

THE HELLER SCHOOL FOR SOCIAL POLICY AND MANAGEMENT
BRANDEIS UNIVERSITY
HS246b1
Statistics

Fall 2017 Half-course
(once a week for the full semester—13 meetings)

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Statistics for Managers: A Rationale

As a primary part of their work, managers constantly make decisions. Fundamentally, these decisions are all based on weighing the relevant information available. However, information is frequently derived from measures that are often quite difficult to make directly, thus introducing some degree of randomness. Even with numerous direct measures, many observed phenomena contain a random component (to a greater or lesser degree). In either case, randomness is important to managers because it means that the consequences of an action may not be predictable with certainty. Reducing randomness, understanding its size and potential impact in a management situation, is a valuable area of knowledge to which the study of statistics can contribute greatly.

Not all randomness is the same—it derives from myriad sources and can be accounted for and even reduced in various ways. Because some randomness reflects a lack of information, receiving more or better information can lessen that part of the randomness, an idea behind quality control. Although some phenomena are random, many random phenomena follow probability distributions that have systematic features. Different random processes have some well-studied probability distributions; statistical knowledge offers managers insight into these matters. Statistical models provide a way to estimate the true relationships we may theorize to exist; to inform the decisions we need to make. By incorporating the concepts of randomness, our models also include a relative degree of certainty related to results—a way for us to test if our results are ‘statistically significant’.

With randomness and uncertainty comes the very real possibility of error. We may determine that a result is ‘statistically significant’ and yet still be wrong. Even here, statistics offers a systematic way to examine how that error may come about. The models we will learn to develop and the measures we will learn to use can offer insight into how to treat the various sources of error, the probabilities of each of those errors, and ways to decide how to minimize the impacts of those errors.

Course Description: This once a week full semester module presents students with an introduction to the fundamentals of parametric statistics.¹ We will cover the essentials required for students to understand issues related to measurement and how to generate descriptive information and statistical analyses from these measurements. The intent of the course is to provide the background to understand the process of statistical model building and the course will culminate in learning how to generate multiple linear regression analyses. To this end, the focus will be primarily on understanding the importance of summary measures (most notably central tendency and dispersion), along with a study of a few fundamental statistical distributions (Z , t , χ^2 , F).

Although some initial work will be done by hand, computers are an integral part of this course and we will begin utilizing Excel immediately. I will introduce you to the basics of formulae and functions in Excel, along with a detailed explanation of the Data Analysis add-in. In addition, as part of this class we will also begin to use STATA as our statistics/data analysis package.

¹ We will touch upon a small number of non-parametric topics, but the primary focus will be as described.

MBA Program Learning Goals

This course touches on at least two of the major MBA Learning Goals, however knowledge from this course forms a basis for work done in several of the other themes.

Financial Literacy: Students will develop a financial literacy skill set that will enable them to identify, organize, and analyze quantitative and qualitative information to solve business problems.

Communication Skills: Students will be able to effectively convey knowledge and express perspectives related to management and policy issues using oral, written and multimedia forms of communication.

Course Learning Goals

A good manager must be able to understand measurement information provided and use that information in a variety of ways. Statistical analysis and model building are primary tools in this process. Upon completion of this class students will be able to:

- Identify, evaluate, modify and manipulate data
- Utilize this data for descriptive purposes by generating, analyzing and presenting a variety of univariate statistics (sum, count, minimum, maximum, mean, median, variance, standard deviation, etc.)
- Utilize this data for inferential purposes by generating, analyzing and presenting a variety of bivariate statistics (correlations, t-tests, f-tests, chi-squares, etc.)
- Utilize this data for inferential purposes by generating, analyzing and presenting simple and multiple regression models

Course Requirements: Because this module meets only once a week, it is crucial that students attend all sessions. There will be assigned problem sets (graded) for each session to be submitted electronically before the next class begins (as solution sets will be posted and discussion of the work done will comprise the first part of the next session). Students will be expected to have prepared *thoroughly* for class (reading the assigned text and completing problem sets) and can assume that they will be called upon to contribute to in-class discussions. These problem sets are a crucial aspect of this course as they provide the information needed to assess how well the material is being both conveyed and, more importantly, understood. We will have both a mid-term (in-class) and a final (take home). My expectations are that by course end students will feel comfortable presenting summary statistical information (both descriptive and inferential) and be able to present analyses using linear regression techniques.

Grading: The grade will be based upon a number of factors. Class attendance is crucial so class participation will account for 10% of the final grade. The problem sets are essential to your understanding and will count 30% towards the final grade. *No late assignments will be accepted.* Please speak with me if you are having any difficulties keeping up with the work. We will also have both an in-class midterm (25%) and a final paper (35%).

Course Material: Readings come from two no-cost online statistics texts: *The StatSoft Electronic Textbook*² and *The HyperStat Online Textbook*³. Selected chapters from other texts may be provided. Two small primers (Statistics Primer, Regression Primer) and a few additional handouts also will be made available either in-class or online.

Provisions for Feedback: Feedback will be provided along a number of paths. The problem sets offer a rich weekly source on your progress, as well as in class interactions. The midterm and final will also provide strong indications of your progress. I will also offer two hours a week of office time at which I will be available if you have any problems/concerns about your work. As I spend much of my time online, e-mail questions are absolutely welcomed I will respond as quickly as possible.

² URL: <http://www.statsoftinc.com/textbook/stathome.html>

³ URL: <http://davidmlane.com/hyperstat/>

Academic honesty: You are expected to be honest in all of your academic work. Please consult Brandeis University [*Rights and Responsibilities*](#) for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found at [LTS - Library guides](#)

Notice: If you have a documented disability on record at Brandeis University and require accommodations, please bring it to the instructor's attention prior to the second meeting of the class. If you have any questions about this process, contact Mary Brooks, disabilities coordinator for The Heller School at maryeliz@brandeis.edu.