Module Manual M.Sc. Econometrics
Date: 26 January 2022

Overview of the program:

NAME		Courses	Credit Points
STATISTICAL THEORY	ME1a	Statistical Theory	10
ASYMPTOTIC THEORY	ME1b	Asymptotic Theory	5
ECONOMETRICS	ME2	Econometrics	9
CASE STUDIES	ME3	Case Studies	8
TIME SERIES ANALYSIS	ME4	Time Series Analysis	10
COMPULSORY ELECTIVES:			48
ECONOMICS	ME5	Different courses	11-26
APPLIED ECONOMETRICS	ME6	Different courses	11-26
ECONOMETRIC METHODS	ME7	Different courses	11-26
MASTER THESIS	ME8	Master Thesis	30

Preliminary remarks

Many of the modules to be described below sharpen students' general skills such as presenting work, programming etc. To avoid redundancies in the module descriptions, we sketch such broad skills here. Aspects that are specific to individual modules will be presented in the corresponding descriptions.

The overarching goal of the Master of Econometrics is to train students in applying and developing methods to suitably model and analyze complex problems involving economic data. Students are not just to apply modern statistical techniques in a cookbook manner, but to thoroughly understand their common foundations and relationships. Only then, we believe, will they be able to make meaningful contributions to both econometric methodology and applications.

Like with most learning goals, but certainly like with any quantitative technique, understanding of econometric methods cannot be achieved through repetitive memorizing. Likewise, while lectures are a useful starting point to introduce new topics, learning ultimately must be an active act rather than only passive consumption of a lecture. Such understanding therefore should be and will be fostered through steady and extensive active work on exercises and concrete applications. Regular tutorials hence are a core and crucial part of the program. Consequently, all of our modules complement lectures (if any) with such exercise sessions.

Next to a deeper understanding of the course material, such tutorials also provide students with effective learning and research strategies. First, experienced PhD students, post docs and professors share their tested approaches to solving complex problems. Second, students come to appreciate that working through concrete problems is an effective way to foster their grasp of different methodologies. Third, writing down their solutions develops students' skills in formulating mathematical, statistical and econometric relationships, as well as, fourth, verbal and written communication skills more generally.

The importance of such exercises is reflected in regular due dates for suitable problem sets. Meeting such compulsory deadlines helps students develop time management skills and a steady work routine. At the same time, the corrected exercises provide students with timely feedback to what extent their learning progress is in line with the progression of the corresponding course. We are therefore convinced that successfully completed problem sets are to be rewarded, and likewise believe that failure to submit such exercises should be sanctioned.

The study regulations aim for different types of assessments so as to reflect the variety of tasks a successful econometrician needs to fulfil in his or her later career. Specifically, students can acquire credits, next to the problem sets described above, through, e.g., oral presentations, term papers and oral exams. These train students' written and oral communication skills. Written exams ask students to actively apply the methods discussed in the various modules.

Modern statistical and econometric work is inconceivable without hands-on application of the methods in statistical computing languages such as R. Our assessments will therefore also regularly ask students to demonstrate that they know how to translate abstract methodology to real-world applications using real data.

Finally, econometric (like most other) research ultimately flourishes most when done, shared and communicated with others. We therefore provide students with regular opportunities to work in groups, e.g. asking them to jointly discuss a suitable line of attack to an empirical problem. Similarly, peer-learning formats help students develop and support each other.

A semester abroad also serves to develop such general, interdisciplinary skills. Students are encouraged to take some courses at a foreign partner university. In particular, the 3rd semester is suitable in this regard. Such international exchanges are for example supported by the ERASMUS programme.

Econometrics (M.Sc.) – Description of the modules

Module: Statistical Theory	**Module ME1a**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st semester	**Credit Points** 10	**Time** 300 h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Statistical Theory	L + T	10	4+2
2	**Language of instruction** English				
3	**Contents of the module** The Statistical Theory module covers the main topics of basic statistical theory and consists of the two blocks 'Probability Theory' and 'Decision Theory'. The block 'Probability Theory' gives an introduction to measure theory and stochastics necessary to formalize the questions discussed in statistical theory. The block 'Decision Theory' introduces the basic concepts associated with statistical tests. Possible topics include: decision rules, Bayes estimator, exponential families, the Neyman-Pearson lemma, two-tailed tests, Wald-tests, conditional tests, sequential hypothesis testing.				
4	**Competences** Participants learn to use the formal language of statistics and gain knowledge of fundamental concepts in stochastics, decision theory and mathematical statistics, which are required in order to analyze, apply and further develop statistical procedures.				
5	**Examinations** Statistical Theory: Graded written exam				
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses				
7	**Requirements** - none -				
8	**Status of the Module** Compulsory module in M.Sc. Econometrics				
9	**Module Coordinator** Prof. Dr. K. Ickstadt, Prof. Dr. C. Jentsch	**Responsible Department** TU Dortmund University, Department of Statistics			

Module: Asymptotic Theory	**Module ME1b**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Asymptotic Theory	L + T	5	2+1

2	**Language of instruction** English
3	**Contents of the module** The course 'Asymptotic Theory' deals with asymptotic properties of statistical methods and presents various central limit theorems used in statistics. The Asymptotic Theory course starts <u>after</u> the first half of the semester and takes place entirely in the second half of the semester (then as a 4+2 course).
4	**Competences** Participants learn to use the formal language of statistics and gain knowledge of fundamental concepts in stochastics and mathematical statistics, which are required in order to analyze, apply and further develop statistical procedures.
5	**Examinations** Asymptotic Theory: Graded written or oral exam
6	**Type of Examinations** ☒ covering the entire module　　　　☐ Relating to individual courses
7	**Requirements** - none -
8	**Status of the Module** Compulsory module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. K. Ickstadt, Prof. Dr. C. Jentsch	**Responsible Department** TU Dortmund University, Department of Statistics

Module: Econometrics	**Module ME2**

M.Sc. Program: Econometrics				
Frequency Each semester	**Duration** 1 semester	**Study section** 1st and 2nd semester	**Credit Points** 9	**Time** 270 h

<table>
<tr><td>1</td><td colspan="5">Structure of the module</td></tr>
<tr><td></td><td>No.</td><td>Courses</td><td>Type</td><td>Credit Points</td><td>Credit Hours</td></tr>
<tr><td></td><td>1a</td><td>Econometrics</td><td>L + T</td><td>9</td><td>6</td></tr>
<tr><td></td><td>1b</td><td>Recent Developments in Econometrics</td><td>L + T</td><td>9</td><td>6</td></tr>
<tr><td></td><td>1*</td><td>Advanced Econometrics</td><td>L + T</td><td>9</td><td>6</td></tr>
<tr><td>2</td><td colspan="5">Language of instruction
English</td></tr>
<tr><td>3</td><td colspan="5">Contents of the module
The lecture deals with a wide range of fundamental econometric methods. Special emphasis is placed on asymptotic results to allow for a general discussion of the statistical properties of these methods. The main focus lies on a formally precise description of the concepts. Topics include the linear regression model, the generalized linear regression model, maximum likelihood estimation and inference, asymptotic theory, endogenous regressors, instrumental variables, generalized method of moments and regression models for time series, among others.
Students can choose between 'Econometrics' and 'Recent Developments in Econometrics'.

<i>*Students, who already took the course 'Econometrics' during the completion of a Bachelor degree at TU Dortmund University, require to take the course 'Advanced Econometrics' (cf. Advanced Topic in Econometrics Methods, Block ME7) to achieve the necessary credits for module ME2.</i></td></tr>
<tr><td>4</td><td colspan="5">Competences
Participants learn to use the fundamental concepts in econometrics, which are required in order to further develop and to successfully apply the statistical methods.</td></tr>
<tr><td>5</td><td colspan="5">Examinations
Graded written exam. The lecturer may include further requirements necessary to attend the final exam. These requirements and the form of the examination will be announced at the beginning of the course.</td></tr>
<tr><td>6</td><td colspan="5">Type of Examinations
☒ covering the entire module   ☐ Relating to individual courses</td></tr>
<tr><td>7</td><td colspan="5">Requirements
- none -</td></tr>
<tr><td>8</td><td colspan="5">Status of the Module
Compulsory module in M.Sc. Econometrics</td></tr>
<tr><td>9</td><td colspan="2">Module Coordinator
JProf. Dr. A. Arsova / Prof. Dr. C. Hanck</td><td colspan="3">Responsible Department
TU Dortmund University, Department of Statistics, University of Duisburg-Essen, Department of Business Administration and Economics</td></tr>
</table>

Module: Case Studies	**Module ME3**

M.Sc. Program: Econometrics				
Frequency: Summer semester	**Duration** 1 semester	**Study section** 2nd and 3rd semester	**Credit Points** 8	**Time** 240 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Case Studies	P	8	4

2	**Language of instruction** English

3	**Contents of the module** In the course 'Case Studies' participants work on statistical problems in one or two larger projects, usually using raw economic data. Working in groups, they independently choose appropriate statistical methods and adapt them to the problem at hand, in order to carry out a comprehensive analysis of the data. The initial research question, methods, analysis and results are to be presented in a detailed written report and an oral presentation. A special focus is put on the "translation" of the initial question into a statistical/data-analytic problem. After completion of the latter, the results are used to provide an answer to the research question. Both the methodological approach and the results regarding the research question are discussed together with the other participants. Alternatively, by agreement, this course may be replaced by an extra-curricular internship, during which students participate in the analysis of raw data in a project within an institution, specialized in statistical advisory work. Subsequently the statistical analysis is summarized in a written report on the internship.

4	**Competences** Participants gain practice in independent scientific research as well as in the presentation of the statistical results in written and oral form. They expand methodological skills and various interdisciplinary qualifications such as teamwork, presentation techniques or communication skills. Working on larger projects trains the skills in project management. Furthermore, the course serves to enhance the counseling competence of the students.

5	**Examinations** Graded written report. Details will be announced at the beginning of the course.

6	**Type of Examination** Attendance at the presentations may be compulsory. This is the decision of the lecturer if s/he deems it to be necessary to achieve the learning goals of the course. ☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Compulsory module in M.Sc. Econometrics

9	**Module Coordinator** Lecturers from TU Dortmund University, Department of Statistics	**Responsible Department** TU Dortmund University, Department of Statistics

Module: Time Series Analysis	**Module ME4**

M.Sc. Program: Econometrics

Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 10	**Time** 300 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Time Series Analysis	L + T	10	6

2	**Language of instruction** English
3	**Contents of the module** The course initially covers methods of descriptive time series analysis. Then, structural theory and estimation of time series models are discussed. Core topics include approximation and elimination of trends, the theory of linear filters, 'naive' forecasting, exponential smoothing, stationary stochastic processes, optimal linear forecasts, ARMA-processes, the autocorrelation function, model identification and parameter estimation in the time domain.
4	**Competences** Participants gain insight on the most common methods for time-dependent data and are able to apply these methods.
5	**Examinations** Graded oral exam (20-45 minutes). In the case of a very high number of students, an alternative form of examination is possible upon application by the examiner to the joint examination board.

