Dr. Margot Löwenberg

# Marketing Analytics I

## Syllabus
## Each Spring Semester

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Chair for Marketing and Market Research
URPP Social Networks
Department of Business Administration
University of Zurich, Switzerland

# Preamble

Welcome to our "Marketing Analytics I" syllabus!

***«Data are just summaries of thousands of stories –***
***tell a few of those stories to help make the data meaningful.»***

Chip & Dan Heath

This course is an introduction to marketing analytics. Today, companies heavily rely on data-driven marketing to better understand the needs of their customers. Through various data collection methods, they gather data on purchase behavior, social relationships, or attitudes. By analyzing such data, firms gain market insights and can enhance marketing decisions such as segmentation and targeting of customers, positioning of products based on customer preferences, or developing the right marketing mix. However, marketers lack knowledge on how data can be collected and how basic research techniques can be applied to analyze it.

This interactive introductory course to marketing analytics will start with generating ideas on how data can lead to better decision-making. Examining real-world business scenarios yields a number of opportunities such as optimizing the decision which customers to address with retention campaigns and which not, how to segment and target customers, or how to position products in a competitive market environment. Based on these ideas, research questions along with appropriate research designs and data collection methods will be discussed and applied in practice. This course will enable you to (1) select appropriate data collection methods, (2) explore data with basic data exploration tools, (3) apply appropriate quantitative analysis, and (4) generate meaningful implications which clearly outline how to optimize business processes.

This course will always take place in the spring semesters and is strongly recommended for Marketing Analytics II. This course will not replace any statistics courses, but rather be complementary to them. All necessary information concerning the course can be found within this syllabus. From time to time, updates will be posted on our website and on the eLearning platform OLAT.

I am pleased to welcome you to this course. Enjoy this introduction.

All the best,

Margot Löwenberg

## QUICK OVERVIEW

### Instructor:

Dr. Margot Löwenberg

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Phone: +41 44 634 2918
E-mail: margot.loewenberg@business.uzh.ch
Web: www.market-research.uzh.ch

Office hours by appointment.

### Teaching Assistant:

Jeroen van den Ochtend, MA

### Tutors:

Andrea Bublitz, BA

Claudia Wenzel, BA

### Type:

Lectures and exercises in form of a two-week block course.

### Target Audience:

Bachelor students assigned to the „Wahlpflichtbereich" BWL 4.

### Frequency:

Each spring semester.

### AP (ECTS):

6

### Work load statement:

| Part | Workload | Total Time | ECTS |
|---|---|---|---|
| Course attendance | 12 lectures à 90 min | 18h | |
| Exercise attendance | 12 exercises à 90 min | 18h | |
| Lecture and Exercise | 14h per week, 2 weeks | 28h | |
| Literature study | Preparation before class and exercises | 44h | |
| Assignments | One individual and two group assignments (incl. preparation, presentation, and discussion) | 72h | |
| Total | | 180h | 6 |

### Maximum Amount of Students:

Limited only by room size.

### Content:

Practical introduction into understanding, applying, interpreting, and documenting quantitative market research methods to analyze marketing data by using R and R Studio.

### Language:

English

### Basic Literature:

Field A., Miles J. & Field Z. (AF) (2012): Discovering Statistics Using R, 1st ed., London: Sage.

Hair J. F., Black W. C., Babin B. J. & Anderson R. E. (HBBA) (2014): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson.

Stock J. H. & Watson M. W. (2012): Introduction to Econometrics, 3rd ed., Boston: Pearson.

Additional literature will be given in class.

### Prerequisite:

Recommended: Statistics, Empirical Research Methods.

### Access:

Join our courses and make up your mind if you want to participate. Then officially register using the booking tool at the University of Zurich.

### Grading:

Participation, assignments and presentations, multiple choice tests.

### Dates:

Block-course, 08.-12.02.2016 and 15.-19.02.2016, 09.00-17:30.

### Location:

Please see the respective information posted on our website and in the VVZ.

### Note:

This information in the syllabus supports the official information in the electronic university calendar (VVZ – Vorlesungsverzeichnis). In cases of doubt, the official information at the VVZ is valid.

# 1. INTRODUCTION AND OBJECTIVE

## 1.1 Course Purpose & Objectives

At the heart of marketing practice there is always a decision. One, for example, has to decide how to price a product, what kind of distribution channels one wants to use, or how to advertise a specific product. In order to reduce complexity and support one alternative from a multitude, analyzing data with quantitative marketing methods is essential in organizations. The purpose of this course is to gain a thorough understanding of instruments that can be implemented and applied to a diversity of marketing settings.

The objective of this course is to become accustomed with, understand, and apply quantitative marketing methods that are typically used in marketing analytics. The course will motivate and encourage students to practice these concepts in practical exercises, to develop a spirit of problem solving, and to enhance the ability to think in business terms. The course presents popular marketing research methods with practical exercises to familiarize students both with the theoretical and practical aspects of marketing methods.

