raisingh

Sec. 302 (Tu 4:00-5:55, 6232 SS)

Sec. 306 (Mo 4:00-5:55, 6228 SS)

office hours: M 11:00-12:00 and 2:30-3:30

office: 6435 SS

raisingh@wisc.edu

Annie Lee

Sec. 301 (Th 4:00-5:55, 6240 SS)

Sec. 304 (Fr 1:20-3:15, 6101 SS)

office hours: F 11:00-1:00

office: 6473 SS

soyeon.lee@wisc.edu

Course Outline

Unit 1: (2.5 lectures)

Reading: Ch. 2: Probability models

Problem set: 1: 2.1.2; 2: 2.2.2; 3: 2.2.8; 4: 2.2.9; 5: 2.2.10; 6: 2.3.1; 7: 2.3.2; 8: 2.3.6;
9: 2.4.3; 10: 2.4.4; 11: 2.4.6; 12: 2.4.9; 13: 2.5.2; 14: 2.5.3; 15: 2.5.6; 16: 2.5.8;
17: 2.5.9; 18: 2.6.2; 19: 2.M.3

Unit 2: (4 lectures)

Readings: Ch. 3: Random variables
Ch. 4: Multiple random variables

Problem set: 1: 3.1.3; 2: 3.1.4; 3: 3.2.2 (by hand); 4: 3.2.5; 5: 3.3.4; 6: 3.3.5; 7: 3.3.6;
8: 3.4.3; 9: 3.4.4; 10: 3.4.5; 11: 3.4.10; 12: 3.4.11; 13: 4.1.1; 14: 4.1.2;
15: 4.1.3; 16: 4.1.4; 17: 4.1.8; 18: 4.1.9; 19: 4.1.10; 20: 4.2.1; 21: 4.2.7;
22: 4.3.2; 23: 4.3.3; 24: 4.3.4; 25: 4.3.5; 26: 4.4.1; 27: 4.4.2; 28: 4.4.4;
29: 4.M.5; 30: 4.M.8

Unit 3: (4 lectures)

Readings: Ch. 5: Bernoulli trials processes and discrete distributions
Ch. 6: Continuous random variables and distributions

Problem set: 1: 5.1.1; 2: 5.1.2; 3: 5.1.3; 4: 5.2.3; 5: 5.2.4; 6: 5.2.6; 7: 5.3.2; 8: 5.3.6;
9: 5.3.11; 10: 5.4.2; 11: 5.4.5; 12: 5.4.6; 13: 5.4.7; 14: 5.M.2; 15: 6.2.1;
16: 6.2.4; 17: 6.3.1; 18: 6.3.3; 19: 6.3.5; 20: 6.3.9; 21: 6.3.10; 22: 6.4.2;
23: 6.4.4; 24: 6.4.7; 25: 6.4.9; 26: 6.5.2; 27: 6.5.3; 28: 6.6.4; 29: 6.6.6;
30: 6.6.7; 31: 6.M.7

Unit 4: (2.5 lectures)

Readings: Ch. 7: The central limit theorem
Sec. 8.1: Poisson distributions and the Poisson limit theorem

Problem set: 1: 7.1.3; 2: 7.2.1; 3: 7.2.2; 4: 7.2.3; 5: 7.3.2; 6: 7.3.3; 7: 7.3.4; 8: 7.4.1;
9: 7.4.2; 10: 7.4.3; 11: 7.6.2; 12: 7.6.4; 13: 7.6.5; 14: 8.1.2; 15: 8.1.5;
16: 8.1.7; 17: 8.1.8

Unit 5: (2 lectures)

Readings: Ch. 9: The psychology of probability
Ch. 10: How to lie with statistics

Problem set: 1: 9.Q.1; 2: 9.Q.5; 3: 9.Q.8; 4: 9.C.4; 5: 9.C.5; 6: 9.C.8; 7: 10.C.8;
8: 10.C.9; 9: 10.C.10; 10: 10.C.14; 11: 10.C.15; 12: 10.C.20

