

Subject card

Subject name and code	Parametric Models, PG_00157244						
Field of study	Informatics and Econometrics						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	part-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	2		ECTS credits		4.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Department of Statistics -> Faculty of Management -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Beata Jackowska				
	Teachers		dr hab. Beata Jackowska				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	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	30		15.0		55.0	100
Subject objectives	Gaining knowledge about the construction and verification of generalized linear models, especially logistic models. Learning about the possible applications of these models. Acquiring skills in estimating and verifying parametric models based on empirical data and interpreting the obtained results.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[liEMU2_W04] The student has an in-depth knowledge of advanced mathematical, statistical, econometric and IT methods that enable the acquisition, processing and analysis of data reflecting the functioning and growth of the national economy and its components, as well as the phenomena and processes occurring in their environment.	The student knows the principles of construction, verification and application possibilities of generalized linear models, in particular logistic models.	[SW4] test/exam - oral or written [SW2] presentation/project/paper/report [SW3] text preparation/written work
	[liEMU2_U07] The student is able to build advanced formal models of complex economic phenomena and processes, estimate them, carry out their verification and apply them to modeling, forecasting and optimization of resources of economic institutions of varying degrees of complexity, their structure and the course of processes in them.	The student is able to select the appropriate form of the model for studying various types of phenomena. On the basis of empirical data, the student is able to estimate and verify the learned parametric models and interpret the obtained results.	[SU2] presentation/project/paper/report
	[liEMU2_U05] The student is able to make a statistical description of basic and detailed economic categories at an advanced level, formulate and verify hypotheses about their formation.	The student is able to identify a research problem, formulate research hypotheses, select and apply appropriate modeling methods to solve the researched problem.	[SU2] presentation/project/paper/report
	[liEMU2_K02] The student can communicate freely with the public on specialised topics in the field of computer science and econometrics in and outside the workplace, communicate his knowledge and share his skills through various media. Culturally participates in discussions, is not afraid to ask questions and knows how to give constructive criticism.	The student understands the need to continuously supplement and deepen acquired knowledge; is prepared to further expand acquired knowledge; is aware of the need to conduct research and the responsibility for its proper implementation.	[SK2] presentation/project/paper/report
	[liEMU2_U06] The student is able to forecast complex economic phenomena and processes at an advanced level and check the properties of the obtained forecasts.	The student is able to use parametric models to identify cause-and-effect relationships and search for regularities occurring in the analyzed data set.	[SU2] presentation/project/paper/report [SU3] text preparation/written work [SU4] test/exam - oral or written
	[liEMU2_K03] The student is able to communicate freely with the public inside and outside the workplace, transfer his knowledge and share his skills through various media.	The student is able to transfer his/her knowledge and share his/her skills in the field of construction, verification and interpretation of parametric models.	[SK2] presentation/project/paper/report [SK3] text preparation/written work [SK4] test/exam - oral or written
Subject contents	Generalized linear models Model form: random component, systematic component, a link function connecting random and systematic components. Distribution of the response variable and link function. Canonical link functions for selected distributions. Essence and application possibilities of generalized linear models for response variables: continuous, dichotomous (binary), count, ordinal. Method of estimation model parameters. Stages of model construction (preparation of variables, choice of model form, estimation of model parameters, model verification). Logistic model Logistic model as a generalized linear model for a qualitative response variable (dichotomous or with more than two categories). Quantitative and qualitative explanatory variables (preparation of variables and method of introduction to the model). The concept of odds and odds ratio. Estimation of model parameters. Statistical inference in logistic regression. Evaluation of the logistic model: assessment of model fit (pseudo-R² measures), information criteria, assessment of classification performance (measures based on the confusion matrix and measures based on the ROC curve). Taking into account the interactions of explanatory variables. Interpretation of the resulting model. Use of the binary logistic model to assess the risk of an event depending on the characteristics of the object (e.g. to assess credit risk, insurance risk, unemployment risk). Use of the binary and multinomial logistic model in survey studies to analyze questions with two or more answer variants (e.g. survey of preferences, opinions, satisfaction).		

Prerequisites and co-requisites	Statistics/Econometrics - basics of correlation analysis and regression analysis		
	Mathematical statistics - basics of point and interval estimation and hypothesis testing		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam with open questions and tasks	51.0%	50.0%
	Final project – realization a final project in teams in the form of a written study of data analysis results using regression analysis methods	51.0%	50.0%
Recommended reading	Basic literature	1. Gruszczyński M. (red.), <i>Mikroekonometria. Modele i metody analizy danych indywidualnych</i>, Oficyna Wolter Kluwer business, Warszawa 2010 2. Jackowska B., <i>Efekty interakcji między zmiennymi objaśniającymi w modelu logitowym w analizie zróżnicowania ryzyka zgonu</i>, "Przegląd Statystyczny", nr 1-2/2011, p. 24-41 3. Stanisław A., <i>Przystępny kurs statystyki z zastosowaniem STATISTICA.PL na przykładach z medycyny</i>. Tom 2. Modele liniowe i nieliniowe, StatSoft, Kraków 2007 (chapters 6, 21)	
	Supplementary literature	1. Agresti A., <i>Categorical Data Analysis</i>, John Wiley & Sons, New Jersey 2002 (chapters 4-7) 2. Harrell F.E., <i>Regression Modeling Strategies with Applications to Linear Models, Logistic and Ordinal Regression, and Survival Analysis</i>, Second Edition, Springer 2015 3. Jong P., Heller G., <i>Generalized Linear Models for Insurance Data</i>, Cambridge University Press, Cambridge 2008 4. Kleinbaum D.G., <i>Logistic Regression. A Self-Learning Text</i>, Springer-Verlag, New York 1996 5. McCullagh P., Nelder J. A., <i>Generalized Linear Models</i>, Chapman & Hall, London 1989 6. Stanisław A., <i>Modele regresji logistycznej. Zastosowania w medycynie, naukach przyrodniczych i społecznych</i>, StatSoft, Kraków 2016	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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