



Business Statistics

MBA 2010

Course Outline

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Overview

The objective of this course is to provide the statistical foundations required to make informed decisions, backed up by data. You will learn concepts that enable you to understand topics such as corporate risk, market research and quality control, which are encountered later in the programme. Among other things, the fundamental concepts of variance, covariance and correlation are covered as they form a cornerstone of portfolio analysis to be studied in finance. The aim is to teach you when a technique is appropriate and what it can achieve, leaving the computational aspect to the computer. The course will include many hands-on sessions with statistical software. The emphasis throughout the course is on concepts, rather than technical details.

The first part of the course will be devoted to reviewing distributions, estimation (point estimates and confidence intervals) and hypothesis testing. These are key concepts in statistical data analysis. Because only one variable quantity is considered, these concepts come under the heading "uni-variate analysis". Typical applications centre on estimating the proportion of consumers who favour a certain product or testing whether the average content of a "pint" of beer is indeed a pint.

The second part of the course concentrates on "multi-variate analysis" because the focus is on relationships between several variables. For instance, do the returns on a certain stock move in line with market returns, or to what extent can we explain variations in sales level by variables such as marketing effort, relative price and seasonality.

The topics to be covered, with a specific business focus, include:

- Descriptive statistics and probability distributions, such as normal and binomial
- Analysis of sample data, including estimation, confidence intervals and hypothesis testing
- Detecting relationships in data and building regression models
- Covariance, correlation and statistics of portfolio analysis.

Practical points

The course consists of classroom sessions, exercises in small tutorial groups and supervised computer workshops, as well as readings and exercises to be undertaken individually. Classroom sessions introduce ideas and approaches for tackling real-world problems. Tutorial exercises take place in small groups, typically of around 8 participants, working with a tutor. Practical computer workshops are conducted in the PC labs with the lecturer and tutors to help you. The main software used will be Microsoft Excel.

The course folder includes exercise sets, guidelines for computer workshops, cases and some additional readings. Class overheads will be handed out at the start of each class. You will need a **simple hand calculator** for the exercise sessions.

Books

A recommended reading is the textbook *Quantitative Methods for Decision Makers* by Mik Wisniewski (FT Prentice-Hall, 4th edition). Other books that might be useful (they can be found in the library and the bookstore) are:

- B.L. Bowerman, R.T. O'Connell, J.B. Orris, "Essentials of Business Statistics", McGraw Hill, 2004.
- S.C. Albright, W.L. Winston and C.J. Zappe, "Managerial Statistics", Duxbury, 2000.
- L. Gonick and W. Smith, "The Cartoon Guide to Statistics", HarperResource, 1993.

Pre - Readings

As preparation for the course, please read Chapter 2 of Wisniewski on basic numeracy. If you are not very familiar with Excel please go through the exercises in the documents Excel Basics.pdf and Excel Statistics.pdf (it uses the file height.xls) that are posted on the course webpage.

Session Format

The odd numbered sessions will consist of lectures, the even numbered sessions will consist of a tutorial and a computer workshop with the exception of the last two sessions, which will include a case preparation and a presentation.

Class Schedule and Assignments

Sessions 1 & 2: Data Analysis and Probability Distributions

Concepts covered

- Extracting information from data
- Histograms
- Measures of central tendency (means, medians, modes)
- Measures of variability (variance, standard deviation)
- Distributions
- Properties of the normal distribution. Examples: exchange rates, service times.

Preparation

- Read Wisniewski Chapter 4, p93-112, Chapter 5: p138-146, p149-173
- Optional: Read through the Tutorial Exercises. You will have time to solve them during the tutorial session.

Sessions 3 & 4: Sampling

Concepts covered

- Sampling
- Communicating uncertainty with confidence intervals
- Hypothesis testing
- Examples: opinion polls and censuses, marketing surveys, statistics in the courtroom, quality control sampling.

Preparation

- Read Wisniewski Chapter 7: p203-228
- Optional: Read through the tutorial and workshop exercises. You will have time to solve them during the sessions.

Sessions 5 & 6: Simple Linear Regression Analysis

Concepts covered

- Correlation and covariance
- Causality and inference
- Building and evaluating simple linear regression models
- Examples: sales and advertising analysis, regression in the CAPM model

Preparation

- Read the Regression Note in your binder
 - Read Wisniewski Chapter 10: p335-354
 - Optional: Read through the workshop exercises. You will have time to solve them during the sessions.
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Sessions 7 & 8: Multiple Regression Analysis

Concepts covered

- Multiple regression models
- Specification issues: residual analysis
- Forecasting with regression models
- Examples: salary discrimination, forecasting revenues for investment decisions

Preparation

- Read Wisniewski Chapter 10: p363-376
- Optional: Read through the workshop exercises. You will have time to solve them during the sessions.

Sessions 9 & 10: Case Solving and Presentations

Concepts covered

- Statistics of portfolio analysis
- Review of regression analysis

Preparation

- Read Wisniewski Chapter 10: p376-392
- Read the Introduction to Portfolio Theory note in your binder

Review the material on regression analysis discussed in class. You will be asked to work on solving a business case in groups and then present your solution to the class during the last session. The presentation should include:

- A description of the problem (main issues), of the data and of the statistical tools you used
- An outline of your analysis: assumptions, results, interpretation
- Recommendations for implementation