6	**Type of Examination**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -
8	**Status of the Module** Compulsory module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. R. Fried / Prof. Dr. C. Jentsch	**Responsible Department** TU Dortmund University, Department of Statistics

Compulsory Electives	Blocks ME5-ME7

M.Sc. Program: Econometrics

Frequency Each semester	Duration 2-3 semesters	Study section 1st to 3rd semester	Credit Points 48	Time 1.440 h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Block ME5: Economics		At least 11, at most 26	330 – 780h
	2	Block ME6: Applied Econometrics		At least 11, at most 26	330 – 780h
	3	Block ME7: Econometric Methods		At least 11, at most 26	330 – 780h
2	**Language of instruction** English or German				
3	**Contents of the module** In the compulsory elective areas, students acquire content-related material and specialist competences for practical use. With regard to the precise learning contents of the individual courses, participants are referred to the module descriptions for the respective elective block.				
4	**Competences** Participants acquire knowledge about current theoretical developments in micro- or macroeconomics, applied econometrics and econometric methods. The focus is on the discussion, adaptation and application of various econometric tools on the one hand and on advanced and up-to-date topics of economic interest on the other hand.				
5	**Examinations** The examinations depend on the modules in the respective compulsory elective areas and the module manuals on which they are based. In each compulsory elective block, modules with a minimum of 11 credit points have to be successfully completed. A total of 48 credit points must be acquired.				
6	**Type of Examination** Either covering the entire module or relating to individual courses, depending on the chosen module.				
7	**Requirements** The entry requirements for the individual modules are based on the module descriptions of the respective selected modules.				
8	**Status of the Module** Elective modules in M.Sc. Econometrics				
9	**Module Coordinator** Lecturers from the responsible departments		**Responsible Department** Participating departments from TU Dortmund University, University of Duisburg-Essen and Ruhr-University Bochum		

Module: Master Thesis	**Module ME8**

M.Sc. Program: Econometrics				
Frequency Each semester	**Duration** 1 semester	**Study section** 4. semester	**Credit Points** 30	**Time** 900 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Master Thesis		22.5	675
	2	Disputation		7.5	225
2	**Language of instruction** English				
3	**Contents of the module** The master thesis demonstrates that students are able to independently apply and adapt scientific methods to an econometric problem within a given period of time. The thesis needs to be completed within six months. Topics are offered each semester by the entire faculty of the program, so that students can choose from a variety of topics. They are also welcome to make their own suggestions for topics. The thesis can also be written at - or on collaboration with - an external public or private institution. After submission of the master thesis, the results are to be presented in form of a disputation.				
4	**Competences** With the successful completion of the Master thesis, the students show that they have the ability to independently conduct econometric research.				
5	**Examinations** Master Thesis (75%) and disputation (25%)**.**				
6	**Type of Examination** ☒ covering the entire module ☐ Relating to individual courses				
7	**Requirements** At least 42 credit points in the compulsory area as well as 30 credit points in the compulsory elective area.				
8	**Status of the Module** Compulsory module in M.Sc. Econometrics				
9	**Module Coordinator** Lecturers from the responsible departments	**Responsible Department** Participating departments from TU Dortmund University, University of Duisburg-Essen and Ruhr-University Bochum			

Compulsory Elective Courses

The set of compulsory electives is subject to change over time. We will react to new developments in econometrics through suitable additions to the current list of compulsory electives. At the same time, changes in the composition of the program's faculty through, e.g., new hires or retirements will be reflected in the course offerings. In particular, new teaching staff will contribute new expertise.

Block ME5 (Economics)

The following list gives a selection of possible courses. Courses that can be selected for this area will be identified in the course catalog available online.

Course	Type	Credit Points	Credit Hours
TU Dortmund University			
Applied Economics III (Advanced Business Cycle Analysis)	L + T	7.5	4
Law and Economics	L + T	7.5	4
Makroökonomie IV (Dynamic Macroeconomics)	L + T	7.5	4
Mikroökonomie II (Economics of Information, Auctions, Economic Theory)	L / L + S	7.5	4
Mikroökonomie IV (Game Theory)	L + T	7.5	4
Ruhr-University Bochum			
Current Topics in Health Economics	S	5	2
Macroeconomics II	L + T	5	4
Market- and Non-Market Valuation of Environmental Goods	S	5	2
Microeconomics I	L + T	5	4
Public Economics	L + T	10	5
Seminar in Applied Economic Policy	S	5	2
Seminar on Health Economics and Health Policy	S	5	2
University of Duisburg-Essen			
Advanced Forecasting in Energy Markets	S	6	2
Empirie der internationalen Geld- und Finanzmärkte	L + T	6	4
Energy Markets and Price Formation	L + T	6	4
Entscheidungstheorie	L + T	6	4
International Capital Movements: Theory and Econometric Evidence	L + T	6	4
Labour Economics and Public Policy	L integrated E	6	4
Migration Economics	L integrated E	6	4
Neuere Entwicklungen der Mikroökonomik	Kolloqium	6	2
Seminar Health and Development	S	6	2
Seminar Labour Economics and Public Policy	S	6	2
Seminar Soziale Sicherung und Besteuerung: Empirische Studien und eigene Projekte	S	6	4

Stock Market Anomalies and Quantitative Trading Strategies	L integrated S	6	4

Block ME6 (Applied Econometrics)

The following list gives a selection of possible courses. Courses that can be selected for this area will be identified in the course catalog available online.

Course	Type	Credit Points	Credit Hours
TU Dortmund University			
Applied Economics I (Applied Monetary Economics)	L + S	7.5	4
Applied Economics II (Applied Macroeconometrics)	L + T	7.5	4
Bayesian Data Analysis	S	4	2
Finance I (Quantitative Finance)	L + T	7.5	4
Finance III (Financial Econometrics)	L + T	7.5	4
Machine Learning for Economic Data	L + T	4.5	3
Programming with Julia	L + T	3	3
Programming with Python	L + T	3	3
Programming Course with R	L + T	3	3
Wirtschaftspolitik II (Microeconometrics and Empirical Applications)	L + T	7.5	4
Wirtschaftspolitik IV	S	7.5	4
Finance V (Research Topics in Finance, Risk- and Resourcemanagement)	L + T + S	7.5	4
Ruhr-University Bochum			
Applied econometrics with R	L + T	5	4
Applied Time Series Analysis	L + T	10	4
Introduction to Data Analysis using Stata	L	5	
Introduction to Empirical Macroeconomics	L	10	2
Intermediate Data Analysis using Stata	S	5	2
Econometric Evaluation of Economic Policies	L	5	2
Seminar in Microeconometrics	S	10	4
University of Duisburg-Essen			
Advanced R for Econometricians	L + T	6	4
Applied Labour Economics	L integrated E	6	4
Econometrics of Electricity Markets	L + T	6	4
Empirical Finance	L	5	2
Empirische Bilanzanalyse	L + T	6	4
Empirische Methoden	L + T	6	4
Financial Mathematics	L + T	6	4
Financial Risk Management	L + T	6	4
Inequality in Health	L integrated E	6	4
Mikroökonometrie	L + T	6	4
Portfolio Management	L + T	6	4
Practising Econometric Research	S	6	4
Quantitative Climate Finance	L + T	6	4

Quantitative Modelle internationaler Wirtschaftsbeziehungen	L + T	6	4

Block ME7 (Econometric Methods)

The following list gives a selection of possible courses. Courses that can be selected for this area will be identified in the course catalog available online.

Course	Type	Credit Points	Credit Hours
TU Dortmund University			
Advanced Econometrics	L + T	9	6
Advanced Statistical Learning	L + T	9	6
Bayesian Econometrics	L + T	4.5	3
Bayes-Statistik	L + T	9	6
Bootstrap Methods	L + T	9	6
Econometrics of treatment effects and policy evaluation	L + T	9	6
Financial Econometrics	L + T	4.5	3
Generalized Linear Models	L + T	9	6
Maschinelles Lernen	L + T	6	4
Multiples Hypothesentesten	L + T	4.5	3
Netzwerkanalyse	L + T	9	6
Resampling Verfahren	S	4	2
Robuste statistische Verfahren	L + T	9	6
Robuste statistische Verfahren	L + T	4.5	3
Seminar in Econometrics	S	4	2
Seminar in Zeitreihenökonometrie	S	4	2
Sequentielle Verfahren	L + T	9	6
Statistik extremer Risiken	L + T	9	6
Stochastische Prozesse	L + T	9	6
Survival Analysis	L + T	9	6
Time Series Econometrics	S	4	2
Unit Root and Cointegration Analysis	L + T	9	6
Wissensentdeckung in Datenbanken	L + T	8	6
Ruhr-University Bochum			
Financial Econometrics	L + T	10	4
Introduction to Microeconometrics	L + T	5	2
Multivariate Statistical Methods	L + T	10	4
Seminar in Econometrics	S	10	2
University of Duisburg-Essen			
Bayesian Econometrics (cf. Fortg. Ökonometrie)	L + T	6	4
Causality and Programme Evaluation	L integrated T	6	4
Nonparametric Econometrics (cf. Fortg. Ökonometrie)	L + T	6	4
Seminar Ökonometrische Methoden	S	6	2
Statistical Learning (cf. Fortg. Ökonometrie)	L + T	6	4
Statistical Modelling of Extremes (cf. Fortg. Ökonometrie)	L + T	6	4
Statistisches Seminar	S	6	2
Stichprobentheorie	L + T	6	4

Prohibited Combinations of Compulsory Elective Courses

The chosen courses may not coincide with similar courses already chosen within one of the compulsory elective blocks.

The prohibited combinations of similar courses are the following:

Nonparametric Econometrics	Stat. Modelling of Extremes	Stat. Learning	Bayesian Econometrics	Bayes-Statistik	Maschinelles Lernen	Mikroökonomie II	Wirtschaftspolitik II	Applied Time Series Analysis	Financial Econometrics	Intro. Microeconometrics	Macroeconomics II	
X	X	X	X	X								Bayesian Econometrics
					X							Entscheidungstheorie
						X				X		Mikroökonometrie
X		X										Stat. Modelling of Extremes
X	X			X								Stat. Learning
	X			X								Machine Learning for Economic Data
	X			X								Wissensentdeckung in Datenbanken
								X				Applied Economics II
									X			Finance III
										X		Wirtschaftspolitik II
											X	Makroökonomie IV

Universität Duisburg-Essen - Faculty of Business Administration & Economics
TU Dortmund - Faculty of Statistics
TU Dortmund - Faculty of Computer Science
TU Dortmund - Faculty of Business and Economics
Ruhr-Universität Bochum - Faculty of Management & Economics

Recommended Course of Study

technische universität dortmund

UNIVERSITÄT DUISBURG ESSEN

RUHR UNIVERSITÄT BOCHUM RUB

Econometrics Master Program
Terms of Study of 2020

Recommended Course of Study
When starting in winter semester

1st semester	2nd semester	3rd semester	4th semester
Module ME 1: Statistical Theory	**Module ME 4:** Time Series Analysis		**Module ME 8:** Master Thesis
Statistical Theory (4+2); 10 ECTS; Graded written exam	Time Series Analysis (4+2); 10 ECTS; Graded oral exam		Prerequisites: At least 75 credit points in ME1-ME7
Probability Theory / Decision Theory			30 ECTS; Graded module exam: Master Thesis and disputation
Asymptotic Theory (2+1); 5 ECTS; Graded written or oral exam			
Asymptotic Theory			
Module ME 2: Econometrics	**Module ME 3:** Case Studies		
Econometrics (4+2); 9 ECTS; Graded module exam	Case Studies (4P) or External Internship; 8 ECTS; Graded written report		
	Note: The course "Case Studies" is additionally offered in German every winter semester.		
Note: The course "Econometrics" is offered every semester, in the winter semester at UDE and in the summer semester at TUDO.	**Elective Area**		

Module Economics ME 5:
Elective modules from catalogue; 11-26 ECTS; Graded module exams or accumulated graded exams
Module Applied Econometrics ME 6:
Elective modules from catalogue; 11-26 ECTS; Graded module exams or accumulated graded exams
Module Econometric Methods ME 7:
Elective modules from catalogue; 11-26 ECTS; Graded module exams or accumulated graded exams

(In the entire elective area modules with a total of 48 ECTS are to be chosen.)

