



## ECONOMETRIC METHODS AND APPLICATIONS

<b>Course code</b>	<i>ECO139</i>
<b>Compulsory in the programmes</b>	<i>Elective</i>
<b>Level of studies</b>	<i>Undergraduate</i>
<b>Number of credits</b>	<i>6 ECTS (48 in-class hours + 2 consultation hours + 2 exam hours, 110 individual work hours)</i>
<b>Course coordinator (title and name)</b>	<i>Assist. Prof. Dr. Simonas Čepėnas</i>
<b>Prerequisites</b>	<i>Econometrics</i>
<b>Language of instruction</b>	<i>English</i>

### THE AIM OF THE COURSE:

This course will examine cross-sectional, time-series, and panel models to facilitate a deeper understanding of their underlying principles and applications to real-world datasets. The focus of this course is less on the error-correction aspect of econometrics and more on the substance behind the models studied. The primary objective is to equip students with the knowledge of selecting empirically sound models that actually test their hypotheses. The curriculum will emphasise Generalised Linear Models (GLMs) and Panel Models.

The course will start with a review of Ordinary Least Squares (OLS) regression, followed by GLMs, such as Logit, Probit, Negative Binomial, and Poisson regressions. Furthermore, it will revisit selected time-series models (e.g., AR(I)MA(X) and Vector Autoregression). The substantial portion of the syllabus will be devoted to Panel Methods, such as Pooled OLS, Fixed-Effects, Random Effects, Panel VARs, Panel GLMs, and Meta-Analysis. Subject to available time and student preferences, the inclusion of survival methods as an additional topic will be considered.

The technical language that we will use throughout the course is R. Familiarity with R and R Studio is not required but highly recommended.

### MAPPING OF COURSE LEVEL LEARNING OUTCOMES (OBJECTIVES) WITH DEGREE LEVEL LEARNING OBJECTIVES (See Annex), ASSESMENT AND TEACHING METHODS

Course level learning outcomes (objectives)	Learning objectives for BSc in Business Management	Learning objectives for BSc in Social Sciences	Assessment methods	Teaching methods
CLO1. To understand the terminology and principles used in econometrics.	BLO1.1., BLO1.2.	ELO1.1., ELO1.2.	Midterm, final exam, seminars	Lecture, Seminars
CLO2. To understand the basic concepts of data gathering, wrangling, and cleaning.	BLO1.1., BLO1.2., BLO3.1.	ELO1.1., ELO1.2.	Midterm, final exam, seminars, problem set	Lectures, Seminars
CLO3. To gain proficiency in R programming. To learn about R programming and tools that make it more efficient, such as R Studio, and R Markdown.	BLO1.1., BLO1.2., BLO1.2., BLO3.1., BLO3.2.	ELO2.1., ELO3.1., ELO3.2.	Midterm, final exam, seminars, problem set	Lectures, Seminars
CLO4. To gain deep knowledge of methods used for cross-sectional data, such as OLS and GLMs.	BLO1.1., BLO1.2., BLO3.1.	ELO1.1., ELO1.2., ELO4.1., ELO4.2., ELO4.3.	Final exam, seminars, problem set	Lectures, Seminars
CLO5. To learn how to model time and about forecasting using time-series data.	BLO1.1., BLO1.2., BLO3.1., BLO4.2.	ELO4.1., ELO4.2., ELO4.3.	Final exam, seminars,	Lectures, Seminars



			problem set	
CLO6. Visualize data, models, and forecasts using GGPlot.	BLO1.1., BLO1.2., BLO3.1., BLO3.2., BLO4.1.	ELO2.1., ELO3.1., ELO3.2.	Seminars, problem set, final exam.	Lectures, Seminars
CLO7. Learn how and when to apply complex methods, such as duration model, experimental designs and panel models.	BLO4.1., BLO4.2., BLO4.3.	ELO4.1., ELO4.2., ELO4.3.	Seminars, problem set, final exam	Lectures, Seminars

### ACADEMIC HONESTY AND INTEGRITY

The ISM University of Management and Economics Code of Ethics, including cheating and plagiarism are fully applicable and will be strictly enforced in the course. Academic dishonesty, and cheating can and will lead to a report to the ISM Committee of Ethics.