This course should (a) sensitize students to typical data-driven marketing problems, (b) develop students' skills in collecting and preparing data, (c) introduce students to marketing research methods that are typically used in marketing management, (d) develop students' abilities to identify and apply the right methods and to draw the right conclusions from it, and (e) develop students' hands-on competence in marketing analytics.

## 1.2 Course Contribution towards Marketing Management

The course includes a comprehensive presentation of the main methods that are typically used to collect, explore, and analyze data relevant to marketing management. These elements are discussed in class and supported by examples. The approach adopted encourages students to critically evaluate given marketing situations and methods, to discuss their applicability, as well as to solve given marketing decision problems.

## 1.3 Course Contribution towards Analytical Competence

The course presents the main quantitative marketing instruments necessary to obtain and use data that are applied in the professional world and which help marketing managers to use data appropriately, to analyze marketing situations, to formulate marketing strategies and plans, and to evaluate their impact. The students' understanding of these analytical instruments, taught to them from basics, is realized through theoretical discussions, examples, exercises, and practical assignments. While many books separate different methods and tests, the approach in this course is to build a unique perspective that draws similarities across several statistical methods and tests.

## 1.4 Course Contribution towards Correctly Understanding and Applying Marketing Instruments

One course objective is to show how analytical marketing instruments can support marketing decisions. The quantitative methods presented and discussed in class will be instruments providing students with an image of the complexity and pitfalls of typical marketing problems. These instruments have to be correctly applied by students in order to successfully solve their assignments.

### 1.5 Course Contribution towards Critical Thinking and Problem Solving Skills

As all instruments are directly applied to realistic marketing situations, students need to formulate the related marketing problem and marketing questions to these given situations. Problem solving skills are developed as a consequence of applying quantitative methods and alternatives are also discussed in class. In order to foster critical thinking, the results of quantitative marketing methods are interpreted and critically analyzed.

### 1.6 Course Contribution towards Ethical and Social Responsibility

The cases that are presented in class integrate ethical questions in order to develop a sense of ethical and social responsibility and to actively generate an understanding of different cultural perspectives. An open minded, tolerant, and respectful atmosphere within class is necessary to maintain this. The pedagogical approach adopted in this course encourages students to participate contributing their opinions, experience, and comments to the discussions developed around the presented marketing methods and to seriously consider and discuss each other's opinion.

### 1.7 Course Contribution towards the Development of Good Teamwork and Communication Skills

The capability to effectively work in teams and to communicate during the working process is an essential skill for marketing managers. The pedagogical approach adopted in this course encourages students to participate in class forwarding their opinions, experience, and comments to the discussions developed around the presented marketing methods. Additionally, group assignments encourage students to develop interpersonal communication skills, as well as to debate and negotiate ideas and decisions during their group work. Finally, students are obliged to use both verbal and written communication during their course work which reinforces these skills.

## 2. COURSE MATERIAL

Students have access to our web-based e-learning platform on OLAT to download the slides presented in class, find other relevant material such as datasets and literature. The following procedure is strongly recommended as preparation for the classes.

### 2.1 Overview of Classes

On our webpage, an overview of all classes given by our team can be found. Students can develop an idea of the classes and how they best fit into their personal agenda. Important: our block-courses Marketing Analytics I and Marketing Analytics II are only offered once a year.

### 2.2 Hands-on Guides

Several files have been prepared that provide background knowledge of the expectations in the classroom and some tips concerning "How to give presentations in class", "How to write in an academic style", etc.. Those guides should be read prior to class to obtain a good understanding of what is expected.

## 2.3 Syllabus

For each course, a syllabus exists with all details concerning that specific course. This is the guideline for the class and a must-read. Everything concerning the grading of the course, the agenda, the planned topics, the workload, readings, and much more can be found in the syllabus.

## 2.4 The Slides

The slides presented and discussed in class are available on the e-learning platform. Slides can be downloaded for each class. The slides do not completely cover the entire syllabus; therefore it is necessary to participate in class.

## 2.5 The Reading List

The reading lists are split into three categories depending on the time and involvement in the class. REQUIRED readings are necessary readings before each class and prepare for the actual content. RECOMMENDED readings are articles that go into more details on the specific topics. FOLLOW-UP readings apply the learned knowledge within different marketing areas and allow students to establish utilization of the learned methods.

## 2.6 Templates

Slide presentations and R Code have to meet our formal requirements. Templates will be provided at the beginning of this course.

## 2.7 Additional Materials

The academic and professional papers published online or in marketing journals can also be used by students to obtain additional information about marketing concepts, theories, and methods. The following journals are reputable and are therefore strongly recommended:

<u>Marketing journals:</u>

Journal of Marketing, Marketing Science, Journal of Marketing Research, Journal of Consumer Research, International Journal of Research in Marketing, Journal of the Academy of Marketing Science, Quantitative Marketing and Economics, Journal of Interactive Marketing, Journal of Business Research, Journal of Service Research, Journal of Product and Innovation Management

<u>Management journals:</u>

Academy of Management Review, Academy of Management Journal, Management Science, Administrative Science Quarterly, Strategic Management Journal

