Course title: Quantitative methods 1.

Instructor: Michal Kotnarowski, Ph.D. IFiS PAN & GSSR

Academic year: 2023/2024

Planned course timetable:

Tuesdays 12.00-14.00,

Office hours: Thursdays 14.00-16.00 (by prior appointment).

Teaching period: 17 October 2023 - 6 February 2024.

Format of the course: onsite class, room 268.

General course description.

The course will cover basic and intermediate statistical techniques. The scope of the course encompasses both the basics of descriptive statistics and statistical inference (the use of samples to infer about the population). It also covers univariate, bivariate and multivariate statistical techniques. Upon completion of the course, participants will be familiar with a wide range of statistical methods that enable them to analyse various types of data, including survey data, administrative data, and experimental data. The logic of the course assumes that participants acquire a broad and grounded foundation of statistical knowledge. The proper foundations of statistical knowledge allow the course participants to learn more advanced statistical techniques in the future.

Goals of the course.

The most general aim of the course is to introduce the logic of quantitative research. Participants will learn what research questions can be answered using a quantitative approach. The course will also address the limitations of the quantitative methodology. In particular, the assumptions of statistical techniques and the consequences of not meeting these assumptions will be discussed at length.

The course will also have practical objectives. Upon completion of the course, participants will be able to understand academic papers using basic quantitative methodology. Besides, students will be able to carry out statistical analyses on their own using the techniques taught in the course.

In the study programme, participants also learn how to work with the R statistics software. It is currently the most popular and one of the most advanced statistical environments. With the R software, students will be able to carry out statistical analyses on their own and gain skills valuable in the labour market in academia and outside.

Course format.

The course will take the form of lectures mixed with lab sessions. During the lectures, statistical topics will be introduced. During lab sessions, participants will learn how to perform statistical analyses in the R environment. Participants are asked to bring their laptops with R software installed for each lab session. Course instructors will provide information on how to install R software.

Involvement of participants:

The fundamental assumption of the course is the activity of students during the classes and their intensive work after meetings. Before each class, participants are required to read the given readings, on average, about 30 pages per week, often quite complex. After each class, it is expected that participants do their homework. Assignments usually will have a form of performing statistical analyses using R software.

Grading system.

The final grade consists of the following components:

1. Preparation for classes, familiarity with the given readings, activity during classes, assignments: 60% of the grade.
2. Final term paper: 40% of the grade.

Schedule.

Schedule of meetings during the first semester of the 2022/2023 academic year.

Day	**Topic**	**Student's own work after the class**
Oct 17	Course Introduction	DASS Ch1, installation of R and RStudio
Oct 24	Introduction to R and RStudio	Problem set 1
Oct 31	Estimating Casual Effects with Randomized Experiments – lecture	DASS Ch. 2
Nov 7	Estimating Casual Effects with Randomized Experiments - lab	Problem set 2
Nov 14	Inferring Population Characteristics via Survey Research – lecture	DASS Ch. 3
Nov 21	Inferring Population Characteristics via Survey Research – lab	Problem set 3
Nov 28	Predicting Outcomes Using Linear Regression - lecture	DASS Ch. 4
Dec 5	Predicting Outcomes Using Linear Regression - lab	Problem set 4

Dec 12	Estimating Casual Effects with Observational Data - lecture	DASS Ch. 5
Dec 19	Estimating Casual Effects with Observational Data - lab	Problem set 5, DASS Ch. 6
Jan 9	Probability – lecture	Problem set 6
Jan 30	Quantifying Uncertainty - lecture	DASS Ch. 7
Feb 6	Quantifying Uncertainty - lab	Problem set 7

DASS = Llaudet, Elena, and Kosuke Imai. 2023. Data Analysis for Social Science: A Friendly and Practical Introduction. Princeton: Princeton University Press.

Additional references (all readings will be available to course participants)**:**

Davies, Tilman M. *The book of R: a first course in programming and statistics*. San Francisco: No Starch Press, 2016.

Field, Andy P., Jeremy Miles, i Zoë Field. *Discovering statistics using R*. London ; Thousand Oaks, Calif: Sage, 2012.

Fox, John. 2016. *Applied Regression Analysis and Generalized Linear Models*. Third Edition. Los Angeles: SAGE.

Fox, John, i Sanford Weisberg. *An R companion to applied regression*. Third edition. Los Angeles: SAGE, 2019.

Healey, Joseph F. *Statistics: a tool for social research*. 9th ed. Belmont, CA: Cengage Learning/Wadsworth, 2011.

Irizarry, Rafael A. *Introduction to data science: data analysis and prediction algorithms with R*. Boca Raton: CRC Press, 2019.

Kellstedt, Paul M., i Guy D. Whitten. *The Fundamentals of Political Science Research*. 3rd Ed. Cambridge University Press, 2018.

Spiegelhalter, David J. 2020. *The Art of Statistics: Learning from Data*. Published in paperback. Pelican, an imprint of Penguin Books.