Total: 30 ECTS	Total: 30 ECTS	Total: 30 ECTS	Total: 30 ECTS

blue: courses at TU Dortmund University
green: courses at University of Duisburg-Essen
brown: courses at Ruhr-University Bochum, TU Dortmund University or University of Duisburg-Essen

Denoted hours:
P: Practical course
else: Lecture + Tutorial or Lecture only

Compulsory Elective Courses – Ruhr-University Bochum

Module: Current Topics in Health Economics	ME5

M.Sc. Program: Econometrics				
Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

<table>
<tr><td>1</td><td colspan="5">Structure of the module</td></tr>
<tr><td></td><td>No.</td><td>Courses</td><td>Type</td><td>Credit Points</td><td>Credit Hours</td></tr>
<tr><td></td><td></td><td>Current Topics in Health Economics</td><td>S</td><td>5</td><td>150 h</td></tr>
<tr><td>2</td><td colspan="5">Language of instruction
English</td></tr>
<tr><td>3</td><td colspan="5">Contents of the module
In this seminar students will explore a variety of current topics in health economics. The topics will cover both empirical and theoretical contributions. Students will prepare their seminar papers in the first half of the semester and present their papers in the second half of the semester. Further course details will be given at the introductory meeting.</td></tr>
<tr><td>4</td><td colspan="5">Competences
Students enhance their ability to understand and assess scientific literature. They also strengthen their knowledge of econometric methods by examining the methodology employed by relevant peer-reviewed papers. During the seminar, students get to know current issues in health economics, learn to write a seminar paper and improve their presentation skills.</td></tr>
<tr><td>5</td><td colspan="5">Examinations
65%: Term paper
25%: Presentations
10%: Active participation in the course</td></tr>
<tr><td>6</td><td colspan="5">Type of Examinations
☒ covering the entire module   ☐ Relating to individual courses</td></tr>
<tr><td>7</td><td colspan="5">Requirements
None. However, sufficient proficiency in microeconomics and microeconometrics in order to be able to read and understand the current international theoretical or empirical literature is strongly recommended.</td></tr>
<tr><td>8</td><td colspan="5">Status of the Module
Elective module in M.Sc. Econometrics</td></tr>
<tr><td>9</td><td colspan="2">Module Coordinator
Prof. Dr. Ansgar Wübker</td><td colspan="3">Responsible Department
RUB Faculty of Management and Economics</td></tr>
</table>

Module: Macroeconomics II				ME5	

M.Sc. Program: Econometrics

Frequency Winter semester	Duration 1 semester	Study section 1st to 3rd semester	Credit Points 5	Time 150 h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
		Macroeconomics II	L + T	5	150 h

2	**Language of instruction** English

3	**Contents of the module** The course will consider both economic theory and advanced mathematical techniques. The first part of the course will cover continuous time dynamics (ordinary differential equations, systems of linear differential equations, the concepts of stability and phase diagrams), systems of difference equations, and chaos theory. In the second part, we will cover economic applications (e.g., closed economic dynamics, employment and inflation, etc.) of these procedures. The software R is ideally suited for solving and plotting dynamic systems; its use and knowledge will be required to solve the problem sets proposed during the course.

4	**Competences**
	• To deepen knowledge and understanding of macroeconomic theories and dynamics.
	• To improve mathematical skills and concepts.
	• To acquire practical skills in using the R software for computational purposes.

5	**Examinations** Written exam (100% of the final grade) Mid-Term exam (not graded)

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** None. However, knowledge of macroeconomic models and concepts at the principles to intermediate level is expected. We will work intensively with R software: it is not necessary to have previous experience with this software, but the willingness to learn how to use it is expected.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Michael Roos	**Responsible Department** RUB Faculty of Management and Economics

Module: Market- and Non-Market Valuation of Environmental Goods	**ME5**

M.Sc. Program: Econometrics

Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Market- and Non-Market Valuation of Environmental Goods	S	5	150 h

2	**Language of instruction** English
3	**Contents of the module** The valuation of environmental goods and amenities is often complicated by the lack of market prices. This seminar will deal with empirical methods to estimate the value of environmental goods and amenities. Methods to be covered include both market and non-market valuation methods, such as hedonic pricing, contingent-valuation and revealed-preference methods to elicit willingness-to-pay and willingness-to-accept.
4	**Competences** Students acquire knowledge on empirical methods to estimate the value of environmental goods and amenities. Furthermore, they improve their ability to understand and assess scientific literature, learn to write a seminar paper and to present their work.
5	**Examinations** Term paper (10 pages) with presentation (15 min)

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Manuel Frondel and postgraduates of RWI	**Responsible Department** RUB Faculty of Management and Economics

Module: Microeconomics I				ME5	

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Winter semester	1 semester	1st to 3rd semester	5	150 h

1 Structure of the module

No.	Courses	Type	Credit Points	Credit Hours
	Microeconomics I	L + T	5	150 h

2 Language of instruction
English

3 Contents of the module
The module covers standard microeconomic topics at graduate level: consumer choice, production and costs, competitive markets, general equilibrium, efficiency and welfare theorems.

4 Competences
This module is an introduction to modern microeconomics and its applications to applied economic policy at graduate level. Students learn the standard modelling techniques. After attending this module, students should be able to read and understand microeconomic oriented scientific literature.

5 Examinations
The module final grade is determined entirely by the grade of the final exam.

6 Type of Examinations

☒ covering the entire module   ☐ Relating to individual courses

7 Requirements
None. However, good knowledge of microeconomics and mathematics is strongly recommended.

8 Status of the Module
Elective module in M.Sc. Econometrics

9 Module Coordinator
Prof. Dr. Julio R. Robledo

Responsible Department
RUB Faculty of Management and Economics

Module: Public Economics	**ME5**

M.Sc. Program: Econometrics

Frequency Summer semester	Duration 1 semester	Study section 1st to 3rd semester	Credit Points 10	Time 300 h

1	**Structure of the module**				

No.	Courses	Type	Credit Points	Credit Hours
	Public Economics	L + T	10	300 h

2	**Language of instruction** English
3	**Contents of the module** The course provides an overview over advanced theoretical models and empirical results of the modern public economics literature. Topics covered are taxation (efficiency, incidence and optimal taxation), public debt (normative justifications for public debt, political economy considerations, the European debt crisis), the role of government institutions, public good provision, externalities, social insurance (adverse selection and moral hazard), redistribution and social welfare as well as international aspects of public economics (international tax and systems competition). The course also provides a brief introduction to micro-econometric methods used in modern empirical public economics.
4	**Competences** Students are enabled to explain basic theoretical and empirical concepts of the modern public economics literature. They are in the position to understand and critically assess modern theoretical and empirical work in this filed. They are furthermore familiar with empirical policy evaluation methods and can implement them in Stata.
5	**Examinations** 100% written exam

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However, good knowledge of microeconomics and econometrics as well as an interest in combining microeconomic theory with empirical research is strongly recommended.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Dr. Bodo Knoll	**Responsible Department** RUB Faculty of Management and Economics

Module: Seminar on Health Economics and Health Policy	**ME5**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Seminar on Health Economics and Health Policy	S	5	150 h

2	**Language of instruction** English

3	**Contents of the module** The German population is projected to contract by more than 10% by 2050. This makes Germany relatively unique among larger EU countries, which are forecast to face less dramatic decline (Italy) or even grow slightly (France, Spain, UK) over the same period (UN, 2012). While the German population will decline overall, the number of elderly people will continue to grow as the population ages. An increasing old-age dependency ratio creates enormous challenges for health insurance, health care and long-term care (LTC) in Germany. Moreover, the changing size and composition of the population is not affecting all parts of Germany in a uniform way: this process is known as geo-demographic change. Some regions are thus facing particular challenges due to a rapidly ageing population and dwindling human resources in the care sector. In this seminar students will prepare a term paper based on selected challenges imposed by population aging and the geo-demographic change. The topics will cover both empirical and theoretical contributions. Students will thus have the possibility to acquire important knowledge and methodological skills for the successful completion of a master thesis in health economics and related fields. Students will prepare their seminar papers in the first half of the semester and present their papers in the second half of the semester. Further course details will be given at the introductory meeting.

4	**Competences** Students enhance their ability to understand and assess scientific literature. They also strengthen their knowledge of econometric methods by examining the methodology employed by relevant peer-reviewed papers. During the seminar, students get to know current issues in health economics, learn to write a seminar paper and improve their presentation skills.

5	**Examinations** Term paper with presentations and active participation in the course

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However, sufficient proficiency in microeconomics and microeconometrics in order to be able to read and understand the current international theoretical and empirical literature is strongly recommended. Moreover, students should be interested in health policy issues.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	Module Coordinator	Responsible Department
	Prof. Dr. Ansgar Wübker	RUB Faculty of Management and Economics

Module: Applied Econometrics with R	**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Applied Econometrics with R	L + T	5	150 h

2	**Language of instruction** English

3	**Contents of the module** Econometrics allows to analyze data sets characterizing economic problems in a quantitative manner. To that end, economic models are cast into econometric models, which can then be applied to the economic data at hand. Two of the most important econometric models are the univariate and multivariate linear regression models, whose properties and underlying assumptions are discussed in detail. Remedies for violations of the assumptions are likewise discussed. A short overview of time series models is likewise given. These models are then implemented in the software package R, using existing and creating new code, and applied to artificially created and actual data sets. Results are analyzed and described.

4	**Competences** Participants should be enabled to distinguish different econometric models and explain their respective properties. They should apply these models to various economic and other data sets and interpret the results. In a situation where violations of certain assumptions are found, they should choose an appropriate approach and decide how to implement it. In the programming exercises, which use the software package R, students are supposed to apply code from pre-existing packages and develop new code based on the methodology studied in the course. Participants should be able to analyze and interpret their program outputs.

5	**Examinations** Final grade is the grade of the final exam.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** –None. However, basic knowledge of regression analysis and analytical statistics is strongly recommended.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Vasyl Golosnoy	**Responsible Department** RUB Faculty of Management and Economics

Module: Applied Time Series Analysis				**ME6**	

M.Sc. Program: Econometrics

Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 10	**Time** 300 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Applied Time Series Analysis	L + T	10	300 h

2	**Language of instruction** English

3	**Contents of the module** This course provides the review of time series models widely applied in economics and finance. Starting from univariate linear ARMA models we consider a broad class of linear and non-linear time series approaches (including ARIMA, GARCH, VARMA, etc.) with focusing on estimation and forecasts.

4	**Competences** Participants should understand and make use of modern time series techniques in empirical research.

5	**Examinations** Final grade is the grade of the final exam.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** None. However, at least one graduate course in Econometrics is strongly recommended.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Vasyl Golosnoy	**Responsible Department** RUB Faculty of Management and Economics

Module: Introduction to Data Analysis using Stata	**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Introduction to Data Analysis using Stata	L	5	150 h

2	**Language of instruction** English

3	**Contents of the module** Using the different contents and applications of Moodle, the students will get an introduction to the statistical software package Stata and acquire the skills to work on their own projects. Through texts, videos and small applications on each topic, the students will prepare for the final test.

4	**Competences** The module aims at giving students a solid base to independently prepare and analyze data using the statistical software package Stata. At the end of the module, the students are equipped with the necessary skills to conduct their first empirical projects. Offered as an online course, students obliged to work on their own time management.

5	**Examinations** The final module examination consists of an online test. The final module grade corresponds to the grade of the online test.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Thomas K. Bauer	**Responsible Department** RUB Faculty of Management and Economics

Module: Introduction to Empirical Macroeconomics	**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 10	**Time** 300 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Introduction to Empirical Macroeconomics	L	10	300 h

2	**Language of instruction** English
3	**Contents of the module** Macroeconomics is about analyzing and forecasting economic developments at the national and international level. Related to this, it is often of great importance to quantify the effects of economic shocks and economic policy measures on macroeconomic variables, like GDP and employment. A crucial topic is therefore the identification and quantification of relationships between macroeconomic variables. The primary objective of this course is to provide an overview of methods suitable for this task. It is necessary to start with an introduction to the main macroeconomic models and the related data. However, the main focus is on the application of econometric methods.
4	**Competences** Analytical and logical thinking, critical reflection on the methods used.
5	**Examinations** Written exam (90 min)
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** - none -
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Torsten Schmidt	**Responsible Department** RUB Faculty of Management and Economics

Module: Intermediate Data Analysis using Stata	**ME6**

M.Sc. Program: Econometrics				
Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Intermediate Data Analysis using Stata	S	5	150 h

2	**Language of instruction** English
3	**Contents of the module** The module deals with the preparation and the econometric analysis of data. Based on the skills acquired in "Introduction to Data Analysis using Stata" the students work on their own empirical projects using the statistical software package Stata. For this purpose, the students are offered assisted data work sessions on a weekly basis. The projects mainly focus on data preparation and are to be conducted in groups. For successful participation the students are required to pass two out of three presentations of their work in progress during the semester. In the end, all groups should hand in their documented data work in a term paper.
4	**Competences** The module aims at enabling students to conduct their own empirical projects using the statistical software package Stata. At the end of the module, the students are equipped with the necessary skills to independently conduct empirical projects outside of this course, for example a master thesis. By presenting their progress and first results to their fellow students, the students are equipped with (further) experience in scientific presentation and improve their own time management skills.
5	**Examinations** The final module examination consists of a term paper. The final grade corresponds to the grade of the term paper.
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** None. However, successful participation of "Introduction to Data Analysis using Stata" is strongly recommended.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Thomas K. Bauer	**Responsible Department** RUB Faculty of Management and Economics

Module: Econometric Evaluation of Economic Policies				**ME6**	

M.Sc. Program: Econometrics

Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
		Econometric Evaluation of Economic Policies	L	5	150

2	**Language of instruction** English

3	**Contents of the module** Tight public budgets increase the need to learn more about the effectiveness and efficiency of public policy measures. The empirical evaluation of these policies, however, is connected with difficult methodological problems. This module discusses the newest developments in the literature on the empirical evaluation of economic policy measures. A lecture introduces the basic concepts. Central contributions to the literature will be presented by the students themselves and discussed by the participants in a detailed way.