<u>For inspiration:</u>

Harvard Business Review, Sloan Management Review, McKinsey Quarterly

# 3. COURSE CONTENTS

## 3.1 Overview of Lectures and Exercises*

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<tr><th></th><th>MONDAY</th><th>TUESDAY</th><th>WEDNESDAY</th><th>THURSDAY</th><th>FRIDAY</th></tr>
<tr><td>09:00 - 09:30</td><td rowspan="3">L1: Introduction to Marketing Analytics and Marketing Research</td><td rowspan="3">L2: Data Collection I: Survey Design</td><td rowspan="3">L4: Data Exploration I: Basics</td><td rowspan="3">Guest Lecture</td><td rowspan="17">Group Assignment I</td></tr>
<tr><td>09:30 - 10:00</td></tr>
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<tr><td>10:30 - 11:00</td><td></td><td></td><td></td><td></td></tr>
<tr><td>11:00 - 11:30</td><td rowspan="3">E1: Introduction to R</td><td rowspan="3">E2: Data Collection I: Survey Design</td><td rowspan="3">E4: Data Exploration I: Basics</td><td rowspan="3">L6: Data Exploration III: Testing basic assumptions</td></tr>
<tr><td>11:30 - 12:00</td></tr>
<tr><td>12:00 - 12:30</td></tr>
<tr><td>12:30 -13:00</td><td rowspan="3">BREAK</td><td rowspan="3">BREAK</td><td rowspan="3">BREAK</td><td rowspan="3">BREAK</td></tr>
<tr><td>13:00 -13:30</td></tr>
<tr><td>13:30 -14:00</td></tr>
<tr><td>14:00 - 14:30</td><td rowspan="3">E1 (cont.): Introduction to R</td><td rowspan="3">L3: Data Collection II: Advances in Data Collection</td><td rowspan="3">L5: Data Exploration II: Graphical Profiling, Outliers, and Missing Data</td><td rowspan="3">L7: Covariance and Correlation</td></tr>
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<tr><td>15:30 - 16:00</td><td></td><td></td><td></td><td></td></tr>
<tr><td>16:00 - 16:30</td><td rowspan="3">E1 (cont.): Introduction to R</td><td rowspan="3">E3: Data Collection II: Advances in Data Collection</td><td rowspan="3">E5: Data Exploration II: Graphical Profiling, Outliers, and Missing Data</td><td rowspan="3">E7: Covariance and Correlation</td></tr>
<tr><td>16:30 - 17:00</td></tr>
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<tr><th></th><th>15.02.</th><th>16.02.</th><th>17.02.</th><th>18.02.</th><th>19.02.</th></tr>
<tr><th></th><th>MONDAY</th><th>TUESDAY</th><th>WEDNESDAY</th><th>THURSDAY</th><th>FRIDAY</th></tr>
<tr><td>09:00 - 09:30</td><td rowspan="3">L8: Data Collection III: Experimental Design</td><td rowspan="3">L10: Simple and Multiple Regression</td><td rowspan="17">Group Assignment II</td><td rowspan="17">Group Assignment II</td><td rowspan="17">Presentations Group Assignment II</td></tr>
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<tr><td>10:00 - 10:30</td></tr>
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<tr><td>11:00 - 11:30</td><td rowspan="3">L9: t-Tests and ANOVA</td><td rowspan="3">E10: Simple and Multiple Regression</td></tr>
<tr><td>11:30 - 12:00</td></tr>
<tr><td>12:00 - 12:30</td></tr>
<tr><td>12:30 -13:00</td><td rowspan="3">BREAK</td><td rowspan="3">BREAK</td></tr>
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<tr><td>14:00 - 14:30</td><td rowspan="3">E9: ANOVA</td><td rowspan="3">L11: Regression Assumptions</td></tr>
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<tr><td>16:00 - 16:30</td><td rowspan="3">Presentations Group Assignment I</td><td rowspan="3">E11: Regression Assumptions</td></tr>
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* Preliminary outline for FS 2016, this schedule is subject to change; L = lecture, E = exercise.

## 3.2 Details of Classes and Required Reading

This is the preliminary outline for FS 2016. This list is subject to change and additional literature might be given in class.

### 1: Introduction to Marketing Analytics and Marketing Research

**Outline:**

This unit will introduce you into some fundamental ideas of why and how we do research. Thus, you will become familiar with the research process and the main statistical ideas and definition. Overall, we'll introduce them in a very practical, hands-on way. In addition, the structure of the course, its administration, grading procedures and organization are discussed. In the end, you should be able to get an idea whether this course fits to your expectations and needs.

**Objectives:**

(1) Get an idea of why and how we do research.
(2) Understand why gathering and analyzing data is important for organizations.
(3) Learn the steps in the Market Research process.
(4) Get an idea of whether this course fits to your needs.

**Key terms:**

Alternative hypotheses, categorical variable, continuous variable, discrete variable, dependent variable, independent variable, interval scale, latent variable, marketing, market research, market research process, manifest variable, measurement error, measurement level, mediator, moderator, nominal scale, null hypothesis, objectivity, ordinal scale, qualitative data, quantitative data, ratio scale, reliability, research question, test statistics, theory, validity.

