Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	**Applied Regression Analysis for Public Policy**
Course code	**27605**
Scientific sector	SECS-P/05 - ECON-05/A
Degree	LM-63 Public Policy and Innovative Governance
Semester and academic year	a.y. 2025/2026 2nd semester
Year	2025/26
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	-
Total exercise hours	-
Attendance	suggested, but not required
Prerequisites	B1 level in English is required to sit the exam.
Course page	https://www.unibz.it/en/faculties/economics-management/master-public-policy-innovative-governance/

Specific educational objectives	The course refers to the typical educational activities and belongs to the scientific area of Statistics-Mathematics (SECS-P/05 - ECON-05/A) Modern regression has a pivotal role in the analysis of public administration data and for evidence-based policymaking. This course introduces students to modern regression methods through a blend of methodological foundations and hands-on applications. Students will acquire proficiency in formulating well-justified regression models and use them analyze data relevant to public policy issues. Special attention will be given to understanding the main assumptions of the linear regression model and its possible generalizations in the context of different data types, including data characterized by temporal and spatial dependency. The course spans the entire analytical process, from formulating relevant research questions and hypotheses to data collection, analysis, visualization, interpretation and communication of results, all within the R computing environment.

Lecturer	**Jan Ditzen** Office: I3.03 Email: jan.ditzen@unibz.it https://www.unibz.it/it/faculties/economics-management/academic-staff/person/44644-jan-ditzen
Scientific sector of the lecturer	SECS-P/05 - ECON-05/A
Teaching language	English
Office hours	18 hours MySNS – My timetable Webpage: https://www.unibz.it/en/timetable/?sourceId=unibz&department=26&degree=14100
Lecturing assistant	//
Teaching assistant	//
Office hours	
List of topics covered	Simple linear regression model; Multiple linear regression; Extensions of the linear regression model; Methods for spatially and temporally correlated data; Recent developments in regression analysis; coding in R.
Course Outline	**1. Introduction to regression analysis for the public sector:** The role of regression analysis in the context of the public sector. Formulating research questions and hypotheses. **2. The simple linear regression model:** Model specification, interpretation, and assumptions. Estimation methods, least squares estimation, and assessment of model uncertainty. **3. Multiple linear regression:** Inclusion of multiple predictors, variable selection, model building, model diagnostics. **4. Extensions of the linear regression model:** Extending the multiple linear regression model by including non-linear terms and interaction effects. Linear regression methods for categorical output variables. **5. Methods for spatially and temporally correlated data:** Linear methods for time series analysis, regression methods for spatially correlated data. **6. Recent developments in regression analysis:** Robust estimation methods and outlier detection. Machine learning methods for high dimensional data from a

	regression perspective. Sparse regression models and penalized least squares methods**.** The emphasis is on applying the methods to evaluate real world policy questions. For this we use the statistical software R.
Teaching format	The course will combine in-class explanations of data-analysis procedures, problem-solving and discussion of case studies. Students will be encouraged to participate actively in class work, which will give them the opportunity to develop their problem-solving skills in the context of realistic situations.

Learning outcomes	**1. Knowledge and Understanding:** • Gain comprehensive knowledge and understanding of the fundamental role of regression analysis in the public sector, providing a foundational tool for decision-making. • Acquire understanding of the theoretical underpinnings, model specifications, and standard assumptions of the linear regression model and its common extensions. **2. Applying Knowledge and Understanding:** • Apply relevant methods within the R computing environment to obtain inference results and predictions within the framework of simple linear regression. • Apply knowledge to formulate precise research questions and hypotheses relevant to regression analysis in public policy contexts. **3. Making Judgments:** • Develop the ability to make informed judgments on public sector data based on regression inference and prediction results. • Develop the ability to discriminate competing models and offer grounded explanations for different type of public sector analysis problems. • Develop the ability to compare results and test hypotheses in the public sector domain based on regression analysis.

	4. Communication Skills: • Enhance technical communication skills in data science by selecting, organizing and articulating the results of regression analysis. • Develop the ability to communicate insights derived from analysis to a non-specialist audience in the public sector. **5. Learning Skills:** • Develop advanced learning skills needed to adapt regression techniques to different and possibly complex data sets. • Develop learning skills needed for continuous learning and interdisciplinary collaboration, staying informed about emerging trends and integrating insights from diverse fields into regression analysis practices. • Develop learning skills to stay updated on the state-of-the art of data science practices, ensuring that regression analyses and its future developments contribute meaningfully to the dynamic landscape of public policy and administration.
Assessment	**For attending and non-attending students** **Take-home data research project** (30% of the final mark): Students will work on a practical empirical project using real data and the statistical software R. The task will involve data management, writing R script files and the interpretation of results. **Final written exam** (70% of the final mark): students will have to solve theoretical, practical, and computational issues concerning a given concrete problem showing knowledge and understanding of the covered theories and methods. For students not turning in the take-home project by the mid-semester deadline, 100% of the final mark in the subject is given by the final exam. The assessment mode is the same for attending and non-attending students. **PROJECT WORK**: *NOTE: Project work are valid for 1 academic year and cannot be carried over beyond that time-frame.*

Assessment language	English
Evaluation criteria and criteria for awarding marks	All students must reach a passing grade on the combined grade of the written exam and the take home research project. The following aspects are relevant for the exam: correctness of answers, ability to interpret R outputs and a critical assessment of regression results considering econometric and economic theory. The following aspects are relevant for the take home research project: correctness of answers, ability to run successfully an econometric project in R, interpretation of R outputs and critical assessment of results.

Required readings	Stock, James H., and Mark W. Watson. *Introduction to econometrics*. Pearson, 2020.
Supplementary readings	Class notes and practical case studies will be made available by the lecturer during the semester.