Probability and Statistical Inference for Economists

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Classroom and Schedule:
OSH 132, T. H. 12:25 - 1:45 pm
Office Hours: By Appointment

Course Description:

We will study distribution, probability and statistical inference based on the following topics: (random) variables, probability distributions, sampling distribution, estimators, confidence intervals, hypothesis testing and regression. Prerequisite for this course is College Algebra (Math 1090 preferred), Principles of Micro and Macroeconomics (Econ 2010 and 2020), or the instructor's consent.

This course fulfills the "Quantitative Reasoning B" (QB) General Education Requirement.

Essential Learning Objectives targeted by this course include the following**:**

- **Quantitative Literacy**: (1) Interpretation: teaches how to interpret different types of graphs (for example, pie chart, bar graph, histogram), numerical summaries of data (for example, proportion, mean, median, variance, standard deviation), and statistical test results (for example, hypothesis tests about means, proportions). (2) Representation: teaches how to construct appropriate graphical and numerical summaries of data and how to present estimates and test results. (3) Estimation: teaches the theoretical foundations of statistical estimation and how to use a sample to construct the estimates. (4) Application: i) teaches how to distinguish between different types of variables, so that they can use appropriate summaries and estimates for analysis; and ii) teaches the strengths and limitations of the estimations, so that they can apply them judiciously. (5) Communication: teaches how to present statistical results in simple language so that it can be communicated to a general audience.

- **Problem Solving**: (1) Defining Problems: The assignments teach how to systematically define a problem for statistical analysis. The students are required to state the objective of an analysis in very precise terms (example, gender based comparison of academic performance of ECON majors). They are also required to identify the following before embarking on the analytical process: the unit of analysis (for example it can be individual, firm, country), the attributes of the units that need to be analyzed, and the nature of attributes (quantitative or categorical). (2) Identifying Strategies: teaches students to identify appropriate graphical and numerical analytical strategies based on the problem description and the nature of the variables. (3) Generating Solutions: teaches students to appreciate that there exist several ways of addressing a question. For example, for a hypothesis testing one can construct different alternative hypotheses and the result can depend upon the way the hypothesis is stated. (4) Selecting Solutions: teaches students to select the solution approach that best suits their problem description. (5) Evaluating Outcomes: emphasizes the need to interpret the statistical results in the broader context that requires synthesis of reasoning from varied perspectives.

- **Foundation and Skills for Lifelong Learning**: promotes "foundations and skills for lifelong learning". The applied examples engages students' curiosity and motivation by providing an opportunity for students to explore a topic of their own choice. The assignments and in-class discussions promote independence of thought, transfer of skills, and reflection for interpreting statistical information in varied contexts and from varied perspectives.

Course Materials

The classes will be operated by presentation files (powerpoint) and lecture notes (pdf) provided by the instructor so that you will download them from CANVAS (https://learn-uu.uen.org). In addition, there are optional textbooks: David S. Moore, George P. McCabe, Layth Alwan, and William M. Duckworth, *The Practice of Statistics for Business and Economics*, 3rd edition, W. H. Freeman, 2010 (or David S. Moore, George P. McCabe, William M. Duckworth and Layth Alwan, *The Practice of Business Statistics*, 2nd edition, W. H. Freeman, 2008).

Grading and Assessment

The course grade will be based on quizzes, assignments, and three closed-book in-class exams (two midterms and final) (Quiz: 15%; Assignments: 25%; Two Midterms: 30%; and Final: 30%). The official course grade will be based on the sum of the grade you have made on quizzes, assignments and three exams. Tentative grading scale: A range $\geq$ 90; B range $\geq$ 75; C range $\geq$ 60; D range $\geq$ 50 (it is tentative and thus could be adjusted based on class performance).

Class Policies

- No late submission of assignments is allowed.
- You cannot miss an exam and take a makeup exam unless I give you permission to do so. Without my permission, you will earn a zero point on your missing exam.
- Incomplete will be given only for compelling reasons such as illness or family emergency.
- Academic misconduct such as cheating on exams (or other forms of academic dishonesty) may lead to failure of class (or expulsion from the class).
- The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

Tentative Schedule: Classes and Assignments

Wk	Date	Topic	Ch.	Note
1	1/13, 15	Intro. ; Examining Distributions	1	
2	1/20, 22	Examining Distributions	1	Last day to drop (delete) (Jan. 21)
3	1/27	Examining Distributions	1	
3	1/29	Examining Relationships	2	
4	2/3, 2/5	Examining Relationships	2	
5	2/10	Producing Data	3	
5	**2/12**	**Review for the Midterm #1**		
6	**2/17**	**Midterm #1**		
6	2/19	Probability & Sampling Distributions	4	
7	2/24, 26	Probability & Sampling Distributions	4	
8	3/3, 5	Probability Theory	5	Last day to withdraw (Mar. 6)
9	**3/10**	**Review for the Midterm #2**		
9	**3/12**	**Midterm #2**	6	
10	**3/17, 19**	**No Class**		Spring Break (Mar. 15 ~ 22)
11	3/24, 26	Introduction to Inference	6	
12	3/31, 4/2	Introduction to Inference	6	
13	4/7, 9	Inference for Distributions	7	
14	4/14, 16	Inference for Distributions	7	
15	4/21, 23	Inference for Proportions	8	
16	4/28	**Review for the Final**		
	5/1	**Final Exam** **(10:30 ~ 12:30 pm on Fri.)**		

Assignment	Chapter	Point	Due	Assignment	Chapter	Point	Due
1	1, 2, 3	8	Feb. 15 (Sun.)	3	6, 7, 8	10	April 28 (Tues.)
2	4, 5	7	Mar. 10 (Tues.)				
Quiz	Chapter	Point	Date	Quiz	Chapter	Point	Date
1	1	3	Jan. 29 (Thurs.)	4	6	3	April 9 (Thurs.)
2	2	3	Feb. 10 (Tues.)	5	7	3	April 21(Tues.)
3	4	3	Mar. 3 (Tues.)				