ECONOMETRICS

ICEF Summer Bridge Course 2023

Course Syllabus

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Course Pre-requisites

Understanding of the following basic principles concepts from
- Calculus (continuity, monotonicity, differentiation, integration)
- Linear algebra (vectors, matrices and basic operations on them)
- Probability theory and statistics (concept of probability, random variable, distribution, density)

Language – English
Technical – MS Office, ability to use statistical packages is a plus

Course description:

This adaptive course is part of pre-masters training program «ICEF Summer Bridge School». Its goal is to prepare students for compulsory Econometrics course on a graduate level. We will focus on topics from probability theory and statistics, which are directly used in introductory and advanced econometrics and solve problems from many popular econometric textbooks. This will allow all students to revise material and, if necessary, fill knowledge gaps and finally be fully prepared for the compulsory course.

Learning Objectives
Upon completion of this course, the students will be expected to:
1. Understand the concepts from probability theory and statistics needed for understanding econometrics
2. Be able to apply theoretical knowledge for problem solving
3. Be aware of basic software and packages which can be used for solving problems which require analysis of substantial amount of data.

Learning Outcomes
The detailed learning outcomes are presented in the table

No.	Topic name	Learning outcomes
1	Calculus	• Repeat limits, derivatives, integration • Understand principles of constrained optimisation
2	Matrix algebra	• Repeat vectors, matrices and operations of them: transposing, inversion, ortogonalisation, diagonalisation • Be able to solve linear systems of equation, find inverse matrix
3	Probability theory	• Understand discrete and continuous random variables, independent random variables • Cumulative distribution function, probability density • Understand covariance and correlation coefficient
4	Estimators	• Be able to find ordinary least squares estimators (OLS) • Be able to find maximum likelihood estimators (MLE) • Be able to find method of moments estimators (MM)

		• Understand the concept of consistent estimators
5	Confidence intervals, hypothesis testing	• Understand the concept of confidence interval, confidence level, critical level and critical value. • Understand the concept of hypothesis, type I and type II errors, power of the test • Be able to construct confidence intervals and test hypotheses for basic population parameters: mean, proportion and variance. Cases of one and two samples.
6	Regression	• Understand basic concepts of linear regression – factors, explanatory variable, model, least squares method. • Be able to estimate regression parameters as OLS estimators. • Be able to make significance tests for linear regression • Be able to analyze multiregression model, coefficient of determination, basic tests. • Understand Gauss-Markov theorem.
7	Introduction to econometrics	• Understand concepts of return, logarithmic return, trend and seasonality. • Understand concepts of multicollinearity and heteroscedasticity. • Understand basic econometric models: moving average (MA) and autoregression (AR)
8	Software overview	• Understand how programming languages and statistical packages can be used for

Course Plan

1 hour = 40 minutes

Topic No.		Overall (hours)	Hours per week	
			Including	
			Lectures	Practice Sessions
1	Calculus	2	2	
2	Matrix algebra	2	2	
3	Probability theory	4	4	
4	Estimators	4	4	
5	Confidence intervals, hypothesis testing	2	2	
6	Regression	6	6	
7	Introduction to econometrics	2	2	
8	Software overview	2	2	
Total:		24	24	

Essential Reading and Course Materials:
1. Wooldridge J. M., «Econometric analysis of cross section and panel data», MIT press, 2010
2. Hansen B. E., «Probability and Statistics for Economists», Princeton University Press, 2022
3. Hansen B. E., «Econometrics», Princeton University Press, 2022
4. Tsay R. S., «Analysis of financial time series», 2010.

Methods of Instruction

The course includes both theory and practice. Lectures consist of theoretical material which follows problem solving sessions for better understanding. The key to success is self-study, active discussions and questions.

Special Equipment and Software Support

• Projector
• Flip chart and markers
• Access to the Internet

Grading System and Final Assessment:

Grading System

The course grade is based on activity and final exam mark. The maximum amount of points available for each component is as follows:

Class participation and activity	30 pts
Final examination	70 pts
Total	100 pts

All grades are given initially out of 100. The final grades are also transferred to 10- and 5-points grades in accordance with the ICEF Grading Regulations (par. 3)

The following basic scale has been established to convert grades from the 100-point scale to the 10-point scale

100-point scale	10-point scale
0-19,99	1
20-29,99	2
30-39,99	3
40-46,99	4
47-53,99	5
54-61,99	6
62-69,99	7
70-77,99	8
78-85,99	9
86-100	10

Grades 0, 1, 2, 3 correspond to a 'fail'; 4, 5 - 'satisfactory'; 6, 7 – 'good'; 8, 9, 10 – 'excellent' performance on the 10-point scale

Sample materials for knowledge assessment are available in ICEF Information system and by request

Guidelines for Knowledge Assessment

The tutor will assess both the width and quality of the analysis, knowledge of probability theory, statistics and econometrics. Final exam will be based on the information from lectures, but students are not limited to search for the relevant information.