Faculty of Economics and Business Administration

COURSE (MODULE) DESCRIPTION

Course title	Code
Time Series Analysis	

Staff	Department
Coordinator(s): Dr. Žymantas Budrys **Other(s):**	Faculty of Economics and Business Administration

Study cycle	Course type
First (Bachelor's)	Elective

Form of implementation	Period of implementation	Language of instruction
Lectures and seminars	Spring semester	English

Requirements for student			
Prerequisites: Mathematical Methods, Statistical Theory, Econometric Theory and Practice I, Econometric Theory and Practice II, Computing and Data Analysis		**Additional requirements (if any):** none	
Number of ECTS credits	**Student's workload**	**Contact hours**	**Individual work**
5	144	36	108

Purpose of the course and competences developed		
The main objectives are: a) to develop analytical skills in time series econometrics for applied economic questions and b) to acquire the necessary programming skills in Matlab for the development of statistical models.		
Learning outcomes (learning outcomes of the programme)	**Teaching methods**	**Assessment methods**
The ability to read and understand time series literature. (1.2) The ability to design and carry out appropriate econometric analysis of time series data. (2.2) The ability to write code for any of the time series models discussed. (3.4) The ability to work in a team to carry out an empirical project (4.1).	Detailed and careful step-by-step explanation of the material during lectures and seminars, self-study of theoretical material and completion of an empirical project under the supervision of the lecturer.	Open questions during the exams and empirical project.

Course themes	Contact / Individual work: time and assignments								
	Lectures	Tutorials	Seminars	Practical classes	Laboratory works	Practice	**Total contact hours**	**Independent work**	**Assignments**
Introduction • What is Time Series Statistics and what is it good for? • Course Overview • Basics (Difference Equations, Lag Operators, Matrix Algebra)	3						**3**	**9**	Reading scientific literature, solving problems at home, preparing for quizzes, learning to use statistical software, and completing the empirical project.

Univariate stationary processes: • Stationarity • Ergodicity • Wold Representation Theorem, invertibility • autoregressive (AR) processes; • moving average (MA) processes; • mixed (ARMA) processes; • impulse response functions • estimation of AR, MA and ARMA models; • forecasting;	6		3				**9**	**27**	Reading scientific literature, solving problems at home, preparing for quizzes, learning to use statistical software, and completing the empirical project.
Multivariate processes: • VAR process • stability conditions • lag length selection • Granger Causality • impulse response functions • identification • variance decomposition • forecasting	9		3				**12**	**27**	Reading scientific literature, solving problems at home, preparing for quizzes, learning to use statistical software, and completing the empirical project.
Nonstationary processes (unit roods and cointegration: • random walk • trends and breaks • spurious regression • unit roots and tests • cointegration and common trends • error correction model, Engle-Granger methodology	6		3				**9**	**27**	Reading scientific literature, solving problems at home, preparing for quizzes, learning to use statistical software, and completing the empirical project.
Advanced topics • State Space Models and Kalman Filter • Factor Models • Principal components • Forecasting and evaluation • Local Projections	3						**3**	**9**	Reading scientific literature, solving problems at home, preparing for quizzes, learning to use statistical software, and completing the empirical project.
Total	**27**		**9**				**36**	**108**	

Assessment strategy	**Share in %**	**Time of assessment**	**Assessment criteria**
Empirical group project	30	Close to the end of semester	The project will assess the practical skills acquired during tutorials. Students' assessment will be based on their successful handling and visualisation of data, interpretation of statistical techniques and results.
Multiple Choice Quizzes	4 x 5	Beginning/ middle/ end of semester	In four multiple-choice quizzes, students will be required to solve various empirical and theoretical problems.
Final exam	50	End of semester	Students will be asked to solve several empirical and theoretical problems. Students will be assessed on the accuracy and completeness of their answers. The final exam will test the material covered throughout the course.

Author	Published in	Title	Issue No. or Volume	Publishing house or Internet site
Compulsory literature				
Hamilton, James D.	1994	Time Series Analysis	1st edition	Princeton University Press
Cochrane, John	2005	Time Series for Macroeconomics and Finance		https://www.johnhcochrane.com/research-all/time-series-for-macroeconomics-and-finance
Stock, J. H. and M. W. Watson	2020	Introduction to Econometrics	4th Edition	Pearson Education
Supplementary literature				
Lütkepohl, Helmut Krätzig, Markus (eds.)	2004	Applied Time Series Econometrics		Cambridge University Press
Diebold, Francis X.	2017	Forecasting in Economics, Business, Finance and Beyond	Version 1	https://www.sas.upenn.edu/~fdiebold/Teaching221/Forecasting.pdf