Probability and Statistical Inference for Economists
ECON 3640 – 002, FALL 2013
Class meets on M & W (11:50 AM - 1:10 PM) in FMAB AUD
Instructor: Dr. Haimanti Bhattacharya
Email: haimanti.bhattacharya@economics.utah.edu
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*. 2ndEdition. 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* (40% weight): There will be two exams for this course.
4. *Project* (20% 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 ≥ 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
        Inference for non-Normal distributions (*optional topic*)