COURSE INFORMATION

Division: Operations & Logistics

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Course duration: August 15, 16 & 19, 2013   **Classroom location: TBA (see schedule)**

Class meeting times: 8:00am – 5:00pm   **Pre-requisites:** None

COURSE DESCRIPTION

"*A knowledge of statistics will one day be as necessary for efficient citizenship as the ability to read and write.*"– attributed to H. G. Wells

The objective of this three–day course is to acquaint entering MBA and MM-ECM students with the rudiments of statistical literacy and the basic toolkit of statistics. Statistics is the science of collecting, organizing, and interpreting data. It provides a set of techniques to help decision-making in the face of uncertainly. Every aspect of our lives is bombarded with data. In business, organizational functions such as finance, marketing, and operations all make extensive use of data collection and analysis techniques.

   We will discuss descriptive statistics (exploratory data analysis using graphs and numerical summaries), inferential statistics (estimation, confidence intervals, hypothesis tests), and simple statistical modeling. We will deal with both concepts and techniques, and will focus on "hands-on" learning. The quantitative material will be taught within the context of Excel and practical situations and problems. By the end of the course you will have the skills to choose and apply appropriate tools in the statistical toolkit to business problems. And you will be able to communicate statistical concepts.

   If you have taken a previous statistics course but have forgotten what it was all about or never really understood it in the first place, or if you have never taken a previous statistics course, this course is for you. It will empower you to be a competent consumer of quantitative information!

LEARNING OBJECTIVES

At the end of this prep session, students will be able to:
1. Identify types of data
2. Critically assess the validity of data sources
3. Summarize data in tables and graphs
4. Apply the principles of good graphing and appraise graphs in the literature
5. Compute and interpret numerical summaries
6. Assess bivariate relationships through scatterplots, correlation, crosstabs
7. Use the normal curve to assess data distributions
8. Use basic data transformations
9. Construct and interpret basic confidence intervals
10. Explain the logic of hypothesis testing and be able to interpret results
11. Use one- and two-sample techniques of inference
12. Recognize situations requiring statistical modeling
13. Complement and supplement other areas of quantitative analysis

ASSESSMENT

There will be no formal assessment or grade assigned in this course. Instead, during the three-day course, "practice" questions will be given for students to try out their understanding of the course material. These assignments will provide diagnostics on which topics may require further study. Additional practice questions will be available upon request.

COURSE RESOURCES AND MATERIALS

Reading Materials: *There is no required textbook. Course notes written by the instructor will be provided during the sessions.*

Other Learning Resources – optional:
Although there are many introductory statistics print textbooks on the market, you can probably find all the resources you need online. In particular, I can recommend three online textbooks, available free of charge.
1) Statistics at Square One, Ninth Edition, T D V Swinscow
Revised by M J Campbell, University of Southampton, BMJ Publishing Group 1997
  http://resources.bmj.com/bmj/readers/statistics-at-square-one/
2) HyperStat Online Statistics Textbook
  http://davidmlane.com/hyperstat/
3) Online Statistics: An Interactive Multimedia Course of Study
  http://onlinestatbook.com/
And, of course, there's always Wikipedia ☺. If you locate other useful references or have other suggestions, please share them with me and your fellow classmates.

Technology Requirements: *None; however, a laptop with Excel is strongly recommended*

SCHEDULE (SUBJECT TO CHANGE)

2013	TOPIC AREAS	SPECIFIC TOPICS AND ACTIVITIES	
Class 1 **August 15**	**Introduction/ Overview** **Statistical Literacy** **Terms and Definitions** **Guesstimation** **Data** **Displaying and describing univariate categorical and quantitative data** **Bivariate descriptive statistics of categorical and quantitative data** **Random Variables** **Probability Distributions**	• What is Statistics? What are statistics? • The size of numbers • Percentages, averages, randomness • How to estimate the size of things • Types of data and variables • Challenges of measurement • Data quality • Data sources: census, survey, experiment • Graphical summaries: bar chart, dot plot, histogram, stem and leaf plot, line plot • Principles of good graphing; appraisal of graphs in literature; infographics • Principles of effective tables • Numerical summaries: proportion, mean, median, mode, range, variance, standard deviation, quartiles, interquartile range • Five-number summary and box plot; fences; outlier identification • Transformations • Crosstabs/contingency tables, association, scatterplots, correlation, least squares • Definitions of random variable and probability distribution	

	Mean, Variance of Random Variables **Combining Random Variables** **The Normal Model**	- Mean and variance of random variables - Combining random variables - Covariance - Mean and variance of combinations of RVs - Normal model, z scores - Other probability distributions: Binomial	
Class 2 **August 16**	**Sampling Distributions** **Central Limit Theorem** **Basic terms in Inference** **Principles of estimation** **Standard Error** **Confidence Intervals** **Logic of hypothesis tests**	- Sampling distribution - Central Limit Theorem - Introduction to inference: population, sample, parameter, sample statistic/estimate - Properties of "good" estimates - Point vs. interval estimate - Confidence intervals for one mean and one proportion - Confidence intervals for comparing two means and two proportions - Interpretation and communication of CIs - Sample size determination based on margin of error - Null and alternative hypotheses - One-sided vs. two-sided - Test statistic, alpha level, critical value, P-value, types of errors, power, significance	
Class 3 **August 19**	**Tests of means** **Tests of proportions and count data** **Statistical modeling: Introduction and framework** **Simple linear regression** **What comes next?**	- One-sample t-test for a single mean - One-sample z-test for a single proportion - Two-sample t-test for comparing two independent means - Paired t-test for dependent means - Two-sample z-test for comparing two proportions - Sample size determination based on power - Chi-square goodness-of-fit test - Chi-square test of independence of two categorical variables - Inference in simple linear regression - Definition of a statistical model - Framework for modeling: rethinking inference - Preview of what comes next...	

COURSE AND INSTITUTIONAL POLICIES

Expectations and Suggestions

Some people are active learners, other are passive learners. The Prep courses are meant to be active learning experiences. This is your chance to ask the questions that you always wanted to ask but were afraid to do because:

- you thought they were the proverbial "stupid" questions
- you thought everyone else knew the answers; you alone were puzzled or confused
- you thought you could figure it out by yourself later
- you thought you could get by without knowing the answers
- you were afraid of speaking out in class (no longer possible – you're in a graduate program!)
- you didn't even know what you didn't know!

Therefore, during this session, ASK QUESTIONS! The goal is to have you as prepared as possible for what comes next in your program.

Classes will be participatory, but will move very quickly to cover all the material. Practice on calculations, advice on Excel, trouble-shooting with computing issues will need to be dealt with outside of class time. It is expected that you will practice the analytic techniques on your own time.

OTHER INFORMATION

Don't Panic! Statistics is understandable, accessible, and, yes, a lot of fun (at least, the way I teach it)!