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**BUS1b: Quantitative Methods in Business**

Brandeis International Business School

Fall 2015—Tuesday 5:00–6:20 pm

Location: Lemberg Academic Center 055

Prof. Bharatendra Rai

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Office: Sachar 1C

Hours: Tuesday, 4:15 – 5:00pm and by appointment

**TA:** TBD

**Overview**

This 2-credit course introduces statistical thinking and fundamental analytical methods to undergraduate business students with little or no prior statistics training. In this module we will develop an approach to enable critical analysis of statistical evidence to inform business decisions. This will be accomplished by formulating both a way to think about data along with hands on use of a statistical analysis package. Topics include the development and use of both descriptive and inferential statistics, continuous probability distributions, estimation, tests of hypotheses, and regression modeling.

We will take advantage of two free on-line statistics textbooks for most of our readings: David M. Lane’s online [Hyperstat](http://www.davidmlane.com/hyperstat/index.html) as well as [Statsoft’s Electronic Textbook](http://www.statsoft.com/textbook/stathome.html). Articles and additional readings will also be supplied on-line.

**Rationale for the Course**

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.

**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 basic 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 regression models

These goals will be achieved through the understanding of a number of Key Concepts that we will focus on throughout this course:

* Populations vs. samples
* Descriptive vs. inferential statistics
* Generating and using summary measures for continuous data
  + Central tendency
  + Spread
* The role of probability for use in prediction and statistical inference
* A look at the basic statistical tests that use these concepts
  + Correlations
  + T-tests (1 and 2 sample) and ANOVA (3 or more samples)
  + Chi-square
  + Simple linear regression

**Prerequisites**

None.

**Keeping Informed**

We’ll make regular use of LATTE and a course mailing list (registering in the course automatically adds you to both lists). All lecture notes, handouts, links and other supporting materials will be available via LATTE, and any late-breaking news will reach you via the mailing list. Please check your Brandeis email regularly to keep apprised of important course-related announcements. **For all communications via email include BUS-1B in the subject area.**

**Participation & Contributions**

Each student in the class should regard participation as a chance to contribute to our joint efforts and helping fellow students to learn. Moreover, because this module aims to build both understanding and effective communication skills, class participation is important. Statistics is not a spectator sport; you will learn by *doing* rather than by watching. Participation can take many forms, and each student is expected to contribute actively, freely, and effectively to the classroom experience by raising questions, demonstrating preparedness and proficiency in the analysis of problems and cases, and explaining the implications of particular analyses in context. To this end, *class attendance is required, and students should use name cards*.

**Grading:** Given below is the break-up.

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| **Evaluation Type** | **Score** |
| Tests (3) | 40% |
| Quizzes (7) | 20% |
| Assignments (4) | 25% |
| Project | 15% |
| TOTAL | 100% |

**Tests:**

There will be three tests throughout the semester, which will be announced at least one week in advance.

**Online Quiz:**

There will be seven online quizzes available on Latte. The online quizzes should be completed before the due date. The online quizzes will not be available after the due date.

**Assignments:**

Details about each assignment will be available on Latte. On-time assignment submissions will be graded out 100% and those submitted late will be graded only out of 50%.

**Workload expectation:** As BUS 1b is a two-credit course, you are expected to spend a minimum of 4.5 hours of study time per week in preparation for class (readings, quizzes, assignments, preparation for tests, etc.).

**Provisions for Feedback:** Feedback will be provided along a number of paths. The quizzes, tests, and assignments offer a rich source on your progress, as well as in-class interactions. I will also have office time every week during 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 and I will respond as quickly as possible. The TA is also available for individual or group work and will provide me another channel for feedback from students.

**Academic honesty:** You are expected to be familiar with and to follow the University’s policies on academic integrity (<http://www.brandeis.edu/svpse/academicintegrity>). Instances of alleged dishonesty will be forwarded to the Office of Campus Life for possible referral to the Student Judicial System. Potential sanctions include failure in the course and suspension from the University. If you have any questions about my expectations, please ask. Academic dishonesty will not be tolerated.

**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.

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| Sep 1 | **Topics Covered** | **Assignment/ Quiz/ Test** (due before start of class) |
|  | ***Introduction to Business Statistics***  Introduction to course; Statistical thinking; Data and Statistics; Types of data; | - |
| Sep 8 | **Topics Covered** |  |
|  | ***Introduction to Business Statistics…cotd.***  Scales of measurement: Nominal, Ordinal, Interval and Ratio; Population versus sample; Sampling methods; Misuse of Data;  **Excel:** Analyzing automobile warranty data | * Assignment -1 |
| Sep 22 | **Topics Covered** |  |
|  | ***Descriptive Statistics***  Tabular and Graphical summary of data; Different patterns of a histogram; Use of PivotTable in Excel;  Numerical summary of data; Measures of central tendency and variability  **Excel:** Analyzing automobile warranty data | * Quiz-1 |

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| **Oct 6** | **Topics Covered** |  |
|  | ***Discrete Probability Distribution***  Binomial Distribution; Use of Microsoft Excel functions; Poisson Distribution; Application examples | * Quiz-2 |
| **Oct 13** | **Topics Covered** |  |
|  | ***Continuous Probability Distributions***  The Normal curve; Standard normal distribution; Calculations using standard normal table & statistical functions in Microsoft Excel | * Quiz-3 * Assignment-2 * Test-1 |
| **Oct 20** | **Topics Covered** |  |

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|  | ***Team exercise***  Team exercise on comparing two products | * Quiz-4 |

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| **Oct 27** | **Topics Covered** |  |
|  | ***Sampling and Sampling Distributions***  Team exercise on central limit theorem  ***Confidence Intervals***  Confidence intervals for mean |  |
| **Nov 3** | **Topics Covered** |  |
|  | ***Confidence Intervals***  Confidence intervals for sigma & proportion; Confidence intervals versus test of hypothesis | * Quiz-5 |
| **Nov 10** | **Topics Covered** |  |
|  | ***Crosstabulations;* crosstabs and Chi-square**  Test of goodness of fit; Examples | * Assignment-3 * Test-2. |
| **Nov 17** | **Topics Covered** |  |
|  | ***Chi-square***  Test of independence; Application examples | * Quiz-6 |
| **Nov 24** | **Topics Covered** |  |
|  | ***Simple Linear Regression***  Simple Linear Regression Model; Least squares method; Sample correlation coefficient; R-square; Regression with Microsoft Excel; Interpretation of regression equation & ANOVA output; |  |
| **Dec 1** | **Topics Covered** |  |
|  | ***Simple Linear Regression …contd.***  Simple Linear Regression Model; Least squares method; Sample correlation coefficient; R-square; Regression with Microsoft Excel; Interpretation of regression equation & ANOVA output; | * Quiz-7 |
| **Dec 8** | **No class session this week, Project, assignment-4 & test-3 due before this date** | * Test-3 * Assignment-4 * Project |