26180 – Multivariate Data Analysis

Syllabus Information

Academic Course: 2022/23
Academic Center: 304- Faculty of Law and Economics; 332 - Faculty of Economic and Business Sciences
Study: 3327 - Bachelor's degree in International Business Economics
Subject: 26180 – Multivariate Data Analysis
Credits: 5.0
Course: 3 and 4
Teaching languages:

  Theory: Group 1: English

  Seminar: Group 101: English

            Group 601: Pending

Teachers: Lorenzo Cappello (Theory), Ferran Carrascosa (Seminars)
Teaching Period: First Quarter
Schedule:

Course Objectives

- Develop a thorough understanding of multivariate data analysis.
- Understanding the analytics of multivariate analysis (using matrix algebra) and the theoretical concepts, and being self-sufficient in the practice of the methods.
- Master basic techniques of reproducible research reproducibility research.
- Conduct basic and advanced multivariate statistics preferably in R.
- Create publication-ready graphics that succinctly communicate findings communicate results and their interpretation.
- Be able to design and execute a multivariate analysis project, including its presentation and written report, involving empirical data and addressing specific research questions

Topics of the Course

1. Introduction to multivariate analysis
2. Review of Matrix Calculus
3. Review of computational tools (R)
4. Visualization
5. The Multivariate Normal Distribution
6. Principal component analysis
7. Scaling methods, metric and non-metric MDS
8. Correspondence analysis
9. Clustering methods
10. Factor analysis
11. Manova
12. Linear and non-linear discriminant analysis
13. Other methods of multivariate analysis

Teaching Methods

The course is divided into Theory and Practice sessions. Theory sessions will be used to introduce the material of the course. Practice sessions will help build the skills to develop an applied project.

Evaluation

- 15% discussion & participation in class
- 35% a project
- 50% final exam

A minimum of 4 points, out of 10, is required in each of the three items to pass the course. The two first components of the grading (1 and 2 above), generate (with weight .15 and .35) what is called the continuous evaluation grade (CEG).

The Project: It is a multivariate analysis project that makes use of the tools introduced in the course. The project should involve empirical data and should address specific research questions. A report of up to 6 typed pages (not counting appendices) should be delivered before/on the day of the Final Exam. Students will select their projects from topics of their own interest, upon the acceptance of the instructors. A mandatory brief oral presentation in class, of the ongoing project, will take place on the final week of the course.

Final exam: The Final Exam will involve closed-notes in which no computer will be allowed

Retake final exam (RFE): Those students that have attended the course complying with all the required activities (including the final exam) and that have failed the subject, are entitled to an RFE and revise their failed final grade. The revised grade will be a weighted average (weights: .3 and .7 respectively) of (1) the CEG attained during the course and (2) the grade of the RFE. A necessary condition for the revision of the grade based on the RFE, is the score of RFE to be greater or equal to 4 (on a scale 0 to 10).

Bibliography and information resources

1. Holmes, S. & Huber, W. (2022). *Modern Statistics for Modern Biology.* Cambridge University Press. Cambridge.

2. Johnson, R. A. & Wichern, D. W. (2014). *Applied Multivariate Statistical Analysis.* Pearson, NY.

3. Harlow, L. L. (2014). *The Essence of Multivariate Thinking: Basic Themes and Methods* (2nd ed.). New York: Routledge.

4. Ho, R. (2014). *Handbook of Univariate and Multivariate Data Analysis with IBM SPSS* (2nd ed.). Boca Raton, FL: Taylor & Francis Group.

5. Rencher, A. C. & Christensen, W. F. (2012). *Methods of Multivariate Analysis* (3rd ed.). Hoboken, NJ: Wiley.