

Subject card

Subject name and code	Econometrics, PG_00174270						
Field of study	Mathematical Modeling and Data Analysis						
Date of commencement of studies	October 2024		Academic year of realisation of subject			2025/2026	
Education level	Bachelor's studies		Subject group			Obligatory subject group in the field of study Optional subject group	
Mode of study	full-time studies		Mode of delivery			at the university	
Year of study	2		Language of instruction			Polish	
Semester of study	3		ECTS credits			6.0	
Learning profile	academic		Assessment form			exam	
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Dorota Ciolek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		0.0		0.0	60
Subject objectives	Learning the econometric model as a tool for verifying hypotheses and forecasting in economics and management sciences. Acquiring knowledge and practical skills in building, estimating, evaluating and interpreting econometric models and their application in various empirical analyses.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[MMiADL3_W09] knows and understands the basics of computational and programming techniques supporting mathematician's work and understands their limitations		knows the basic types of single-equation econometric models, methods of their estimation, tools for their verification and ways of their interpretation in relation to specific relationships in economics and other social sciences			[SW4] test/exam - oral or written	
	[MMiADL3_U10] is able to recognise problems, including practical issues, that can be solved algorithmically; can make a specification of such a problem		is able to propose an econometric model suitable for verifying specific hypotheses or research goals			[SU5] implementation of a problem task	
	[MMiADL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning		takes a conscious approach to assessing the possibilities of using econometric modeling to achieve a specific research goal or analytical task			[SK5] implementation of a problem task	
	[MMiADL3_U11] knows how to arrange and analyse an algorithm in accordance with the specification and save it in the selected programming language		is able to build and estimate an econometric model and verify and interpret it			[SU5] implementation of a problem task [SU6] demonstration of practical skills	

Subject contents	1. The nature of quantitative economic data: types of statistical data, economic variables as random variables; regression as an econometric model, the idea of the error term; various analytical forms of the model (when logarithms and when variable levels?), interpretation of parameters in regression (marginal effects, elasticities, semi-elasticities) 2. Model estimation using the OLS: the Gauss-Markov theorem, the idea of the Ordinary Least Squares, numerical conditions for the applicability of the OLS, stochastic assumptions and their significance for the properties of the OLS, the matrix formula of the OLS, theoretical values and model residuals, standard errors of parameter estimates, confidence intervals for parameters 3. Econometric model verification: tests of stochastic assumptions, goodness of fit measures and their interpretation, tests of individual and joint significance of parameters; methods of proceeding in case of failure to meet assumptions, robust standard errors, RESET test as verification of correctness of analytical form 4. Econometric model additional issues: impact of data scaling on the results of OLS estimation, dependence between variables of "inverted U" character - quadratic function in econometric model, models with interactions of variables, collinearity of explanatory variables VIF measure (Variance Inflation Factor); comparison of different models - information criteria: AIC, BIC, problem of endogeneity of explanatory variables 5. Regressions with dummy variables: qualitative variables as explanatory variables, methods of introducing dummy variables (change of intercept, change of slope), perfect collinearity, interactions between qualitative variables; identification and control of outlier observations (leverage measures, standardized residuals, Cook's distance), dummy variables for outliers, dummy variables for structural changes 6. Econometric model for time series: specificity of time series data, stochastic process generating data, static model - interpretation of parameters, model with distributed lags: short- and long-term interpretation (multipliers), trend in variables observed over time; spurious regressions - common trend, introduction of time variable t, R2 for explained variables characterized by a trend, seasonality for variables with higher frequency, trend models with seasonal fluctuations; stationarity and non-stationarity of time variables, unit root test, economic variables "with long memory" 7. Gravity model in international trade and hedonic price model on real data as examples of application of econometric modeling . 8. Elements of spatial econometrics: cartograms and cartodiagrams, spatial weight matrices, spatial autocorrelation (Moran's I statistic), spatial lag model (SAR), spatial error autocorrelation model (SEM), spatial cross-regression models (SLX). As part of their own work, students solve problem tasks using econometric modeling. The solutions to these tasks and any problems in their implementation are discussed during consultations with the lecturer.		
Prerequisites and co-requisites	Knowledge of: - matrix algebra, basic differential calculus, probability calculus, - descriptive statistics and statistical inference - macroeconomic and microeconomic theory		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	implementation of the problem task	51.0%	40.0%
	written exam	51.0%	60.0%
Recommended reading	Basic literature	Koop G. (2015), Wprowadzenie do ekonometrii, Wolters Kluwer, Warszawa Kufel T.(2004), Rozwiązanie problemów z wykorzystaniem programu Gretl, PWN, Warszawa Kukuła K. (red.) (2009), Wprowadzenie do ekonometrii, PWN, Warszawa Osińska M., (red), (2007), Ekonometria współczesna, TONiT. Toruń. Wooldridge J. M. (2013), Introductory Econometrics: A Modern Approach, South-Western Cengage Learning	

	Supplementary literature	Ciołek D., Brodzicki T. (2016), Determinanty działalności eksportowej polskich firm produkcyjnych, Gospodarka Narodowa., vol. 27, nr 2, s. 59-76. Ciołek D., Brodzicki T. (2016), Determinanty produktywności polskich powiatów, Bank i Kredyt, vol. 47, nr 5, s.463-494. Greene W.H. (2002), Econometric Analysis, New York University. Upper Saddle.
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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