**Readings:**

- Required reading:
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 1-61.
- Recommended reading:
  Bagozzi, R. P. (1974): Marketing as an Organized Behavioral System of Exchange, *Journal of Marketing*, 38(October), p. 77-81.
  Bagozzi, R. P. (1975): Marketing as Exchange, *Journal of Marketing*, 39(October), p. 32-39.
  Cohen, J. (2009): Mission Improbable: A Concise and Precise Definition of p-value, Science Now Daily, available from: http://news.sciencemag.org/2009/10/mission-improbable-concise-and-precise-definition-p-value. [Accessed: October 25th, 2015].
  Cohen, J. (1990): Things I have learned (so far), *American Psychologist*, 45(12), p. 1304–1312.
  Cohen, J. (1994): The earth is round (p < .05), *American Psychologist*, 49(12), p. 997-1003.
  DeCarlo, L. T. (1997): On the Meaning and Use of Kurtosis, *Psychological Methods*, 2(3), p. 292-307.
  Hunt, S. (1976): The Nature and Scope of Marketing, *Journal of Marketing*, 40(July), p. 17-28.
  Hunt, S. (1983): General Theories and The Fundamental Explananda of Marketing, *Journal of Marketing*, 47(Fall), p. 9-17.
  Kotler, P. (1972): A Generic Concept of Marketing, *Journal of Marketing*, 36(April), p. 46-54.
- Follow-up reading:
  Gelman, A. & Weakliem, D. (2009): Of Beauty, Sex and Power - Too little attention has been paid to the statistical challenges in estimating small effects, *The American Scientist*, 97, p. 310-316.

## 2: Data Collection I: Survey Design

### Outline:

This unit will introduce you to the topic of survey design. You will learn how to design a survey which gives you valid data. The first step is to plan the length of the survey and the question order. The second step is to choose the wording of the questions so that they exactly measure what they are intended to measure. This step is often done in a pretest, which is used to assess the quality of the questions. The last step is the planning of the incentives. Subsequently, the survey can be executed and analyzed.

### Objectives:

(1) Learn how to define research problems.
(2) Learn how to choose the type of survey.
(3) Learn how to design a questionnaire.

### Key terms:

Balanced vs. unbalanced, built-in assumptions, closed-ended questions, cross-sectional vs. longitudinal design, dichotomous vs. multichotomous, double-barreled questions, Likert scale, leading questions, mail surveys, measurement bias, odd vs. even scale points, open-ended questions, personal interviews, pre-test, question bias, ranked (or ordinal) questions, rating-scale questions, respondent bias (social effects), sample design error, telephone surveys, uni-dimensional vs. multi-dimensional, web (internet-based) e-mail surveys.

### Readings:

- Recommended reading:
  Fernández-Aguirre, K., Landaluce-Calvo, M. I., Martín-Arroyuelos, A. & Modroño-Herrán, J. I. (2012): Knowledge extraction from a large on-line survey: a case study for a higher education corporate marketing, Journal of Applied Statistics, 38, p. 2661-2679.
  Garson, G. D. (2013): Survey Research & Sampling, Statistical Associates Publishing, available from: http://www.statisticalassociates.com/sampling.pdf. [Accessed: October 25th, 2015].
  Jones, D. A. (1975): Survey Technique to Measure Demand under Various Pricing Strategies, Journal of Marketing, 39, p. 75-77.
  Stat Trek (2015): Bias in Survey Sampling, available from: http://stattrek.com/survey-research/survey-bias.aspx. [Accessed: October 25th, 2015].
- Follow-up reading:
  Bassham, G. (2004): Critical Thinking, 4th ed., New York, NY: McGraw-Hill.
  Dillman, D. A., Smyth, J. D. & Christian, L. M. (2008): Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method, 3rd ed., Hoboken, NY: John Wiley & Sons.
  Klohnen, E. C. & Luo S. (2003): Interpersonal attraction and personality: What is attractive - self similarity, ideal similarity, complementarity or attachment security?, *Journal of Personality and Social Psychology*, 85, p. 709-722.
  Parr, C. L., Hjartåker, A., Laake, P., Lund, E. & Veierød, M. B. (2009): Recall bias in melanoma risk factors and measurement error effects: a nested case-control study within the Norwegian Women and Cancer Study, *American Journal of Epidemiology*, 169, p. 257-266.
  Singh, J., Dall'Olmo, F., Hand, R., Hand, C. & Maeda M. (2012): Measuring brand choice in the older customer segment in Japan, *International Journal of Market Research*, 54, p. 347-368.
  Trailer, B. & Dickie, J. (2006): Understanding what your sales manager is up against, *Harvard Business Review*, 48, p. 48-55.

## 3: Data Collection II: Advances in Data Collection

### Outline:

This unit will introduce further data collection methods. You will acquire practical knowledge on how to use Amazon Mechanical Turk, how to scrape data from websites, how to use API's to collect data from Twitter or Facebook, and how to use Google Analytics to gain insights on website traffic and use.

### Objectives:

(1) Get an overview of some recent tools for data collection.
(2) Learn how to collect data using AMT, web scraping, and APIs.
(3) Get an idea of how data is collected using Google Analytics.