Unit 6: (2.5 lectures)

Readings: Ch. 12: Descriptive statistics
Ch. 13: Probability models for statistical inference
Ch. 14: Point estimation

Problem set: 1: 12.2.1; 2: 12.2.2; 3: 12.2.3; 4: 12.2.5; 5: 13.C.1; 6: 13.C.5; 7: 13.C.6;
8: 13.C.7; 9: 14.1.1; 10: 14.1.4; 11: 14.2.2; 12: 14.2.4; 13: 14.2.6; 14: 14.3.1;
15: 14.3.3; 16: 14.3.6; 17: 14.4.1; 18: 14.4.3; 19: 14.4.5

Unit 7: (2.5 lectures)

Reading: Ch. 15: Interval estimation and confidence intervals

Problem set: 1: 15.2.1; 2: 15.2.2; 3: 15.2.7; 4: 15.2.9; 5: 15.2.10; 6: 15.3.1; 7: 15.3.2;
8: 15.3.5; 9: 15.4.2; 10: 15.4.5; 11: 15.4.6; 12: 15.4.7; 13: 15.5.4; 14: 15.5.5;
15: 15.6.3; 16: 15.M.1

Unit 8: (3.5 lectures)

Reading: Ch. 16: Hypothesis testing

Problem set: 1: 16.2.1; 2: 16.2.4; 3: 16.2.5; 4: 16.3.1; 5: 16.3.2; 6: 16.3.3; 7: 16.3.5;
8: 16.3.6; 9: 16.3.11; 10: 16.4.3; 11: 16.4.4; 12: 16.4.8; 13: 16.5.1; 14: 16.5.2;
15: 16.5.4; 16: 16.5.5; 17: 16.6.1; 18: 16.6.2; 19: 16.6.3; 20: 16.7.2; 21: 16.7.3;
22: 16.7.4; 23: 16.7.6; 24: 16.7.7; 25: 16.7.9; 26: 16.7.10; 27: 16.7.11

Unit 9: (2.5 lectures)

Readings: Ch. 19: Simple regression: descriptive statistics
Sec. 18.4: Causal inference: treatment effects (time permitting)

Problem set: 1: 19.1.1 (by hand); 2: 19.1.2; 3: 19.1.3; 4: 19.2.1; 5: 19.2.3; 6: 19.3.2;
7: 19.3.3; 8: 19.3.6; 9: 19.4.1; 10: 19.4.2; 11: 19.4.5; 12: 19.4.6; 13: 19.5.1;
14: 19.5.3; 15: 19.5.5; 16: 19.5.6; 17: 18.4.2; 18: 18.4.3; 19: 18.4.4

Course Schedule

Tuesday	Thursday
	Sept. 7: Unit 1
Sept. 12: Unit 1	Sept. 14: Units 1–2
Sept. 19: Unit 2 Problem set 1 due	Sept. 21: Unit 2
Sept. 26: Unit 2	Sept. 28: Units 2–3
Oct. 3: Unit 3 Problem set 2 due	Oct. 5: no lecture
Oct. 10: Unit 3	Oct. 12: Unit 3
Oct. 17: Units 3–4	Oct. 19: Unit 4 Problem set 3 due
Oct. 24: Unit 4	Oct. 26: Unit 5 Problem set 4 due
Oct. 31: Unit 5	Nov. 2: Unit 6 Problem set 5 due
Nov. 7: Unit 6	Nov. 9: Units 6–7
Nov. 14: Unit 7 Problem set 6 due	Nov. 16: Unit 7
Nov. 21: Unit 8 Problem set 7 due	
Nov. 28: Unit 8	Nov. 30: Unit 8
Dec. 5: Units 8–9	Dec. 7: Unit 9 Problem set 8 due
Dec. 12: Unit 9	

Midterm: Monday, Oct. 30, evening

Final: Friday, Dec. 15, 2:45–4:45