Course Descriptions None 2020-2021

Course Title	High-Dimensional Econometric Methods for Big Data
Course Code	EBC4218
ECTS Credits	6,5
Assessment	Whole/Half Grades

Period

Period	Start	End	Mon	Tue	Wed	Thu	Fri
4	1-2-2021	26-3-2021	C				

Level	Advanced
Coordinator	Stephan Smeekes For more information:s.smeekes@maastrichtuniversity.nl
Language of instruction	English
Goals	The objective of this course is to provide students with an understanding of modern and advanced econometric techniques for the analysis of high-dimensional data. Students will be able to read and understand theoretical papers on the subject, to implement the techniques themselves in statistical software, and to apply the techniques to data used in economics and business. In addition to gaining this knowledge they will develop the skills to assess such methods critically and consequently adapt them to suit their needs.
Description	PLEASE NOTE THAT THE INFORMATION ABOUT THE TEACHING AND ASSESSMENT METHOD(S) USED IN THIS COURSE IS WITH RESERVATION. THE INFORMATION PROVIDED HERE IS BASED ON THE COURSE SETUP PRIOR TO THE CORONAVIRUS CRISIS. AS A CONSEQUENCE OF THE CRISIS, COURSE COORDINATORS MAY BE FORCED TO CHANGE THE TEACHING AND ASSESSMENT METHODS USED. THE MOST UP-TO-DATE INFORMATION ABOUT THE TEACHING/ASSESSMENT METHOD(S) WILL BE AVAILABLE IN THE COURSE SYLLABUS. In this course we cover several advanced techniques that have recently been developed in econometrics and statistics for the analysis of high-dimensional problems, which often arise in the context of Big Data. We will discuss theoretical properties of the methods, their practical implementation using the statistical programming language R and the application of these methods to real-life economic and financial datasets. Topics that are covered include: •Linear regression with many regressors: the "curse of dimensionality" in standard least squares estimation and standard approaches to model selection (such as information criteria and cross-validation); •Modern statistical techniques for estimating high-dimensional regression models such as penalized regression (the lasso, ridge and variants): implementation, interpretation and properties; •The standard modern tool in high-dimensional econometrics: Estimation, inference and forecasting in common factor models; •Inference in high-dimensional regression models: multiple hypothesis testing, post-model selection inference, construction of 'honest' confidence intervals and hypothesis tests; •High-dimensional discrete choice/classification methods. The course will consist of lectures, in which the methods and theory are introduced, and tutorials, in which groups of students present specific papers on the subject. Students also have to write a paper for which they implement and apply the methods to economic problems.
Literature	•Hastie, T., R. Tibshirani and J. Friedman (2009). The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2nd Ed). Freely available at http://statweb.stanford.edu/~tibs/ElemStatLearn/ •Hastie, T., R. Tibshirani and M. Wainwright (2015). Statistical Learning with Sparsity: The Lasso and Generalizations. Freely available at http://web.stanford.edu/%7Ehastie/StatLearnSparsity/ •Selected papers and book chapters (to be announced on Canvas /Student Portal).
Prerequisites	This is an ADVANCED econometric course. Familiarity with the mathematical methods underlying econometric theory is therefore essential. In particular, students need to have solid background in probability theory, mathematical statistics, econometric methods and time series analysis, comparable to the knowledge obtained during the econometric courses of the bachelor programme Econometrics and Operations Research. Familiarity with asymptotic analysis is necessary. In addition, a solid knowledge about time series econometrics is recommended, in particular about VAR models. One way to achieve (more than) sufficient knowledge of time series econometrics is by following the course Time Series Analysis and Dynamic Econometrics (potentially in parallel).
Keywords	
Teaching methods	PBL / Presentation / Lecture / Groupwork
Assessment methods	Final Paper / Participation / Written Exam
Evaluation in previous academic year	For the complete evaluation of this course please click http://iwio-sbe.maastrichtuniversity.nl/rapporten.asp?referrer=codeUM

This course belongs to the following programme / specialisation

Master Business Research - No specialisation	Year 2 Free Elective(s)
Master Business Research - Operations Research	Year 1 Elective Course(s)
Master Business Research - Operations Research	Year 2 Elective Course(s)
Master Econometrics and Operations Research	E&OR Electives
Master Economic and Financial Research - Econometrics	Year 1 Elective Course(s)
Master Economic and Financial Research - No specialisation	Year 1 Elective Course(s)
SBE Exchange Master	Master Exchange Courses
SBE Non Degree Courses	Master Courses