SciencesPo

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*Program in International Relations*

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# Quantitative Methods – 17758

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## CONTACT

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## COURSE OBJECTIVES

This is an introductory course on quantitative methods for social scientists. It aims to provide students with a non-technical and comprehensive introduction to statistical methods for empirical quantitative data analysis. The goal of the course is that you become an effective reader and user of empirical quantitative analyses in the field of International Relations and beyond. To achieve this, you will learn elementary statistical concepts and theory, including the various assumptions and limitations of quantitative methodologies. The course will combine lectures on statistical theory with practical lab sessions using the statistical software R.

The course is structured in three basic blocks: Block I will introduce you to the logic of empirical analysis, and you will learn about the basic concepts of quantitative methods. Block II will show you how to use simple quantification techniques to describe data, display it in powerful graphs, and test simple hypotheses. Block III will introduce you to the logic of regression analysis, and you will learn how to read, interpret, and carry out regression analyses, including diagnosing and treating common problems.

You are encouraged to apply the material while learning to code in the statistical software R. This course steadily builds on previous material needed to understand the subsequent lectures. Thus, you must attend class, consult the readings for clarification, and complete the homework assignments.

## PREREQUISITES

No prior knowledge of quantitative methods or programming is required for this course. While I do not expect you to be confident math users, I expect you to be keen learners. The course will be held in English. You should bring your computer to class with R and R Studio installed to follow the practical examples in R.

## COURSE VALIDATION

The grading of the course is composed of the following elements:

- Homework assignments 25% (5 assignments, each worth 5%)
- Midterm exam 30% (in session 7)
- Final paper 45% (15 December at midnight)

The **homework assignments** are tied to the practical lab sessions. They are designed to test your abilities in coding in R. Five short homework assignments are distributed in lab sessions II to VI.

The **midterm exam** will take place during the first half of session 7 on 16 October. It will cover the concepts and quantifications you have learned in sessions 1 to 6. Please bring a calculator and z- and t-score conversion tables.

The **final paper** will be a group project of 2 to 3 students. Together, you will choose a topic for your final paper that follows the structure of a research article in the social sciences. Find a suitable dataset to operationalise your chosen concept(s). While there are many ways to structure a paper, I recommend you follow the following guidelines:

*Title and abstract*: Choose a concise and informative title that reflects the essence of the research. Briefly summarise the research question, methods, key findings, and implications. Keep it succinct, ideally around 150-250 words.

*Introduction*: Introduce the research topic, its significance in the discipline within social science (political science or international relations), and the specific research question you aim to address. Highlight why this question is important and how it contributes to the broader understanding of the subject matter.

*Theoretical Framework*: Explain the theoretical concepts that underpin your research. Describe how these theories guide your hypotheses or expectations. You may refer to research in international relations or political science to strengthen your argument.

*Research Design and Methodology*: Restate your research question and outline the hypotheses you intend to test. Describe your data sources and explain why they are relevant to your research. Be critical about potential measurement errors and other problems of operationalisation. Define and operationalise the independent and dependent variable(s) in your study. Specify the quantitative techniques you apply (e.g., regression analysis, descriptive statistics) and explain why these methods suit your research question.

*Results and Discussion*: Present your findings in a clear and organised manner. Use tables, charts, and graphs to visualise the data descriptively. Present the results of your regression analysis meaningfully and interpret the results, focusing on the relationships between variables and the implications for your research question and theoretical framework. Discuss whether the findings align with your hypotheses. Address any limitations of your study and suggest areas for future research.

*Conclusion:* Summarise the main findings of your study and reiterate their implications for the broader field of political science or international relations. You could reflect on potential real-world applications and policy implications of your study.

*References***:** List all the sources cited in your paper following one of the following referencing styles: APA, Chicago, MLA, or Harvard.

*Appendices***:** Include any supplementary materials that support your analysis, such as additional data tables, questionnaires, or technical details of your methodology.

When writing the final paper, try to be concise and focused – present information clearly and precisely. Make evidence-based arguments and support your claims with empirical evidence from your data analysis. Visualise your data effectively using graphs, charts and tables that enhance the understanding of your main point and highlight key trends and patterns. Include a list of references using Harvard Style in-text references.

The deadline for the final paper is **15 December** at midnight. Please do not exceed a word limit of **5000 words** of substantial text (excluding the title page and table of contents, abstract, graphs, tables, appendices and references).

# COURSE OUTLINE

*BLOCK I: Logic and Concepts of Quantitative Data Analysis*

**Session 1: Introduction to the course and Quantitative Methods: Core Concepts**

- Lamont (2015) chapter 1: “Introduction”
- Meier et al. (2015) chapter 2: “Measurement”

**Session 2: The Logic of Inference: From Variables to Models**

- Braumoeller and Sartori (2004) chapter 6: “The Promise and Perils of Statistics in International Relations”
- Meier et al. (2015) chapter 3: “Research Design”

*Lab session I – Introduction to R*

*BLOCK II: Simple Quantifications*

**Session 3: Descriptive Statistics and Data Visualisation**

- Meier et al. (2015) Part 2: “Descriptive statistics” (chapters 4 to 6)
- Wilke (2019) part I: “From data to visualisation”

**Session 4: Inferential Statistics: Theory**

- Kmenta (1997) chapter 1: “Introduction to Statistical Inference”
- Meier et al. (2015) chapter 10: “Introduction to Inference”

**Session 5: Inferential Statistics: Testing Hypotheses I**

- Meier et al. (2015) chapter 11: “Hypothesis testing”

*Lab session II – Descriptive statistics*

**Session 6: Inferential Statistics: Testing Hypotheses II**

- Meier et al. (2015) chapter 13: “Testing the Difference between Two Groups” and chapter 15 “Aids for the Interpretation of Contingency Tables”

*Lab session III – Data visualisation*

**Session 7: Mid-term exam (1h) and fun with maps (1h)**

*BLOCK III: Regressions Analysis*

**Session 8: Introduction to Linear Regression**

- Meier et al. (2015) chapter 17: "Introduction to Regression Analysis" and chapter 18: "The Assumptions of Linear Regression"

*Lab session IV – Testing relationships*

**Session 9: Introduction to Multivariate Linear Regression**

- Meier et al. (2015) chapter 20: "Multiple Regression"

**Session 10: Regression assumptions and diagnostics**

*Lab session V – Multivariate regression and diagnostics*

**Session 11: Applied research methods: Web scraping**

**Session 12: Joker session**

This session will be filled based on student demand and progress during the semester. Potential topics are:

- Revision of course material
- Research Symposium: Presentations of work in progress on final papers
- Research designs for causal inference

*Lab session VI – Data cleaning*

# READINGS

The course will use the following textbook available in the Sciences Po library:

- Meier, K.; Brudney, J.; Bohte, J. (2015) Applied Statistics for Public and Nonprofit Administration. 9th edition. Cengage, Stamford.

Single chapters are taken from the following books:

- Kmenta, J. (1997) Elements of Econometrics. 2nd edition. Macmillan Publishing Company, New York.
- Lamont, C. (2015) Research Methods in International Relations. SAGE Publications, London.
- Braumoeller, B. and Sartori, A. (2004) Introduction: The Promise and Perils of Statistics in International Relations. in: Sprinz, D. and Wolinsky, Y. (eds.) *Models, Numbers, and Cases - Methods for Studying International Relations*. p. 129 - 151. University of Michigan Press.
- Wilke, C. (2019) Fundamentals of Data Visualisation: A Primer on Making Informative and Compelling Figures. 1st edition. Sebastopol, CA: O'Reilly Media. Available online here.