### COURSE OUTLINE

Topic	In-class hours	Readings
1. What is science? How social sciences differ from natural sciences?	2	Daniel E Lieberman, <a href="#">Upending the Expectations of Science</a> ;
2. Introduction to R programming: objects, vectors, lists, datasets. Writing functions in R. Datasets in R: gathering, wrangling, and cleaning of data.	6	Grolemund, G., & Wickham, H [Ch. 2, 4, 5, 6, 11, 26]
3. t-test, ANOVA and Ordinary Least Squares (OLS) Regression Analysis revisited. Introduction to GGPlot and data visualization	4	Grolemund, G., & Wickham, H [ Ch. 3, 25]
4. Generalized Linear Models (GLMs)	4	Agresti, A. [Ch. 1, 7]
5. Time-series models and economic forecasting revisited: AR(I)MA(X), Hawkes processes, ECM, and VAR	4	Box-Steffensmeier et al. [Ch. 1-8]
6. Midterm examination   Problem Set	4	
7. Survival analysis	4	TBA
8. Models for natural experiments in social sciences: Regression discontinuity design and difference in difference	4	Dunning T. [Ch. 5], Angrist, J. D., Pischke, J. [Ch. 6]
9. Introduction to Panel Models: Pooled OLS and PCSE	4	Angrist, J. D., Pischke, J. [Ch. 1-3]
10. Fixed-effects and Random effects models	4	Angrist, J. D., Pischke, J. [Ch. 5]
11. Meta-analysis in social sciences using R	4	TBA
12. Panel VAR and Panel GLMS	4	Hsiao, C. (2014) [Ch. 10]
	<b>Total: 48 hours</b>	



CONSULTATIONS	2	
FINAL EXAM	2	

### FINAL GRADE COMPOSITION

Type of assignment	%
<i>Individual assignments 80%</i>	
Final examination	40%
Final Project	40%
<i>Group assignments 20%</i>	
Midterm Examination   Problem Set	20%
<b>Total:</b>	<b>100</b>

### DESCRIPTION AND GRADING CRITERIA OF EACH ASSIGNMENT

*(Provide short descriptions and grading criteria of each assignment)*

Midterm exam will take place as a group activity / workshop, where students will have 3 hours to solve a problem set using R. Problem set will facilitate your learning of R programming and constitute 20% of your final grade.

Final exam will consist of theory and modeling questions. It will comprise 40% of the final grade. The final exam will be based on topics 1-12.

Final project will help you prepare for writing your bachelor thesis next semester and constitute 40% of the grade. It will take a form of a short methodologically oriented research paper.

### RETAKE POLICY

*(Provide short description and percentage of the final grade)*

In case of a negative final grade, students can sit for a retake exam. Such an exam will cover all course material. The weight of a retake is 60%. Grades from final project is not subject to a retake but their evaluation (if positive) will count towards the final grade with the retake exam.

### ADDITIONAL REMARKS

The syllabus is subject to small changes. Specific chapters from the books are TBA. All readings will be available online on the course website.

### READINGS

Grolemund, G., & Wickham, H. (2017). *R for Data Science*. O'Reilly Media.

Agresti, A. (2015). *Foundations of Linear and Generalized Linear Models*. United Kingdom: Wiley.

Angrist, J. D., Pischke, J. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. United Kingdom: Princeton University Press.

Hsiao, C. (2014). *Analysis of Panel Data*. United Kingdom: Cambridge University Press.



### **ADDITIONAL READINGS**

Dunning, T. (2012). *Natural Experiments in the Social Sciences: A Design-Based Approach*. United Kingdom: Cambridge University Press.

Box-Steffensmeier JM, Freeman JR, Hitt MP, Pevehouse JCW. (2014). *Time Series Analysis for the Social Sciences*. Cambridge: Cambridge University Press. doi:10.1017/CBO9781139025287



**ANNEX**

**DEGREE LEVEL LEARNING OBJECTIVES**

**Learning objectives for the Bachelor of Business Management**

*Programmes:*

*International Business and Communication,  
Business Management and Marketing, Finance,  
Industrial Technology Management*

<b>Learning Goals</b>	<b>Learning Objectives</b>
Students will be critical thinkers	BLO1.1. Students will be able to understand core concepts and methods in the business disciplines
	BLO1.2. Students will be able to conduct a contextual analysis to identify a problem associated with their discipline, to generate managerial options and propose viable solutions
Students will be socially responsible in their related discipline	BLO2.1. Students will be knowledgeable about ethics and social responsibility
Students will be technology agile	BLO3.1. Students will demonstrate proficiency in common business software packages
	BLO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	BLO4.1. Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	BLO4.2. Students will be able to convey their ideas effectively through an oral presentation
	BLO4.3. Students will be able to convey their ideas effectively in a written paper

**Learning objectives for the Bachelor of Social Science**

*Programmes:*

*Economics and Data Analytics,  
Economics and Politics*

<b>Learning Goals</b>	<b>Learning Objectives</b>
Students will be critical thinkers	ELO1.1. Students will be able to understand core concepts and methods in the key economics disciplines
	ELO1.2. Students will be able to identify underlying assumptions and logical consistency of causal statements
Students will have skills to employ economic thought for the common good	ELO2.1. Students will have a keen sense of ethical criteria for practical problem-solving
Students will be technology agile	ELO3.1. Students will demonstrate proficiency in common business software packages
	ELO3.2. Students will be able to make decisions using appropriate IT tools
Students will be effective communicators	ELO4.1. Students will be able to communicate reasonably in different settings according to target audience tasks and situations
	ELO4.2. Students will be able to convey their ideas effectively through an oral presentation
	ELO4.3. Students will be able to convey their ideas effectively in a written paper