### Key terms:

Amazon Mechanical Turk (AMT), Advanced Programming Interface (API), closing tag, Extensible Markup Language (XML), Human Intelligence Tasks (HITs), Hyper Text Markup Language (HTML), HTML tags, Hypertext Transfer Protocol (HTTP), Java Script Object Notation (JSON), operating tag, tagging, web scraping.

### Readings:

- Follow-up reading:

  Buhrmester, M., Kwang, T. & Gosling, S. D. (2011): Amazon's Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data?, *Perspectives on Psychological Science*, 1, p. 3-5.

  Lewis, K., Kaufman, J., Gonzalez, M., Wimmer, A. & Christakis N. (2008): Tastes, ties, and time: A new social network dataset using Facebook.com, *Social Networks*, 30, p. 330-342.

  Ross, J., Zaldivar, L., Irani, L. & Thomlinson, B. (2010): Who are the Turkers? Worker Demographics in Amazon Mechanical Turk, *ACM*, p. 2863-2872.

  Takhteyeva, Y., Gruzdb, A. & Wellmanc, B. (2012): Geography of Twitter networks, *Social Networks*, 34, p. 73-81.

  Ye, Q., Zhang, Z. & Law, R. (2009): Sentiment classification of online reviews to travel destinations by supervised machine learning approaches, *Expert Systems with Applications*, 36, p. 6527-6535.

  Zhao, Z. R. (2014): Data Mining: Examples and Case Studies, Chapters 10 and 11, available at: http://cran.r-project.org/doc/contrib/Zhao_R_and_data_mining.pdf. [Accessed: October 25th, 2015].
- Interesting links:

  http://blog.tagesanzeiger.ch/datenblog/

## 4: Data Exploration I: Basics

### Outline:

This unit will introduce you into the exploration process of data. You will learn how to describe and explore the data. This is the initial step in each data analysis. We start the data exploration process by describing the dataset and its variables, their sampling, their measurement scales and distributions.

### Objectives:

(1) Learn how to describe the distribution of variables (shape, central tendency, spread).
(2) Learn how the mean can serve as a statistical model.
(3) Learn how to calculate probabilities.
(4) Learn to distinguish between standard distribution and standard error.

### Key terms:

Central limit theorem (CLT), confidence interval, degrees of freedom (df), distribution, frequency, kurtosis, interquartile range (IQR), law of large numbers (LLN), measures of central tendency, model, median, mean, normal distribution, power-law distribution, probability, range, sampling distribution, skewness, standard deviation, standard error, sum of squares, total error, variance, z-score.

### Readings:

- Required reading:
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 13-61.
  Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 33-42.
- Recommended reading:
  Cohen, J. (2009): Mission Improbable: A Concise and Precise Definition of p-value, Science Now Daily, available from: http://news.sciencemag.org/2009/10/mission-improbable-concise-and-precise-definition-p-value. [Accessed: October 25th, 2015].
  Cohen, J. (1990): Things I have learned (so far), *American Psychologist*, 45(12), p. 1304–1312.
  Cohen, J. (1994): The earth is round ($p < .05$), *American Psychologist*, 49(12), p. 997-1003.
  DeCarlo, L. T. (1997): On the Meaning and Use of Kurtosis, *Psychological Methods*, 2(3), p. 292-307.
- Follow-up reading:
  Gelman, A. & Weakliem, D. (2009): Of Beauty, Sex and Power. Too little attention has been paid to the statistical challenges in estimating small effects, *The American Scientist*, 97, p. 310-316.

## 5: Data Exploration II: Graphical Profiling, Outliers, and Missing Data

### Outline:

In this unit you will learn how to graphically profile your data using univariate, bivariate, and multivariate graphical profiling. You will also learn how to detect outliers and missing values and how to evaluate their impact on the analyses you are doing.

### Objectives:

(1) Learn how to select appropriate graphical methods to examine the characteristics of the data and the relationship of interest.
(2) Assess the potential impact of outliers and reasons for their existence.
(3) Assess the potential impact of missing values and reasons for their existence.

### Key terms:

Bivariate graphical profiling, boxplot, histogram, imputation, missing at random (MAR), missing completely at random (MCAR), missing values, multivariate graphical profiling, not missing at random (NMAR), numerical profiling, outliers, shape of a distribution, scatterplot, univariate graphical profiling.

### Readings:

- Required reading:
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 116-165.
  Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010) Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 33-70.
- Recommended reading:
  Acock, A. C. (2005): Working with Missing Values, *Journal of Marriage and Family*, 67, p. 1012-1028.

Ariely, D. (2011): Beware conflicts of interest, TED.com, available from: https://www.ted.com/talks/ dan_ariely_beware_conflicts_of_interest. [Accessed: October 25th, 2015].
Bollen, K. & Jackman, R. (1990): Regression Diagnostics: An Expository Treatment of Outliers and Influential Cases, in: Fox, J. & Long, J. (eds.): Modern Methods of Data Analysis, Sage Publications, p. 257-291.
Schafer, J. L. & Graham, J. W. (2002): Missing Data: Our View of the State of the Art, *Psychological Methods*, 7(2), p. 147-177.
Yuan, Y. C. (2009): Multiple Imputation for Missing Data: Concepts and New Development, Br*itish Medical Journal*, 338, p. 1-13.

