

# Multivariate Analysis (MULTIAN)

## 1. Objectives

The Multivariate Analysis course is mainly concerned with the analysis of multivariate data on individuals or firms. The objectives of the course are:

- (a) To provide the student with some useful tools for his/her future research.
- (b) To help the student to develop a way of thinking in quantitative terms.
- (c) To provide the student with the basic concepts of factor analysis and structural equation modeling.

## 2. Methodology

### 2.1. Contents

1. Principal component analysis
2. Exploratory factor analysis
3. Confirmatory Factor Analysis (CFA)
4. Structural models with observed variables
5. Structural models with latent variables
6. Multigroup analysis

### 2.2. Description of the methodology

The sessions are distributed in 6 blocks of the two sessions. They are conducted in a traditional, professor-to-student way. The topics covered are explained in a set of lecture notes and there is a worked example for each block. Computation is expected to be done in Stata.

The material for this course consists in the lecture notes, the worked examples and data sets. The data sets are in Stata format (extension .dta).

### 2.3. Number and title of the sessions

The course has 12 sessions, listed in the table of section 5 of this outline.

### 2.4. Description of the topics

The topics covered are described in the table.

### 2.5. Required readings

The required readings will be handed out before each class.

## 2.6. Optional readings

AC Acock (2013), *Discovering Structural Equation Modeling with Stata*, Stata Press.

DJ Bartholomew, F Steele, I Moustaki & J Galbraith (2008), *Analysis of Multivariate Social Science Data*, Chapman & Hall.

RB Kline (2010), *Principles and Practice of Structural Equation Modeling*, The Guilford Press.

Stata Corp. (2015), *Stata Multivariate Statistics Reference Manual*, Release 14, Stata Press.

## 3. Grading

The grades are based on the individual assignments at the end of each chapter.

## 4. Competences

### 4.1. General competences

- To understand the basic ideas of factor analysis and structural equation modeling.
- To manage the basic methods of multivariate statistical analysis.

### 4.2. Specific competences

- To understand and apply principal component analysis.
- To understand and apply exploratory and confirmatory factor analysis.
- To estimate, test and evaluate structural equation models.
- To understand and apply multigroup analysis.

## 5. Outline of the course

SESSION	DESCRIPTION	DOCUMENTS
1-2	Principal component analysis	Outline of the Multivariate Statistics Course The multivariate normal distribution [MVSTAT-01] Principal component analysis [MVSTAT-E1] Exercise 1
3-4	Exploratory factor analysis	[MVSTAT-02] Exploratory factor analysis [MVSTAT-E2] Exercise 2

5-6	Confirmatory factor analysis	[MVSTAT-03] Confirmatory factor analysis [MVSTAT-E3] Exercise 3
7-8	Structural models with observed variables	[MVSTAT-04] Structural models with observed variables [MVSTAT-E4] Exercise 4
9-10	Structural models with latent variables	[MVSTAT-05] Structural models with latent variables [MVSTAT-E5] Exercise 5
11-12	Multigroup analysis	[MVSTAT-06] Multigroup analysis [MVSTAT-E6] Exercise 6

## 6. Professors' Biographies

**Yuan (Echo) Liao** is an Assistant Professor in the Department of Managing People in Organizations at IESE. She holds a PhD in International Business from Beedie School of Business, Simon Fraser University and an MPhil in Psychology from the Chinese University of Hong Kong. Prior to joining IESE, Prof. Liao was a postdoctoral research fellow in the School of Management at University of New South Wales, Australia. She has taught at Simon Fraser University and Justice Institute of British Columbia in Canada. At IESE, Prof. Liao teaches courses on leadership and cross-cultural management in MBA, Global Executive MBA, and Leadership Development Programs.

Prof. Liao's research interests lie in cross-cultural management, cultural intelligence, and multiculturalism. Her research aims to understand the underlying mechanisms through which culture influences attitudes and behavior and to improve the way people work with others in culturally diversified workplaces. Her academic work has appeared in journals such as the *Journal of International Business Studies*, *Management International Review*, *Journal of Business Ethics*, among others.

**Tobias Dennerlein** received a joint doctorate in Management (Organizational Behavior) from Rotterdam School of Management and HEC Lausanne. Prior to that, he worked in finance in Germany and London (UK). He also holds a MSc degree in business and economics from the University of Erlangen-Nuremberg.

His research interests revolve around the intersection of leader behavior (e.g., empowering leadership, narcissistic leadership, leader justice) and employee motivation and behavioral outcomes (such as creativity and performance) across levels of analysis. He uses both experimental and cross-sectional methods to answer his research questions.