4	**Competences** After participation, the students should be able to understand the newest econometric techniques developed for the evaluation of economic policies. They should understand their basic identification strategy, the necessary data to implement these strategies as well as the main problems of these strategies. The module aims to give the students the necessary skills to read and understand the scientific literature in this area and to give a critical assessment of empirical evaluation studies.

5	**Examinations** The final module examination consists of a presentation or a written exam. The final grade corresponds to the grade of the presentation or the written exam.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** None. However, advanced knowledge of empirical research and/or econometrics is recommended.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Thomas K. Bauer	**Responsible Department** RUB Faculty of Management and Economics

Module: Seminar in Microeconometrics	**ME6**

M.Sc. Program: Econometrics				
Frequency As offered	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 10	**Time** 300 h

1	**Structure of the module**			

No.	Courses	Type	Credit Points	Credit Hours
	Seminar in Microeconometrics	S	10	300 h

2	**Language of instruction** English
3	**Contents of the module** This module deals with the econometric analysis of micro data. The first lectures will review the basic econometric methods and introduce the participants into the software package STATA. Afterwards, the students work on their own empirical project. As part of this project, the students review the relevant literature, identify their research question, prepare the underlying data, and empirically analyze the data by applying basic and advanced econometric methods. The results of the projects are presented to the class and documented in a term paper.
4	**Competences** By the end of this course, students should be able to understand and evaluate empirical studies based on micro data and to conduct small empirical projects independently. Based on their analyses, students should learn to write a scientific paper and to present their research results to the class.
5	**Examinations** The final module examination consists of a term paper (20 pages). Additional study achievements can be acquired through an oral presentation and discussion, for which bonus points can be awarded. A maximum of 25% bonus points will be awarded for the presentation. The best grade can only be achieved, if the student has earned bonus points. The bonus points will not be credited if the final module examination would have not been passed without bonus points.
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** None. However, advanced knowledge of empirical research and/or microeconometrics is strongly recommended. Basic knowledge of STATA is helpful.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Thomas K. Bauer	**Responsible Department** RUB Faculty of Management and Economics

Module: Financial Econometrics	**ME7**

M.Sc. Program: Econometrics

Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 10	**Time** 300 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Financial Econometrics	L + T	10	300 h

2	**Language of instruction** English
3	**Contents of the module** This course provides the review of empirical methods applied in a quickly growing field of financial econometrics. The course concentrates on describing and modelling stylized facts found in return and volatility time series. The important financial models (CAPM, APT) are discussed from the empirical point of view as well.
4	**Competences** Participants should understand and make use of modern econometric techniques for modelling financial processes.
5	**Examinations** Final grade is the grade of the final exam.

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However, at least one graduate course in Econometrics is strongly recommended.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Vasyl Golosnoy	**Responsible Department** RUB Faculty of Management and Economics

Module: Introduction to Microeconometrics	**ME7**

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Summer semester	1 semester	1st to 3rd semester	5	150 h

<table>
<tr><td>1</td><td colspan="5">Structure of the module</td></tr>
<tr><td></td><td>No.</td><td>Courses</td><td>Type</td><td>Credit Points</td><td>Credit Hours</td></tr>
<tr><td></td><td></td><td>Introduction to Microeconometrics</td><td>L + T</td><td>5</td><td>150 h</td></tr>
<tr><td>2</td><td colspan="5">Language of instruction
English</td></tr>
<tr><td>3</td><td colspan="5">Contents of the module
This module deals with the advanced analysis of econometric methods applicable to micro data. In particular, discrete choice and selection models as well as advanced empirical evaluation methods are covered. Within the lecture, the participants are introduced to the theoretical concepts of the methods.</td></tr>
<tr><td>4</td><td colspan="5">Competences
By the end of this course, students should be able to understand and evaluate empirical studies based on micro data and to be proficient in the subject-related terminology. Moreover, they should have the ability to choose the right empirical strategy based on a given dataset/problem.</td></tr>
<tr><td>5</td><td colspan="5">Examinations
The final module examinations consist of a written exam. The final grade corresponds to the grade of the written exam.</td></tr>
<tr><td>6</td><td colspan="5">Type of Examinations
☒ covering the entire module   ☐ Relating to individual courses</td></tr>
<tr><td>7</td><td colspan="5">Requirements
None. However, advanced knowledge of empirical research and/or econometrics is recommended.</td></tr>
<tr><td>8</td><td colspan="5">Status of the Module
Elective module in M.Sc. Econometrics</td></tr>
<tr><td>9</td><td colspan="2">Module Coordinator
Prof. Dr. Thomas K. Bauer</td><td colspan="3">Responsible Department
RUB Faculty of Management and Economics</td></tr>
</table>

Module: Multivariate Statistical Methods	**ME7**

M.Sc. Program: Econometrics

Frequency Winter semester	Duration 1 semester	Study section 1st to 3rd semester	Credit Points 10	Time 300 h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
		Multivariate Statistical Methods	L + T	10	300 h

2	**Language of instruction** English
3	**Contents of the module** This course provides the review of multivariate statistical methods, e.g. principal component analysis, factor analysis and discriminant analysis, which are of great importance in empirical economic research.
4	**Competences** Participants should understand and make use of different multivariate statistical methods and apply them to economic and other data sets. In the written exercises, methods are applied, compared and evaluated. In the programming exercises, which use the software package R, students are supposed to apply code from pre-existing packages and develop new code based on the methodology studied in the course. Participants should be able to analyze and interpret their program outputs.
5	**Examinations** Final grade is the grade of the final exam.
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** None. However, basic knowledge of regression analysis and analytical statistics is strongly recommended.
8	**Status of the Module** Elective module in M.Sc. Econometrics
9	**Module Coordinator** Prof. Dr. Vasyl Golosnoy	**Responsible Department** RUB Faculty of Management and Economics

Module: Seminar in Econometrics	**ME7**

M.Sc. Program: Econometrics

Frequency Every semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 10	**Time** 300 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Seminar in Econometrics	S	10	300 h

2	**Language of instruction** English

3	**Contents of the module** The seminar provides a broad spectrum of topics to choose, primarily (but not only!) in the fields of macroeconomics, financial econometrics and time series econometrics. Participants are supposed to write a term paper of at most 20 pages and to present it at the end of the semester.

4	**Competences** Participants should learn to comprehend, compare and summarize one or multiple sources on a particular topic, which can either be parts of textbooks or original research articles. They should rephrase and organize the main aspects of the topic, and, in a possible application, analyze a data set or discover the properties of a particular statistical or econometric approach, as well as evaluate their results

5	**Examinations** Oral examination. Participation in the oral examination requires that a term paper is submitted until the due date, and that the submitted term paper would suffice to receive a passing grade.

6	**Type of Examinations**
	☒ covering the entire module　　　　☐ Relating to individual courses

7	**Requirements** None. However, at least one graduate course in Econometrics is strongly recommended.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Vasyl Golosnoy	**Responsible Department** RUB Faculty of Management and Economics

Module: Seminar in Applied Economic Policy	**ME5**

M.Sc. Program: Econometrics				
Frequency Every semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Applied Economic Policy	S	5	150 h

2	**Language of instruction** English
3	**Contents of the module** After one kick-off meeting at the beginning of the semester, the students should work independently (and in consultation with their supervisors) on current economic policy topics. They should present the relevant research in this area and understand the empirical strategies involved in answering policy-relevant questions. The results of their research should be presented and discussed in a two-day block seminar, and summarized in a seminar paper, including the discussion results.
4	**Competences** The aim of the seminar is to improve the understanding of current economic problems and to provide insights into the theoretical and empirical analysis of political decisions. Students should learn to develop concrete research questions independently and to understand and evaluate empirical strategies for answering politically relevant questions. The seminar is intended to enable students to independently produce scientific papers and to give them the opportunity to practice their presentation skills.
5	**Examinations** The final module examination consists of a term paper. By giving a presentation and participating in the discussion, bonus points can be awarded, which amount to a maximum of 25% of the maximum total number of points. A maximum of 75 points can be achieved through the seminar paper, a maximum of 20 bonus points through the presentation and a maximum of 5 bonus points for participation in the discussion. The module score then results from a scale of points ranging from zero to 100 points. Bonus points earned have no influence on the examination result if it is "not passed" (5.0) without the bonus points.
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** None. However, sound understanding of basic econometrics is strongly recommended.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Dr. h.c. Christoph M. Schmidt	**Responsible Department** RUB Faculty of Management and Economics

Compulsory Elective Courses –TU Dortmund University

Module: Applied Economics III	ME5

M.Sc. Programme: Econometrics

Frequency Summer semester	Duration 1 Semester	Study section 1st to 3rd semester	Credit Points 7.5	Time 225 h

<table>
<tr><td>1</td><td colspan="5">Structure of the Module</td></tr>
<tr><td></td><td>No.</td><td>Courses</td><td>Type</td><td>Credit Points</td><td>Credit Hours</td></tr>
<tr><td></td><td>1</td><td>Advanced business cycle analysis</td><td>L + T</td><td>7.5</td><td>4</td></tr>
<tr><td>2</td><td colspan="5">Language of instruction
English</td></tr>
<tr><td>3</td><td colspan="5">Content of the Module
The lecture covers current quantitative business cycle theories cast in the form of dynamic stochastic general equilibrium models. Students will learn about the quantitative implications of modelling decisions used in state-of-the-art business cycle models, the analytical and numerical solution of models, as well as their uses for simulation and empirical evaluation of theories.</td></tr>
<tr><td>4</td><td colspan="5">Competences
Students acquire the ability to solve and quantitatively evaluate dynamic stochastic general equilibrium models. In the exercises, students will practically learn how to use software tools for numerical solution, simulation, and evaluation of theoretical models. Thus, they will gain the methodological competence to participate in applied macroeconomic research.</td></tr>
<tr><td>5</td><td colspan="5">Examinations
Written and graded exam covering the entire module (90 minutes).</td></tr>
<tr><td>6</td><td colspan="5">Type of Examinations

☒ covering the entire module   ☐ Relating to individual courses</td></tr>
<tr><td>7</td><td colspan="5">Requirements
- none -</td></tr>
<tr><td>8</td><td colspan="5">Status of the Module
Elective module in M.Sc. Econometrics</td></tr>
<tr><td>9</td><td colspan="2">Module Coordinator
Prof. Dr. Ludger Linnemann</td><td colspan="3">Responsible department
TU Dortmund University, Department of Business and Economics</td></tr>
</table>

Module: Law and Economics	**ME5**

M.Sc. Programme: Econometrics				
Frequency Winter semester	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credit Points** 7.5	**Time** 225 h

1	**Structure of the Module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Law and Economics	L + T	7.5	4

2	**Language of instruction** English

3	**Content of the Module** This course provides an introduction to the economic analysis of law, i.e., the application of economic methods to analysis of legal rules and institutions. It covers the areas of tort law, contract law and criminal law, property law and the Coase Theorem, intellectual property law, among others. The focus of the lectures will be primarily on theoretical work. Practice exercises will be assigned during the semester.

4	**Competences** Students leave the course understanding how microeconomic theory can be used to critically evaluate law and public policy. The course should prove useful for any student interested in analyzing policy issues. It will be particularly valuable background for those students intending to specialize in public economics, political economy and economic policy.

5	**Examinations** Written and graded exam covering the entire module (90 minutes).