## 6: Data Exploration III: Testing Basic Assumptions

### Outline:

In this unit we will conclude the data exploration process by outlining basic assumptions underlying most multivariate methods. You will learn how they can be tested.

### Objectives:

(1) Understand what assumptions are and why it is necessary to test them.
(2) Learn how to verify assumptions.
(3) Learn how to handle data which do not meet assumptions.

### Key terms:

Boxplot, data transformations, heteroskedasticity, homogeneity of variance, homoscedasticity, independent scores, interval data, Levene's test, marginal distribution, normal distribution assumption, parametric tests, qq-plot, Shapiro-Wilk test, skewness, uncorrelated errors, z-scores.

### Readings:

- Required reading:
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 166-204.
  Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 70-86.
- Recommended reading:
  Bollen, K. & Jackman, R. (1990): Regression Diagnostics: An Expository Treatment of Outliers and Influential Cases, in: Fox, J. & Long, J. (eds.): Modern Methods of Data Analysis, Sage Publications, p. 257-291.
  Wilcox, R. R. (2005): Introduction to Robust Estimation and Hypothesis Testing, 2nd ed., Burlington MA: Elsevier.

## 7: Covariance and Correlation

### Outline:

After the data collection and data exploration parts of this class, we start studying relationships between variables. This unit deals with relationships between a set of multiple independent and multiple dependent variables. You will learn how to use covariance and correlation analysis to gain more insights on relationships between variables.

### Objectives:

(1) Understand the difference between covariance and correlation.
(2) Describe correlation analysis and understand its purpose.
(3) Summarize the conditions that must be met for application of correlation analysis.

**Key terms:**

Coefficient of determination, covariance, correlation, (semi)partial correlation, Pearson correlation coefficient.

**Readings:**

- Required reading:
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 205-244.
- Recommended reading:
  Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 235-260.
  Ritter, D. (2014): When to Act on a Correlation, and When Not To, HBR Blog Network, available from: http://blogs.hbr.org/2014/03/when-to-act-on-a-correlation-and-when-not-to/. [Accessed: October 25th, 2015].
- Follow-up reading:
  Borgatti, S. & Foster, P. (2003): The New Paradigm in Organizational Research: A Review and Typology, *Journal of Management*, 29(6), p. 991-1013.
  Borgatti, S. P., Mehra, A., Brass, D. J. & Labianca, G. (2009): Network Analysis in the Social Sciences, *Science*, 323, p. 892-895
  Iacobucci, D. & Wasserman, S. (1988): A General Framework for the Statistical Analysis of Sequential Dyadic Interaction Data, *Psychological Bulletin*, 103(3), p. 379-390.
  Marsden, P. (1990): Network Data and Measurement, *Annual Review of Sociology*, 16, p. 435-463.
  Scott, J. (2000): Social Network Analysis, Newbury Park CA: Sage.
  Wasserman, S. & Faust, K. (1994): Social Network Analysis: Methods and Applications, Cambridge University Press.

## 8: Data Collection III: Experimental Design

**Outline:**

In this unit, we will focus on experiments. Many firms realized that interfaces where customers get in touch with their firms are great platforms on which to commission experiments. Experiments enable firms to test how customers react to various Marketing actions. You will learn how to design and commission experiments. Overall, we'll introduce experiments in a very practical, hands-on way.

**Objectives:**

(1) Learn to distinguish between different types of experiments and treatments.
(2) Learn how to sample subjects from the population.
(3) Learn how to design experiments and corresponding treatments in various situations.
(4) Learn how to analyze data generated via experiments.

**Key terms:**

A/B testing, between subject design, control group, dependent variable, external validity, factorial design, fractional design, independent variable, internal validity, intervening (or extraneous) variables, laboratory vs. field experiment, matching, natural experiment, quasi experiment, randomization, single vs. multiple treatments, test units, treatment group(s), true experiment, within subject design.

**Readings:**

- Required reading:
  Andersen, E. & Simester, D. (2011): A Step-by-Step Guide to Smart Business Experiment, *Harvard Business*

*Review*, (March), p. 98-105.
Reips, U. D. (2002): Standards for Internet-Based Experimenting, *Experimental Psychology*, 49(4), p. 243-256.

