

**Probability and Statistical Inference for Economists
ECON 3640 – 001, Spring 2014**

Class meets on M & W (3:00 PM - 4:20 PM) in OSH 277

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Office: OSH 339B, Office Hours: By Appointment
3 Credit Hours, Fulfills QB Requirement

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 test hypotheses in 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

Additional Reference

Sidney Siegel and N. John Castellan Jr. *Nonparametric Statistics for The Behavioral Sciences* (Publication Date: 1988 | ISBN-10: 0070573573 | ISBN-13: 978-0070573574 | Edition: 2)

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* (30% 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* (10% weight): You are required to work in groups to apply the tools learnt in the course in a context of your choice.

Course grade criterion

$A \geq 93\%$, $93\% > A- \geq 90\%$,
 $90\% > B+ \geq 87\%$, $87\% > B \geq 83\%$, $83\% > B- \geq 80\%$
 $80\% > C+ \geq 77\%$, $77\% > C \geq 73\%$, $73\% > C- \geq 70\%$
 $70\% > D \geq 50\%$, $50\% > E$

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, mode
 - Comparing mean and median

Measures of spread: variance, standard deviation, quartiles
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

Inference for non-Normal distributions (*optional topic*)