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However, the course requires successful participation in microeconomics and game theory courses.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Galina Zudenkova, Ph.D.	**Responsible department** TU Dortmund University, Department of Business and Economics

Module: Makroökonomie IV (Macroeconomics)	**ME5**

M.Sc. Programme: Econometrics

Frequency Winter semester	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credit Points** 7.5	**Time** 225 h

1	**Structure of the Module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Dynamic macroeconomics	L + T	7.5	4

2	**Language of instruction** English
3	**Content of the Module** This module presents methods and core applications of modern dynamic macro-economic theory. Main topics are consumption and savings choices in incomplete markets, pricing of risky and riskless assets and applications to (optimal) fiscal policy and (search) theory of frictional labor markets.
4	**Competences** The module provides tools and main results in modern dynamic macroeconomics on an advanced level to enable students to conduct their own research in macroeconomics.
5	**Examinations** Graded written exam (90 minutes) <u>or</u> oral exam (30 minutes) covering the entire module (mode will be announced in time).
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** - none -
8	**Status of the Module** Elective module in M.Sc. Econometrics
9	**Module Coordinator** Prof. Dr. Philip Jung	**Responsible department** TU Dortmund University, Department of Business and Economics

Module: Mikroökonomie II (Microeconomics)				**ME5**	

M.Sc. Programme: Econometrics

Frequency As offered	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credit Points** 7.5		**Time** 225 h

1	**Structure of the Module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Economics of Information	L	3.5	2
	2	Auctions: Theory, Applications, and Experiments	L	4	2
	3	Seminar in Economic Theory I	S	4	2
2	**Language of Instruction** English				
3	**Content of the Module** Element 1 proceeds from course 1. It delves into the explicit consideration of the distribution of information, in particular of markets with informational asymmetries and treats Moral Hazard, Adverse Selection, Signaling and Screening in jobmarkets, markets for insurance and markets for used cars. Course 2 introduces the foundations of the theory of auctions with private and interdependent valuations and of `all pay auctions', the revenue equivalence theorem, and mechanism design. The element analyzes two European case studies (the '3G'-mobile phone auctions, the design of treasury bond auctions). Furthermore, the module reviews the literature on experimental studies on auctions. The seminar in Economic Theory in course 3 completes the module. The topics vary from term to term but meet the microeconomic methodological requirements and fit into the theme of the module.					
4	**Competences** The aim of course 1 is to generate theoretical comprehension of real market structures and of the diversity of observed behavior. In particular the systemic perspective on basis of the game theoretic approach, that individual behavior cannot be determined isolatedly, shall facilitate the ability for autonomous economic reasoning within market-based structures. Course 2 facilitates the skill to analyze practice-oriented problems of auctioning of economic goods strategically. Participants obtain profound knowledge of the literature and learn how to test scientific leading questions experimentally. The compulsory seminar serves the acquirement of the capability to communicate these abilities.					
5	**Examinations** Participants must pass a written and graded exam (60 min) of element 1 and may choose between courses 2 and 3. Course 2 requires a written and graded exam (60 min) and Course 3 requires a graded written paper.					
6	**Type of Examinations**				
	☐ covering the entire module		☒ Relating to individual courses		
7	**Requirements** None. However, knowledge of game theory at bachelor level is strongly recommended.				
8	**Status of the Module** Elective module in M.Sc. Econometrics				
9	**Module Coordinator** Successor of Prof. Dr. Wolfgang Leininger	**Responsible department** TU Dortmund University, Department of Business and Economics			

Module: Mikroökonomie IV (Microeconomics)		**ME5**
M.Sc. Program: Econometrics		

Frequency As offered	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credit Points** 7.5	**Time** 225 h

1	**Structure of the Module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Game Theory	L + T	7.5	4

2	**Language of instruction** English
3	**Content of the Module** Game theory is a mathematical method of modeling virtually any situation in which humans interact and it has found applications in virtually every aspect of the social sciences. This course will examine the fundamental tools and concepts of game theory, both from a rationalistic as well as evolutionary point of view, while maintaining a focus on its applications in economics and business.
4	**Competences** The course aims at a thorough understanding of interactive decision situations. Any social situation can be modeled as an interactive decision problem; i.e. a game. Mastering the modeling stage is the first step to analysis and finally solution of the problem. In particular, game theoretical models of market competition are contrasted with the standard approach to perfect competition, which is based on classical decision theory. The need of methodological competence to understand real world phenomena is stressed in this way.
5	**Examinations** Written and graded exam covering the entire module (90 minutes).

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However, knowledge of game theory at bachelor level is strongly recommended.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Successor of Prof. Dr. Wolfgang Leininger	**Responsible department** TU Dortmund University, Department of Business and Economics

Advanced Topics in Applied Econometrics					ME6

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Each semester	1 semester	1st to 3rd semester	4.5 / 3	135h / 90h

1	No.	Module	Type	Credit Points	Credit Hours
	1	Machine Learning for Economic Data	L + T	4.5	3
	2	Programming with Julia	L + T	3	2
	3	Programming with Python	L + T	3	3
	4	Programming Course with R	L + T	3	3
2	**Language of instruction** English or German				
3	**Contents of the module** *Note: more than one of the above courses can be credited.* These modules cover various topics in applied econometrics. In general, more than one lecture is taught each semester.				
4	**Competences**				
5	**Examinations** Graded oral exam or graded written exam. The lecturer may include further requirements necessary to attend the final exam. These requirements and the form of the examination will be announced at the beginning of the course.				
6	**Type of Examinations**				
	☒ covering the entire module		☐ Relating to individual courses		
7	**Requirements** - none -				
8	**Status of the Module** Elective module in M.Sc. Econometrics				
9	**Module Coordinator** Lecturers from TU Dortmund University, Department of Statistics		**Responsible Department** TU Dortmund University, Department of Statistics		

Module: Applied Economics I	**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 - 2 Semester	**Study section** 1st to 3rd semester	**Credits** 7.5	**Time** 225 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credits**	**Credit Hours**
	1	Applied monetary economics	V	3.5	2
	2	Seminar zu Applied monetary economics	S	4	2
2	**Language of instruction** Deutsch / Englisch				
3	**Contents of the module** Das Modul besteht aus zwei Elementen. Element 1 behandelt Grundlagen dynamischer allgemeiner Gleichgewichtsmodelle zum Studium monetärer Zusammenhänge, sowie deren Anwendung auf die Analyse optimaler Geldpolitik. In Element 2 werden wechselnde Fragestellungen der angewandten monetären Ökonomik anhand von aktueller Forschungsliteratur in Form eines Seminars behandelt.				
4	**Competences** Das Modul ermöglicht den Studierenden, empirisch relevante Fragestellungen der monetären Konjunkturtheorie und deren Implikationen für die Gestaltung der Wirtschaftspolitik zu bearbeiten. Hierbei wird besonderes Gewicht gelegt auf die Integration von theoretischer Analyse, deren methodische Grundlagen in Element 1 im Vordergrund stehen, und deren praktischer Anwendung auf wirtschaftspolitische Fragestellungen anhand der aktuellen Fachliteratur, die im Seminar in Element 2 behandelt wird.				
5	**Examinations** In Element 1 findet eine benotete Teilleistung in Form einer Klausurarbeit (Dauer 60 Minuten) statt. In Element 2 findet eine benotete Teilleistung in Form einer schriftlichen Hausarbeit und eines mündlichen Referates statt.				
6	**Type of Examinations** ☐ Modulprüfung ☒ Teilleistungen				
7	**Requirements** - keine -				
8	**Status of the Module** Wahlmodul im Masterstudiengang Econometrics				
9	**Module Coordinator** Prof. Dr. Ludger Linnemann	**Responsible Department** TU Dortmund University, Department of Business and Economics			

Module: Applied Economics II	**ME6**

M.Sc. Program: Econometrics				
Frequency Summer semester	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credits** 7.5	**Time** 225 h

1	**Structure of the module**				
	No.	Courses	Type	Credits	Credit Hours
	1	Applied Macroeconometrics	V+Ü	7.5	4

2	**Language of instruction** Deutsch / Englisch
3	**Contents of the module** Das Modul befasst sich mit Theorie und Praxis der modernen Makroökonometrie. Behandelt werden zeitreihenanalytische Methoden, mit denen die dynamischen Zusammenhänge zwischen den wichtigsten makroökonomischen Indikatoren abgebildet werden können. Ziel ist es, empirisch gestützte Aussagen zu Ursache-Wirkungszusammen-hängen zu gewinnen, und die Resultate zur Beurteilung der empirischen Plausibilität von Theorien sowie zur Prognose und der Simulation von wirtschaftspolitischen Eingriffen zu nutzen.
4	**Competences** Das Modul macht den Studierenden die wichtigsten Methoden der angewandten makroökonometrischen Forschung zugänglich, und befähigt sie so, theoretisch und/oder wirtschaftspolitisch relevante Fragestellungen anhand von Zeitreihendaten zu bearbeiten, empirische Studien kritisch zu beurteilen und eigene empirische Projekte selbständig zu bearbeiten. Hierbei wird besonderes Gewicht auf die Vermittlung der notwendigen methodischen Competences gelegt. Diese werden anhand von computergestützten Übungen anhand von einschlägigen Softwarewerkzeugen erworben und vertieft.
5	**Examinations** Es findet eine benotete Modulprüfung entweder in Form einer Klausurarbeit (Dauer 90 Minuten) <u>oder</u> in Form einer mündlichen Prüfung (Dauer 20 Minuten) statt. Die Art der Prüfung wird rechtzeitig bekannt gegeben.

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements** - keine -
8	**Status of the Module** Wahlmodul im Masterstudiengang Econometrics

9	**Module Coordinator** Prof. Dr. Ludger Linnemann	**Responsible Department** TU Dortmund University, Department of Business and Economics

Module: Finance I	**ME6**

M.Sc. Program: Econometrics				
Frequency Summer semester	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credit points** 7.5	**Time** 225 h

1	**Structure of the Module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit hours**
	1	Quantitative Finance	L + T	7.5	4

2	**Language of instruction** English
3	**Content of the module** The course provides the basic concepts of classical as well as modern approaches in financial theory and its implication to the private sector. The module covers a broad range of highly quantitative topics with a strong application in international financial markets. The theoretical frameworks assess the most recent research findings for pricing, network analysis and financial engineering.
4	**Competences** Students learn to discuss and derive theoretical models while promoting innovative and critical thinking. The theoretical framework provided is applied on empirical datasets during the tutorial sessions. The interpretation of empirical results in the light of current academic findings is a key aspect of the tutorials. Controversial findings within the literature are evaluated. The practical sessions are conducted using the industry's programming language (currently python).
5	**Examinations** Written and graded exam covering the entire module (90 minutes) <u>or</u> graded presentation based on written case study's expose. The mode of the exam will be assigned at the beginning of the course.

