Probability and Statistical Inference for Economists
ECON 3640 – 001, Spring 2016
3 Credit Hours, Fulfills QB Requirement

Class meets on M & W (11:50 AM - 1:10 PM) in OSH 137

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Objective
This course introduces students to the foundations of statistical analysis. The course aims to impart the basic understanding about randomness and how to make inferences based on samples. You can find this skill useful in a wide range of contexts ranging from reading and interpreting news articles critically, becoming an educated consumer, evaluating policies, to taking more advanced classes in quantitative analysis. This course belongs to the category of Quantitative Reasoning (QR-B) courses.
At the end of the semester a successful student would be able to
- Examine a dataset and construct meaningful graphical and numerical summaries of the data using the software EXCEL
- Apply statistical inference tools based on point and interval estimation, and testing hypotheses in a wide range of contexts
- Critically evaluate statistical results and communicate the implications in simple language to a general audience

Prerequisites
College Algebra, (MATH 1090 preferred), ECON 2010 and 2020.

Suggested Textbook
David S. Moore, George P. McCabe, William M. Duckworth, Layth Alwan. *The Practice of Business Statistics*. 2nd Edition. Publisher: W H Freeman

Course evaluation components and their weights
1. *Class participation* (10% weight): You will be required to work in groups in the class and discuss or debate your interpretations.
2. *Home Assignments* (20% weight): You can expect about 4 or 5 home assignments for the course.
3. *Exams* (50% weight): There will be two exams for this course.
4. *Project* (20% weight): You are required to work on a project to apply the tools learnt in the course in a context of your choice.

Course grade criterion
A ≥ 93%, 93% > A- ≥ 90%,
90% > B+ ≥ 87%, 87% > B ≥ 83%, 83% > B- ≥ 80%
80% > C+ ≥ 77%, 77% > C ≥ 73%, 73% > C- ≥ 70%
70% > D ≥ 50%,   50% > E

Late assignments lose points. The exams must be taken at the scheduled time. When a student has a legitimate reason (documented emergency) for missing the first exam, the weight of the exam will be transferred to the second exam. Absolutely no make-up exams are given. Incompletes are not generally given for non-medical reasons.

Americans with Disabilities Act (ADA) Statement

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 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability Services. (www.hr.utah.edu/oeo/ada/guide/faculty/)

 Wellness Statement

Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness - www.wellness.utah.edu; 801-581-7776.

Topics

1. Types of variables
Quantitative
Categorical

2. Examining distributions using graphs
Ways to chart categorical data
Bar graphs
Pie charts

Ways to chart quantitative data
Histograms

Stemplots
Time plots

3. Examining distributions using summary statistics
Measures of center: mean, median
Comparing mean and median
Measures of spread: quartiles, standard deviation
Five-number summary and boxplots

4. Density curves and Normal distributions
Density curves
The mean and median of a density curve
Normal distributions
The 68-95-99.7 rule
The standard Normal distribution
Normal distribution calculations
Finding a value when given a proportion
Assessing the Normality of data

5. Examining relationships
Explanatory and response variables
Scatterplots
Correlation
Least-Squares Regression

6. Obtaining data
Sampling designs
Observation versus Experiment

Population versus sample

Sampling methods for observational data
Simple random samples
Stratified samples

Design of experiments (*optional topic*)
Comparative experiments
Randomization
Completely randomized designs
Matched pairs designs
Block designs

Ethics for experimental data (*optional topic*)
Institutional review boards
Informed consent
Confidentiality
Clinical trials
Behavioral and social science experiments

7. Probability theory and sampling distributions
Randomness and probability
Probability rules
Assigning probabilities
finite number of outcomes
intervals of outcomes
Random variables
Probability distributions
Mean and Variance of a random variable
Sampling distributions
Law of large numbers
The central limit theorem
Normal distribution
Binomial and Poisson distributions
Conditional probability

8. Point and interval estimation
 Statistical confidence
Confidence intervals
Choosing the sample size

9. Hypothesis testing
Tests for a population mean
Stating hypotheses
Test statistic, the significance level α and P-values
Two-sided tests and confidence intervals
Statistical significance vs. practical significance
Type I errors, Type II errors, and the power of a test
Comparing two means
Inference for proportions