- Recommended reading:
  Davenport, T.-H. (2009): How to design Smart Business Experiments, Harvard Business Review, February, 69-76.
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 197-263.
  Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 439-476.
- Follow-up reading:
  Almqvist, E. Wyner, G. (2001): Boost your Marketing ROI with Experimental Design, *Harvard Business Review*, (October), p. 5-11.
  Ariely, D. (2010): Why Businesses don't experiment, *Harvard Business Review*, (October), p. 15-21.
  Duhigg, C. (2009): What does your credit card company know about you?, New York Times, available from: http://www.nytimes.com/2009/05/17/magazine/17credit-t.html?_r=0. [Accessed: October 25th, 2015].
  Giorgieva, D. (2012): An introduction into A/B testing for marketing optimization, HubSpot, available from: http://cdn2.hubspot.net/hub/53/file-13221855-pdf/docs/ebooks/introductionto_ab_testing_for_marketing_optimization.pdf. [Accessed: October 25th, 2015].
  Huberty, C. J. & Morris, J. D. (1989): Multivariate Analysis Versus Multiple Univariate Analysis, *Psychological Bulletin*, 105(2), p. 302-308.
  Iacobucci, D. Henderson, G. Marcati, A. Chang, J. (1996): Network Analyses of brand switching behavior, *International Journal of Research in Marketing*, 13(August), p. 415-429.
  Mohr, J. Nevin, J. R. (1990): Communication Strategies in Marketing Channels: A Theoretical Perspective, *Journal of Marketing*, 59(October), p. 36-51.

## 9: t-Tests and ANOVA

### Outline:

In a previous unit, we studied correlation analysis, a method which belongs to the confirmatory method group, because we a priori have hypotheses that we would like to test. Another family of confirmatory multivariate methods is so called General Linear Models (GLM). These methods can be used to study mean differences between groups. With GLM models we can also calculate regression methods, but also different forms of analysis of variance (ANOVA, ANCOVA, MANOVA, MANCOVA). That's why they are called general models. In today's unit we study t-tests and ANOVA's. You will also learn how to analyze data from experimental analysis by using ANOVA.

### Objectives:

(1) Understand how the t-test can be used to compare two means.
(2) Understand how to apply and interpret one-way ANOVA (GLM1) to compare several means.

### Key terms:

Dependent t-test, effect size r, effect size w, family-wise error, F-distribution, F-ratio, independent t-test, mean sum of squares, model sum of squares, one-way ANOVA, post-hoc test, residual sum of squares, total sum of squares.

### Readings:

- Required reading:
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 359-549.
- Recommended reading:

Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 439-476.

- Follow-up reading:

  Huberty, C. J. & Morris, J. D. (1989): Multivariate Analysis Versus Multiple Univariate Analysis, *Psychological Bulletin*, 105(2), p. 302-308.

  Mohr, J. & Nevin, J. R. (1990): Communication Strategies in Marketing Channels: A Theoretical Perspective, *Journal of Marketing*, 59(October), p. 36-51.

## 10: Regression Analysis I: Simple and Multiple Regression

### Outline:

Correlation analysis is a helpful tool to identify the existence of relationships between multiple variables. Nevertheless, we don't get any idea of which variables cause other variables. Thus, we do not get the direction of influence of exogenous variables on one or more endogenous variables. Regression analysis helps us to understand how the values of an endogenous variable changes, when any one of the exogenous variables is varied, while the other exogenous variables are held fixed. Regression therefore is a confirmatory technique that tries to find evidence for an a priori stated hypothesis. Regression is used to identify influential exogenous variables for specific endogenous variables of interest and to make predictions.

### Objectives:

(1) Get familiar with the method of least squares.
(2) Learn how to assess individual predictors.
(3) Understand how to run simple and multiple regression analysis in R and how to interpret the results of such an analysis.

### Key terms:

Adjusted R-squared, all-subset methods, backward method, confidence interval, dummy coding, forced entry method, forward method, F-ratio, hierarchical method, intercept, least squares method, mean sum of squares, model sum of squares, multiple regression, ordinary least squares (OLS), R-squared, regression coefficients, residual sum of squares, simple regression, slope, standardized coefficients, stepwise methods, total sum of squares, t-test, variance decomposition, unstandardized coefficients.

### Readings:

- Required reading:

  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 245-266, p. 267-286, p. 302-308.

- Recommended reading:

  Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 153-234.

- Follow-up reading:
  Farris, P. W., Bendle, N. T., Pfeiffer, P. E. & Reibstein, D. J. (2010): Marketing Metrics - The Definitive Guide to Measuring Marketing Performance, Upper Saddle River: New Jersey, Wharton School Publishing.
  Sass, R. (2009): Spyker and Saab and the Value of Dead Brands, The New York Times, available from: http://wheels.blogs.nytimes.com/2009/12/19/spyker-and-saab-and-the-value-of-dead-brands/. [Accessed: October 25th, 2015].

## 11: Regression Analysis II: Testing Assumptions of Regression Models

### Outline:

In the previous unit, we have studied simple- and multiple regression analyses. In this unit we will focus on testing assumptions. You will learn which assumptions are underlying regression analysis and how to test them so that you can trust that the estimated results are unbiased, consistent, and efficient so that they can be generalized from the sample to the population. You will also learn the problems and consequences if certain assumptions are violated and how to react to solve these problems.

### Objectives:

(1) Get an overview of assumptions for regression models.
(2) Learn how to verify those assumptions.
(3) Learn how to handle data which do not meet assumptions.

### Key terms:

Autocorrelation, best linear unbiased estimator (BLUE), cook's distance, DFFit, DFBeta, Durbin-Watson test, homoscedasticity, independently identically distributed (IID).