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However, knowledge in the programming language used (eg. Python), acquired e.g. by successful examination of Finance III (Financial Econometrics), is strongly recommended. Due to limited PC-capacities you need to register for this course.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Peter N. Posch	**Responsible department** TU Dortmund University, Department of Business and Economics

Module: Finance III	**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credit points** 7.5	**Time** 225 h

<table>
<tr><td>1</td><td colspan="5">Structure of the Module</td></tr>
<tr><td></td><td>No.</td><td>Courses</td><td>Type</td><td>Credit
Points</td><td>Credit
hours</td></tr>
<tr><td></td><td>1</td><td>Financial Econometrics</td><td>L + T</td><td>7.5</td><td>4</td></tr>
<tr><td>2</td><td colspan="5">Language of instruction
English</td></tr>
<tr><td>3</td><td colspan="5">Content of the module
This lecture applies modern econometric methods to current questions from the field of finance, risk-management and commodity markets. We will both explore the theoretical dimensions of the models used as well as apply the methods to real-life datasets.</td></tr>
<tr><td>4</td><td colspan="5">Competences
Students learn the basic and advanced methods of financial econometrics. They apply the methods using datasets and thereby learn both the application of econometric methods as well as the caveats associated with real-life data, data gathering and data mining. The use of the industry specific programming language (currently Python) for econometric analysis is an essential part of this course.</td></tr>
<tr><td>5</td><td colspan="5">Examinations
Written and graded exam covering the entire module (90 minutes) <u>or</u> graded presentation based on written case study's expose. The mode of the exam will be assigned at the beginning of the course.</td></tr>
<tr><td>6</td><td colspan="5">Type of Examinations

☒ covering the entire module   ☐ Relating to individual courses</td></tr>
<tr><td>7</td><td colspan="5">Requirements
None. However, knowledge in statistical and econometrical methods, prior knowledge in finance, e.g. one of the modules, is strongly recommended. Due to limited PC-capacities you need to apply for this course.</td></tr>
<tr><td>8</td><td colspan="5">Status of the Module
Elective module in M.Sc. Econometrics</td></tr>
<tr><td>9</td><td colspan="2">Module Coordinator
Prof. Dr. Peter N. Posch</td><td colspan="3">Responsible department
TU Dortmund University, Department of Business and Economics</td></tr>
</table>

Module: Finance V	**ME6**

M.Sc. Program: Econometrics				
Frequency Each semester	**Duration** 1 Semester	**Study section** 1st to 3rd semester	**Credit points** 7.5	**Time** 225 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit hours**
	1	Research Topics in Finance, Risk- and Resourcemanagement	S	7.5	4

2	**Language of instruction** English
3	**Content of the module** In this course we will discuss current research topics including, but not limited to, the methods applied, the scope and aim of the research and its impact. We train quantitative analysis with concrete research questions and real datasets and increase the competency in academic writing and methodology.
4	**Competences** Analytical and quantitative competences in the field of finance and risk management are trained. The seminar prepares students for the master thesis to which the topics can be (generally) extended. Literature research as well as the current state of the academic discussion in the topic's area furthermore deepens the student's competences in pursuing an academic training on a high level**.**
5	**Examinations** Graded written paper and oral presentation.

6	**Type of Examination**	
	☐ covering the entire module	☒ Relating to individual courses

7	**Requirements** None. However, at least one master module in the area of finance and interest in the research topics in the field of finance, risk management and resource management or/and an application for writing the master thesis is strongly recommended.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Peter N. Posch	**Responsible department** TU Dortmund University, Department of Business and Economics

Module: Wirtschaftspolitik II (Economic Policy)	ME6

M.Sc. Programme: Econometrics

Frequency Winter semester	Duration 1 Semester	Study section 1st to 3rd semester	Credit Points 7.5	Time 225 h

1	**Structure of the Module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Microeconometrics and Empirical Applications	L + T	7.5	4

2	**Language of instruction** English (except German gets unanimous vote)
3	**Content of the Module** The lecture covers the econometric analysis of individual data, such as households and firms. Students learn how to solve frequently occurring problems with using microeconomic data. Among other topics, panel data, instrumental variables, limited dependent variables and causality models are analyzed. The accompanying exercise serves the following purposes: students get an introduction to the econometric program Stata and learn how to apply it in practice. The exercise is supplemented by presentations of innovative empirical studies applying the presented methods.
4	**Competences** On the one hand, this module aims at providing knowledge of the fundamental econometric models developed for typical problems associated with microeconomic datasets (individuals, households, firms). Students will gain an understanding of the basic problems associated with different datasets and variables and will be confronted with solutions in representative research papers. On the other hand, students learn how to apply these methods in practice. Participants acquire the necessary skills to conduct their own empirical studies, e.g. for seminar presentations or master thesis.
5	**Examinations** Written and graded exam covering the entire module (90 minutes).
6	**Type of Examinations**

☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However basic knowledge of empirical economics is advantageous.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Kornelius Kraft	**Responsible Department** TU Dortmund University, Department of Business and Economics

Module: Wirtschaftspolitik IV	ME6

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credits	Time
Jedes Semester	1 Semester	1st to 3rd semester	7.5	225 h

1	**Structure of the module**				
	No.	Courses	Type	Credits	Credit Hours
	1	Empirisches Seminar zur Wirtschaftspolitik	S	7.5	4

2	**Language of instruction**
	Deutsch

3	**Contents of the module**
	Das empirische Seminar widmet sich der Vermittlung und konkreten Anwendung empirischer Methoden im Kontext von aktuellen wirtschaftspolitischen Fragstellungen. Hierfür werden umfangreiche und repräsentative Datenquellen zur Verfügung gestellt. Die Studierenden werden an das selbständige empirische Arbeiten herangeführt und aktiv bei den ökonometrischen Auswertungen unterstützt.

4	**Competences**
	Neben der intensiven Auseinandersetzung mit aktuellen Forschungsergebnissen der Wirtschaftspolitik, steht hierbei insbesondere die eigenständige empirische Arbeit der Studierenden im Vordergrund. Dabei soll die Fähigkeit zur selbständigen wissenschaftlichen Bearbeitung und Präsentation eines Themas vertieft werden. Ein weiteres Ziel ist dabei eine Einübung in den wissenschaftlichen Diskurs.

5	**Examinations**
	Es findet eine benotete Modulprüfung in Form einer schriftlichen Hausarbeit i.V.m. einem mündlichen Vortrag statt.

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements**
	Keine. Empfohlen wird ein abgeschlossenes Ökonometrie-Modul.

8	**Status of the Module**
	Wahlmodul im Masterstudiengang Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Kornelius Kraft	TU Dortmund University, Department of Business and Economics

Seminar in Applied Econometrics Econometrics				ME6	

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Each semester	1 semester	1st to 3rd semester	4	120h

1	**Structure of the module**				
	No.	Module	Type	Credit Points	Credit Hours
	1	Bayesian Data Analysis	S	4	2
	2				

2	**Language of instruction** English or German
3	**Contents of the module** *Note: more than one of the above courses can be credited.* In this module each participant works with a scientific paper dealing with current topics of econometric research. The participants summarize the main content and results of the work in a written report and illustrate their finding in an oral presentation.
4	**Competences** Participants gain practice in the presentation of the statistical results in written and oral form and expand their methodological skills.
5	**Examinations** Written report and oral presentation. Details will be announced at the beginning of the course.
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** - none -
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Lecturers from TU Dortmund University, Department of Statistics	**Responsible Department** TU Dortmund University, Department of Statistics

Advanced Topics in Econometric Methods					ME7	

M.Sc. Program: Econometrics

Frequency Each semester		Duration 1 semester	Study section 1st to 3rd semester		Credit Points 9 / 4.5	Time 270 h / 135 h

1	No.	Module		Type	Credit Points	Credit Hours
	1	Advanced Econometrics		L + T	9	6
	2	Advanced Statistical Learning		L + T	9	6
	3	Bayesian Econometrics		L + T	4.5	3
	4	Bayes-Statistik		L + T	9	6
	5	Bootstrap Methods		L + T	9	6
	6	Econometrics of treatment effects and policy evaluation		L + T	9	6
	7	Financial Econometrics		L + T	4.5	3
	8	Generalisierte Lineare Modelle		L + T	9	6
	9	Multiples Hypothesentesten		L + T	4.5	3
	10	Netzwerkanalyse		L + T	9	6
	11	Robuste statistische Verfahren		L + T	9	6
	12	Robuste statistische Verfahren		L + T	4.5	3
	13	Statistik extremer Risiken		L + T	9	6
	14	Sequentielle Verfahren		L + T	9	6
	15	Stochastische Prozesse		L + T	9	6
	16	Survival Analysis		L + T	9	6
	17	Unit Root and Cointegration Analysis		L + T	9	6

2	**Language of instruction** English or German

3	**Contents of the module** *Note: more than one of the above courses can be credited.* These modules cover various research topics in modern econometrics. The mathematical background is extensively discussed using stochastic tools. In general, more than one lecture is taught each semester.

4	**Competences** Participants gain deeper knowledge in a specific area of econometric research. They gain insight in the theoretical background and derivation of econometric procedures and are able to adapt the methods in accordance to the desired settings. Based on the deeper understanding in a certain research field, the participants learn to handle and work with unknown procedures efficiently.

5	**Examinations** Graded oral exam or graded written exam. The lecturer may include further requirements necessary to attend the final exam. These requirements and the form of the examination will be announced at the beginning of the course.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	Requirements	
	- none -	
8	**Status of the Module**	
	Elective module in M.Sc. Econometrics	
9	**Module Coordinator**	**Responsible Department**
	Lecturers from TU Dortmund University, Department of Statistics	TU Dortmund University, Department of Statistics

Seminar in Econometrics				ME7	

M.Sc. Program: Econometrics

Frequency Each semester	Duration 1 semester	Study section 1st to 3rd semester	Credit Points 4	Time 120h

1	**Structure of the module**				
	No.	Module	Type	Credit Points	Credit Hours
	1	Seminar in Econometrics	S	4	2
	2	Seminar in Zeitreihenökonometrie	S	4	2
	3	Resampling Verfahren	S	4	2
	4	Time Series Econometrics	S	4	2

2	**Language of instruction** English or German

3	**Contents of the module** *Note: more than one of the above courses can be credited.* In this module each participant works with a scientific paper dealing with current topics of econometric research. The participants summarize the main content and results of the work in a written report and illustrate their finding in an oral presentation.

4	**Competences** Participants gain practice in the presentation of the statistical results in written and oral form and expand their methodological skills.

5	**Examinations** Written report and oral presentation. Details will be announced at the beginning of the course.

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Lecturers from TU Dortmund University, Department of Statistics	**Responsible Department** TU Dortmund University, Department of Statistics

Module: Maschinelles Lernen			ME7

M.Sc. Program: Econometrics,				
Frequency Nach Ankündigung	**Duration** 1 Semester	**Study section** 1. bis 3. Semester	**Credits** 6	**Time** 180 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credits**	**Credit Hours**
	1	Maschinelles Lernen	V	3	2
	2	Übungen zu Maschinelles Lernen	Ü	3	2

2	**Language of instruction** Deutsch
3	**Contents of the module** Das Gebiet des maschinellen Lernens betrifft als Optimierung oder Funktionsapproximation eine Vielzahl von Aufgaben: Klassifikation und Clustering von Texten, Bildern und Musikstücken, Entdeckung auffälliger Teilräume in Daten, Analyse von Zeitreihen, Vorhersage von Beobachtungen, zusammenfassende Beschreibung von Messdaten... Grundlage ist die empirische und strukturelle Risikominimierung, aber auch logische Theorien (Stichwort: Induktion) können genutzt werden. Die Lernbarkeit von Konzepten wird in Bezug auf die Beispiele, die Repräsentationsklasse der Hypothesen und die erlaubten Operatoren untersucht. Neue Arbeiten berücksichtigen das Lernen aus verteilten Datensammlungen und aus Datenströmen unter Beschränkung des Speicherplatzes. Die Studierenden sollen an die in der Forschung diskutierten Fragestellungen herangeführt werden.
4	**Competences** Die Studierenden lernen die grundlegenden Algorithmen des maschinellen Lernens so kennen, dass sie sie selbst implementieren können. Dadurch verstehen sie die in der aktuellen Literatur diskutierten alternativen Ansätze mit ihren Vor- und Nachteilen. In der Verbindung von Vorlesung und Übungen werden die (theoretischen) Eigenschaften der Algorithmen und ihre (praktischen) Auswirkungen deutlich, so dass die Studierenden dann eigenständig praktische Anwendungen von bekannten Lernverfahren in unterschiedlichen Feldern durchführen können.
5	**Examinations** mündliche Prüfung (30 Minuten) Studienleistungen: -keine-

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements** - keine -
8	**Status of the Module** Wahlmodul im Masterstudiengang Econometrics

9	**Module Coordinator** Prof. Dr. K. Morik	**Responsible Department** TU Dortmund University, Fakultät Informatik

Module: Wissensentdeckung in Datenbanken		**ME7**

M.Sc. Program: Econometrics,				
Frequency jährlich	**Duration** 1 Semester	**Study section** 1.-2. semester	**Credits** 8	**Time** 240 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credits**	**Credit Hours**
	1	Wissensentdeckung in Datenbanken	V	6	4
	2	Übungen zu Wissensentdeckung in Datenbanken	Ü	2	2
2	**Language of instruction** Deutsch				
3	**Contents of the module** Wissensentdeckung in Datenbanken liegt im Schnittbereich von Datenbanken, Maschinellem Lernen und Statistik. Es geht darum, in sehr großen Datenbeständen Muster zu finden, die gemäß einem Qualitätsmaßes bewertet werden. Je nach den Vorgaben der Benutzer und dem Qualitätsmaß unterscheidet man die Lernaufgaben • Klassifikation • Clustering • Subgruppenentdeckung • Finden häufiger Mengen und Assoziationsregeln Ausgehend von gegebenen Daten müssen in einer Folge von Vorverarbeitungsschritten die Daten für die Lösung der Lernaufgabe erstellt werden, wobei unterschiedliche Algorithmen zum Einsatz kommen. Dabei werden verschiedene Arten von Daten vorgestellt, z.B. binäre Datenbanken, Zeitreihen, zeitgestempelte Daten. Die formale Charakterisierung der Lernaufgabe und des Verfahrens muss algorithmisch so umgesetzt werden, dass sehr große Datenmassen schnell durchsucht werden, wodurch sich Approximationen an die gewünschte Lösung und heuristische Verkürzungen ergeben. In der Vorlesung werden für jede Lernaufgabe einige Algorithmen vorgestellt. Vorverarbeitungsketten werden exemplarisch anhand einiger realer Anwendungen diskutiert.				
4	**Competences** Auf der Grundlage statistischer Theorie und algorithmischer Umsetzungen sollen die Studierenden selbständig Anwendungen der Wissensentdeckung entwickeln und Zugang zu den Forschungsthemen haben können.				
5	**Examinations** mündliche Prüfung (30 Minuten) oder Klausur (120 Minuten) Studienleistungen sind außerdem die aktive Mitarbeit in den Übungen und erfolgreiche Bearbeitung der Übungsblätter. Die Studienleistung ist Voraussetzung zur Teilnahme an der Modulprüfung.				
6	**Type of Examinations**				
	☒ Modulprüfung		☐ Teilleistungen		
7	**Requirements** - keine - Vorausgesetzte Kenntnisse: Grundkenntnisse der Stochastik				
8	**Status of the Module** Wahlmodul im Masterstudiengang Econometrics				
9	**Module Coordinator** Prof. Dr. K. Morik	**Responsible Department** TU Dortmund University, Fakultät Informatik			

Compulsory Elective Courses – University of Duisburg-Essen

Module: Advanced Forecasting in Energy Markets	ME5

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Advanced Forecasting in Energy Markets	S	6	2

2	**Language of instruction** English
3	**Contents of the module** The purpose of this seminar is to provide an advanced understanding of modeling and forecasting methods in energy markets, esp. concerning probabilistic forecasting. The students apply sophisticated forecasting methods to real data (e.g. electricity or natural gas prices, electricity load, wind and solar power production) using the statistical Software R. They write a report and present their findings. The focus of the seminar is placed especially on probabilistic forecasting with different applications in e.g. electricity price and electricity load or wind and solar power production forecasting. A particular attention is given to regression-based modeling methods for electricity market data.

4	**Competences**
	The students
	    -have an advanced understanding of forecasting concepts and techniques applied in energy markets
	    -will use statistical software R to fit estimation and forecasting algorithms to real world data
	    -can visualize and interpret obtained results

5	**Examinations** Weighted average of a group R-project and a presentation (usually about 20 minutes).

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Jun-Prof. Dr. Florian Ziel	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Empirie der internationalen Geld- und Finanzmärkte	**ME5**

M.Sc. Program: Econometrics				

Frequency	**Duration**	**Study section**	**Credit Points**	**Time**
Summer semester	1 semester	1st to 3rd semester	6	180h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1a	Empirie der internationalen Geld- und Finanzmärkte	L	3	2
	1b	Empirie der internationalen Geld- und Finanzmärkte	T	3	2

2	**Language of instruction** English
3	**Contents of the module**
4	**Competences**
5	**Examinations**

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** None.
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Gabriel Arce-Alfaro	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Energy Markets and Price Formation				**ME5**

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Summer semester	1 semester	1st to 3rd semester	6	180h

<table>
<tr><td>1</td><td colspan="5">Structure of the module</td></tr>
<tr><td></td><td>No.</td><td>Courses</td><td>Type</td><td>Credit Points</td><td>Credit Hours</td></tr>
<tr><td></td><td>1a</td><td>Energy Markets and Price Formation</td><td>L</td><td>3</td><td>2</td></tr>
<tr><td></td><td>1b</td><td>Energy Markets and Price Formation</td><td>T</td><td>3</td><td>2</td></tr>
<tr><td>2</td><td colspan="5">Language of instruction
English</td></tr>
<tr><td>3</td><td colspan="5">Contents of the module

Energy markets classified according to energy sources and customer segments
Products in energy trading: spot market, forwards, futures, options, real options
Pricing in wholesale markets I: Fundamental analytic models, problem formulations and solving as computer models
Pricing in wholesale markets II: Financial and econometric models, i.a. Wiener process, mean-reversion process, GARCH–model formulation and implementation
Organization of energy trading in companies: organizational structure, IT-Support
Valuating options: analytical methods (Black-Scholes, Black, Margrabe), numerical methods (Monte-Carlo-Simulation), tree-building methods
Risk management in energy trading: legal basis, risk management system, risk classification, risk measurement – Greeks, Value-at-Risk, Profit-at-Risk
Emissions trading: legal and economic foundation, design and trading strategies
Perspectives of energy trading and future methodological developments
</td></tr>
<tr><td>4</td><td colspan="5">Competences
Students taking the course will

gain knowledge of products in energy trading
get familiar with modern concepts and methods of analyzing the pricing on energy markets
learn how to describe and use procedures of fundamental and mathematical-econometric market analyses
</td></tr>
<tr><td>5</td><td colspan="5">Examinations
Written exam (generally 60-90 minutes) or oral exam (generally 20-40 minutes). The chosen examination method (written or oral exam) is defined by the lecturer during the first weeks of the lecture period.</td></tr>
<tr><td>6</td><td colspan="5">Type of Examinations
☒ covering the entire module   ☐ Relating to individual courses</td></tr>
<tr><td>7</td><td colspan="5">Requirements
None. However, good knowledge in the field of investment and financing as well as general business administration is required. Knowledge of statistics and operations research would be an advantage.</td></tr>
<tr><td>8</td><td colspan="5">Status of the Module
Elective module in M.Sc. Econometrics</td></tr>
<tr><td>9</td><td colspan="3">Module Coordinator
Prof. Dr. Christoph Weber</td><td colspan="2">Responsible Department
University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen</td></tr>
</table>

Module: Entscheidungstheorie				ME5	

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Wintersemester	1 Semester	1.bis 3. Semester	6	180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1a	Entscheidungstheorie	V	3	2
	1b	Entscheidungstheorie	Ü	3	2

2	**Language of instruction**
	Deutsch

3	**Contents of the module**
	Vermittlung von Kenntnissen in der Methodik der Entscheidungsfindung. Dabei wird zunächst auf Ein-Personen Entscheidungen unter Berücksichtigung von Informationsunvollkommenheit und Risiko eingegangen. Diese Analyse wird anschließend auf strategische Entscheidungen erweitert und auf aktuelle Beispiele angewandt. Es werden folgende Lehrinhalte abgedeckt: Einführung in die Entscheidungstheorie, Information und Entscheidung unter Unsicherheit, Theorie strategischer Entscheidung, Anwendungen Bayesianischer Spiele sowie Anreizstrukturen: Mechanism Design.

4	**Competences**
	Die Studierenden
	- sind in der Lage, die in aktuellen wissenschaftlichen Publikationen verwendete Methodik der Entscheidungsfindung und Interaktion kritisch nachzuvollziehen
	- können die Methodik der Entscheidungstheorie und der Spieltheorie anhand einfacher Fragestellungen selbständig anwenden
	- können die relevanten Aspekte identifizieren und diese nachvollziehbar darstellen
	- sind in der Lage, die zugehörige Literatur zu identifizieren und selbständig kritisch die wesentlichen Aspekte verstehen und anwenden

5	**Examinations**
	Zum Modul erfolgt eine modulbezogene Prüfung in der Gestalt einer Klausur (in der Regel: 60-90 Minuten)

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements**
	- keine -

8	**Status of the Module**
	Wahlmodul im M.Sc. Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Erwin Amann	University of Duisburg-Essen, Department of Business Administration and Economics

Module: International Capital Movements: Theory and Econometric Evidence	ME5

M.Sc. Program: Econometrics

Frequency Winter semester	Duration 1 semester	Study section 1st to 3rd semester	Credit Points 6	Time 180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1a	International Capital Movements: Theory and Econometric Evidence	L	3	2
	1b	International Capital Movements: Theory and Econometric Evidence	T	3	2
2	**Language of instruction** English				
3	**Contents of the module** The course provides advanced knowledge of new theoretical and empirical research in the field of international capital movements. This includes the analysis of the determinants of international capital movements, the analysis of the determining reasons of exchange rate movements as well as the analysis of the functionality of international financial markets. Furthermore, various explanatory approaches for international currency and financial crises are going to be presented and assessed.				

4	**Competences**
	Students
	    -understand the conceptual basics of international capital movements
	    -are able to present current models of international capital movements formally, graphically, and
	       are also able to interpret them verbally
	    -are in a position to transfer the obtained knowledge and skills to other subjects				

5	**Examinations** The module-related examination is performed by a written test (usually 60-90 minutes).				
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses				
7	**Requirements** - none -				
8	**Status of the Module** Elective module in M.Sc. Econometrics				
9	**Module Coordinator** Prof. Dr. Volker Clausen	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen			

Module: Labour Economics and Public Policy	**ME5**

M.Sc. Program: Econometrics				

Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Labour Economics and Public Policy	L	6	180 h

2	**Language of instruction** English
3	**Contents of the module** Labor markets are of great importance for the development of modern economies. Labor market policy measures are often at the center of political and public debate. This lecture provides an insight into labor market economics and the effects of labor market policy measures. The most important theoretical and empirical concepts of labor market economists are explained. In addition, recent empirical findings are discussed and linked to the current political debate.
4	**Competences** The students • learn the most important theoretical and empirical concepts of labor economics, • know the current state of research in the field of labor economics, • are able to analyze different aspects of labor market economic measures and to interpret and critically question scientific findings in this area.
5	**Examinations** The module is examined in the form of a written exam (usually 60-90 minutes) or an oral exam (usually 20-40 minutes). The concrete form of the examination is determined by the lecturer after the first session.

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Jun.-Prof. Dr. Sebastian Otten	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Migration Economics	**ME5**

M.Sc. Program: Econometrics				

Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Migration Economics	L	6	180 h

2	**Language of instruction** English

3	**Contents of the module** Migration is one of the most important topics in the political and public debate. The lecture gives an insight into the economic aspects of migration. The most important theoretical and empirical concepts of migration research will be explained, and recent empirical findings will be discussed and linked to the current debate on migration.

| **4** | **Competences** The students
- learn the most important theoretical and empirical concepts of migration economics,
- know the current state of research in the field of migration economics,
- are able to analyze various aspects of immigration and integration from an economic perspective and to interpret and critically question scientific findings in this area. |
|---|---|

5	**Examinations** The module is examined in the form of a written exam (usually 60-90 minutes) or an oral exam (usually 20-40 minutes). The concrete form of the examination is determined by the lecturer after the first session.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** None. However, advanced knowledge in microeconomics and microeconometrics is strongly recommended.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Jun.-Prof. Dr. Sebastian Otten	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Neuere Entwicklungen der Mikroökonomik	**ME5**

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Jedes Semester	1 Semester	1. bis 3. Semester	6	180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Neuere Entwicklungen der Mikroökonomik	Kolloquium	6	2

2	**Language of instruction**
	Deutsch/English

3	**Contents of the module**
	Analyse aktueller wissenschaftlicher Texte aus dem Bereich Mikroökonomik. Lehrinhalte sind Bayesian Games, Mechanism Design, Implementation Theory sowie Informationally Decentralized Systems.

4	**Competences**
	Die Studierenden
	- können aktuelle wissenschaftliche Texte aus dem Bereich der mikroökonomischen Theorie insbesondere der Spieltheorie lesen, hinterfragen und die zentralen Erkenntnisse nachvollziehbar präsentieren
	- sind in der Lage, diese Erkenntnisse und Methoden auf neue selbst identifizierte Fragestellungen eigenständig zu übertragen

5	**Examinations**
	Zum Modul erfolgt eine modulbezogene Prüfung, die sich auf folgende Prüfungsformen erstreckt: vorlesungsbegleitendes Erstellen von drei wissenschaftlichen Essays (Umfang in der Regel je 2 bis 3 Seiten) zu den jeweiligen Themen, Präsentation und Diskussion.