### Readings:

- Required reading:
  Field A., Miles J. & Field Z. (2012): Discovering Statistics Using R, 1st ed., London: Sage, p. 266-276, p. 287-301.
  Stock, J. H. & Watson, M. W. (2007): Introduction to Econometrics, 2nd ed., Boston: Pearson, p. 126-31, p. 166-169, p. 202-205.
- Recommended reading:
  Hair, J. F. Jr., Black, W. C., Babin, B. J. & Anderson, R. E. (2010): Multivariate Data Analysis. A Global Perspective, 7th ed., Upper Saddle River: Pearson, p. 153-234.
- Follow-up reading:
  Farris, P. W., Bendle, N. T., Pfeiffer, P. E. & Reibstein, D. J. (2010): Marketing Metrics - The Definitive Guide to Measuring Marketing Performance, Upper Saddle River: New Jersey, Wharton School Publishing.
  Sass, R. (2009): Spyker and Saab and the Value of Dead Brands, The New York Times, available from: http://wheels.blogs.nytimes.com/2009/12/19/spyker-and-saab-and-the-value-of-dead-brands/. [Accessed: October 25th, 2015].

# 4. EVALUATION

This course consists of three formal assessment opportunities. There will be no exam at the end of this course.

### 4.1 Multiple Choice Tests (25%)

Multiple Choice Tests (MCT) are handed out at the beginning of each day. The contents of the previous day will be covered in 10 MC questions. To receive credit for the MCT, students must be attending the lectures on time and answer the corresponding MCT's.

### 4.2 Group Assignments (50%)

We will assign students into groups to work on group assignments pertaining to the topics of the class. Depending on the number of students registering for this course, group sizes and the number of groups may vary. Each group will be assigned one assignment in each week.

The evaluation is based on the contents of the presentation, the corresponding R-code, as well as the structure and style of the presentations given in class. Students receive credits for correct solutions, basic and advanced R-commands or functions, as well as for interpretations of the results and deriving implications for marketing managers. In addition, students must follow our style guidelines for slide presentations as well as R-Codes.

We will issue peer evaluation forms at the end of the course in which students will be asked to evaluate their peers' performance during the group assignments. The peer evaluation refers to all assignments and will be part of the group assignment grade.

### 4.3 Individual Participation in Class and Individual Assignment (25%)

Credits are awarded for thoughtful and active oral participation in class and in exercise discussions throughout the course. Credits will be given for correct articulation of arguments and comments, contribution to case discussions, and knowledge of readings. Participation will be evaluated for quality as well as consistency. Students will also have to work on and hand in one individual assignment.

In addition, each student can individually contribute by working in more detail on a topic covered in class the student is particularly interested in (e.g., by preparing a presentation, by collecting data, or by coding). We especially offer this opportunity to those students who do not feel comfortable actively interacting in the classroom.

We strongly recommend that you participate in all classes, do the readings, and follow our instructions. Attending the class and the exercises regularly and on time is an indication of professionalism and will also improve your participation grade.

# 5. ACADEMIC FRAUD

Academic fraud is an act by a student, which may result in a false academic evaluation of that student or of another student. The Honor Code of the University of Zurich applies to all work in this course, and will be strictly enforced. The intent of the Honor Code in this course is to ensure that each student claims and receives credits for his/her own efforts. Violations to this are considered academic fraud.

# 6. ADMINISTRATIVE COMMENTS

### 6.1 Students with Disabilities

Any student with a documented disability needing academic adjustment or accommodations is requested to speak with the instructor of this course during the first day of the course. All discussion will remain confidential. Students with disabilities will need to also contact the directors of the school.

### 6.2 Registration Cards

Registration cards will be handed out at the beginning of the course. Students will be asked to add a recent profile picture and some personal information. The information is kept confidential and is only accessible to our team. We will need this information to learn the students' names by pictures and for administrative reasons. Delivering these files is of course voluntary.

### 6.3 Name Plates

Name plates should be used regularly in class so that we can learn the students' names. Name plates will be handed out during the first day of the course.

### 6.4 Getting in Contact

Emails should be short and to the point. Before sending an email it should be clarified that email is the right medium for the question or concern at hand. Questions can also be asked at the beginning of or during lectures and exercises.

### 6.5 Class Dismissal

Students are asked to remain seated and attentive until class is dismissed by the lecturer or teaching assistant.

### 6.6 Sound-emitting Devices

It is expected that everybody turns off/mute all devices that emit sounds and noises that may interrupt the class (e.g., mobile phones, pagers, watch alarms). If an occasion arises, in which a student may need to receive a phone call, he or she has to inform the lecturer or teaching assistant before class.

### 6.7 Laptops and Calculators

Laptops, tablets, mobile phones, and programmable calculators are allowed in class if indicated by the lecturer or teaching assistant and as far as their usage supports the individual learning process. Otherwise they are not permitted.

### 6.8 Important Deadlines and Class Schedule

Important deadlines and the class schedule are communicated in the first lecture. If a student cannot participate in this lecture, it is his/her duty to obtain any relevant information.

***We are very much looking forward to meet you in class!***