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements**
	- keine -

8	**Status of the Module**
	Wahlmodul im M.Sc. Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Erwin Amann	University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Seminar Health and Development	**ME5**

M.Sc. Program: Econometrics

Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Fachseminar Health and Development	S	6	180 h

2	**Language of instruction** English

3	**Contents of the module** The seminar covers the following topics, among others: • Education and schooling experiments • Environmental/Infrastructural Determinants of Health • Income and microfinance • Information and changes in health behavior • Early childhood interventions • Impact of Health on Individual Productivity • Demand for Health Products and Healthcare • Supply of Health Care The concrete topics will be announced in the first session.

4	**Competences** The students • are able to write their own scientific work in the field of health economics in the context of developing countries • are able to discuss and solve their own as well as external questions in plenary sessions

5	**Examinations** The module is examined in a module-related examination which covers the following forms of examination: Writing a seminar paper (15 pages, 70% of the grade) and presentation and discussion of the paper in a plenary session (30 minutes, 30% of the grade). Both parts must be passed to pass the seminar.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Jun.-Prof. Dr. Daniel Kühnle	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Seminar Labour Economics and Public Policy	**ME5**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Fachseminar Labour Economics and Public Policy	S	6	180 h

2	**Language of instruction** German or English

3	**Contents of the module** In this seminar, students work on a current issue from the field of labour market economics and write a seminar paper in which the topic is presented and classified in the literature, the methodological approach is explained and conclusions are critically evaluated. The seminar papers are presented and discussed in a block seminar.

4	**Competences** The students

- know the current state of research in the field of the respective topic
- can understand and critically evaluate scientific studies
- deepen their knowledge in independent scientific work,
- are prepared for the requirements of a master thesis,
- improve their presentation and communication skills,
- are able to discuss and solve their own as well as external questions in plenary sessions.

5	**Examinations** A module-related examination takes place for the module, which covers the following forms of examination: seminar paper (usually: 15 pages, 70% of the grade) and presentation and discussion of the paper in plenary (usually: 30 minutes, 30% of the grade). To pass the seminar both parts must be passed.

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Jun.-Prof. Dr. Sebastian Otten	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Seminar Soziale Sicherung und Besteuerung: Empirische Studien und eigene Projekte	**ME5**

M.Sc. Program: Econometrics				
Frequency Jedes Jahr zum Wintersemester	**Duration** 1 Semester	**Study section** 1. bis 3. Semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**			
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Fachseminar Soziale Sicherung und Besteuerung: Empirische Studien und eigene Projekte	S	6	4

2	**Language of instruction** Deutsch

3	**Contents of the module** Das Abfassen der Projekt- oder Seminararbeit steht im Zentrum dieser Veranstaltung. Die Teilnehmer sind dazu aufgefordert, eigene Forschungsthemen zu entwickeln und diese dann in Kooperation mit dem Dozenten zu konkretisieren. Dabei ist das Spektrum möglicher Forschungsgegenstände breit gefächert und umfasst den gesamten Bereich der sozialen Sicherung (z.B. Arbeitsmarkt-, Renten- und Gesundheitspolitik) und darüber hinaus weitere Themen wie zum Beispiel die Bildungspolitik. Während der Bearbeitungsphase durchlaufen die Studierenden sämtliche Phasen der empirischen Arbeit (Literaturrecherche und –auswertung, Datenaufbereitung und Schätzung sowie Dokumentation der Forschungsergebnisse) und werden dabei durch den Dozenten betreut. Durch die Präsentationen der eigenen Forschungsarbeiten erhalten die Teilnehmer auch einen Einblick in die Studien der jeweils anderen Studierenden. Falls notwendig werden ergänzende Methodenvorlesungen mit variablen Themen gelesen.

4	**Competences** Die Studierenden

- können sich kritisch mit empirischen Studien aus dem Bereich der sozialen Sicherung und Besteuerung auseinandersetzen und diese bewerten
- können sich auf der Grundlage von bereits vorhandenen empirischen Studien das methodische Vorgehen erarbeiten und dieses in eigene Projektvorschläge umsetzen
- können Mikrodatensätze für empirische Analysen mit Stata aufbereiten
- können ökonometrische Methoden mit Stata eigenständig anwenden
- können kritische Aspekte von empirischen Studien identifizieren und hieraus Verbesserungsvorschläge oder eigene Forschungsvorhaben entwickeln

5	**Examinations** Zum Modul erfolgt eine modulbezogene Prüfung, die sich auf folgende Prüfungsformen erstreckt: Hausarbeit (20-30 Seiten) und Präsentation (in der Regel: 10 Minuten). Benotung: 50% schriftliche Hausarbeit, 40% Präsentation der Arbeit, 10% Diskussion im Plenum.

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements** - keine -

8	**Status of the Module** Wahlmodul im M.Sc. Econometrics

9	Module Coordinator	Responsible Department
	Prof. Dr. Reinhold Schnabel	University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Stock Market Anomalies and Quantitative Trading Strategies	**ME5**

M.Sc. Program: Econometrics				
Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Stock Market Anomalies and Quantitative Trading Strategies	L + S	6	4

2	**Language of instruction** English

3	**Contents of the module**
	The lecture gives an introduction to the field of equity market anomalies. It provides an overview over well-known as well as and recently discovered cross-sectional quantitative anomalies and discusses from both a theoretical and an empirical point of view why these return patterns might arise and persist. It also discusses to which extent these anomalies may be translated into effective investment strategies and explains potential pitfalls when evaluating trading strategies. In the second half of the semester, students make use of their newly acquired knowledge by writing and presenting a seminar paper in which they critically evaluate specific trading strategies/market anomalies. Students can decide whether their paper is based mainly on a synthesis of the literature or based mainly on programming, backtesting, and critically discussing a self-proposed trading strategy (for instance via the online platform "Quantopian").

4	**Competences**
	Students
	-have a profound understanding of the most important stock market anomalies
	- are able to critically reflect to what extent these anomalies can be translated into real-life trading strategies
	-know the key insights of theoretical, experimental, and empirical research aiming at explaining these anomalies
	-have a profound understanding of the link between individual behavior in financial markets, market frictions, and resulting return patterns
	-can evaluate scientific studies accurately, understand the methodology used in leading papers of the field, can interpret estimation results correctly, and analyze them critically
	-are in a position to identify starting points for their own research and to present and defend their research proposals in a professional way

5	**Examinations**
	The module-related examination consists of a seminar paper (usually 15 pages, 65% of the grade), of an accompanying presentation (usually 15 minutes, 25% of the grade), as well as of the active participation in the discussions of other presentations (10%).

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module**	
	Elective module in M.Sc. Econometrics	
9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Heiko Jacobs	University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Advanced R for Econometricians				**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Advanced R for Econometricians	L + T	6	4

2	**Language of instruction**
	English

3	**Contents of the module**
	The first part of the course covers intermediate concepts in functional and object orientated programming, error handling, profiling and benchmarking as well as a treatment of selected R packages tailored for big data applications. Students are also introduced to reporting with dynamic documents. Part II deals with the tidyverse, a collection of packages designed for modern applications in data science. The third part introduces topics such as multi-core computing, C++ integration and other cutting-edge R extensions.

4	**Competences**
	Students
	- are prepared for applications in future studies and are able to efficiently tackle research-related programming tasks.
	- know the strengths and limitations of the high-level statistical programming language R.
	- thoroughly understand the R ecosystem and have a profound understanding in selected fields of advanced R programming.
	- can apply their skills in advanced statistical and econometric applications
	- are able to document and communicate scientific results in a reproducible manner.

5	**Examinations**
	Weighted average of a (group) R-project (70%) and a presentation (30%, usually about 20 minutes).

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements**
	- none -

8	**Status of the Module**
	Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Christoph Hanck	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Applied Labour Economics	**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Applied Labour Economics	L	6	180 h

2	**Language of instruction** English

3	**Contents of the module** Using given data sets, econometric methods of analysis are applied to current issues in labor market economics and independently empirically investigated. A detailed outline will be provided in the first lecture. Selected topics include: • Gender wage gap • Returns to education • Labour supply of married women • Effects of a job training program • Unemployment benefits and job quality • Welfare effects of unemployment benefits

4	**Competences** The student • learn to competently interpret, evaluate and question labor market studies • understand to apply quantitative methods in a differentiated way, to form hypotheses and to test them empirically. • will be able to develop research designs, conduct econometric analyses and process the results of these analyses by working independently on a PC. • also know how to present the findings of other people's or their own empirical work concisely, evaluate them critically and communicate them to the (specialist) public.

5	**Examinations** The module is examined in the form of a term paper (usually: 15 pages) or a term paper (usually: 15 pages, 70% of the grade) and a presentation (usually: 30 minutes, 30% of the grade). The concrete form of the examination is determined by the lecturer after the first session.

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** None. However, basic knowledge in microeconomics and microeconometrics is strongly recommended.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Jun.-Prof. Dr. Daniel Kühnle	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Econometrics of Electricity Markets	**ME6**

M.Sc. Program: Econometrics				

Frequency Summer semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				

No.	Courses	Type	Credit Points	Credit Hours
1a	Econometrics of Electricity Markets	L	3	2
1b	Econometrics of Electricity Markets	T	3	2

2 Language of instruction
English

3 Contents of the module
The objective of the lecture is to provide a basic understanding of electricity markets and regression based modeling methods for electricity prices. The aim of this course is to apply estimation and forecasting algorithms to real data using the statistical Software R, to interpret and to visualize the results. The lecture covers the following subjects: introduction to electricity markets, an overview of different model approaches, regression based modeling methods for electricity prices, forecasting and evaluation techniques and advanced estimation and modeling approaches.
In the tutorials, the students apply the learned methods in an own real data project.

4 Competences
The students
    -have an advanced understanding of electricity markets • understand regression based modeling methods for electricity prices
    -can apply estimation and forecasting algorithms to real data using the statistical Software R
    -are able to interpret and to visualize the results

5 Examinations
Equally weighted average of a group R-project and a presentation (usually about 20 minutes).

6 Type of Examinations
☒ covering the entire module   ☐ Relating to individual courses

7 Requirements
- none -

8 Status of the Module
Elective module in M.Sc. Econometrics

9

Module Coordinator Jun-Prof. Dr. Florian Ziel	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Empirische Bilanzanalyse	ME6

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Unregelmäßig zum Sommersemester (im Wechsel mit „Stichprobentheorie")	1 Semester	2. Semester	6	180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1a	Empirische Bilanzanalyse	V	3	2
	1b	Empirische Bilanzanalyse	Ü	3	2

2	**Language of instruction**
	Deutsch

3	**Contents of the module**
	Im Rahmen der Veranstaltung werden für das empirische Arbeiten mit umfangreichen Unternehmensbilanzdatensätzen besonders relevante statistische Methoden behandelt. Ausgewählte Fragen (Möglichkeiten der Insolvenzprognose, Determinanten der Investitionstätigkeit, Ausmaß der Finanzialisierung, etc.) werden unter Verwendung der dargestellten Methoden empirisch untersucht. Zu diesen Methoden gehören Regressionsansätze wie statische und dynamische Panelmodelle und Logit-/Probit-Regression, Entscheidungsbäume und Zufallswälder. Es erfolgt eine Anwendung der Methoden auf Unternehmensbilanzdaten zur vertieften Diskussion ökonomischer Fragestellungen.

4	**Competences**
	Die Studierenden
	- kennen ausgewählte empirische Methoden
	- beherrschen den Umgang mit Unternehmensbilanzdaten
	- entwickeln eigenständig Strategien, um inhaltliche Fragen empirisch zu untersuchen
	- wenden ausgewählte empirische Methoden mit geeigneter Software eigenständig auf Unternehmensbilanzdaten an

5	**Examinations**
	Zum Modul erfolgt eine modulbezogene Prüfung in der Gestalt einer empirischen Auswertung am PC (Prüfung vor Ort, in der Regel: 90-120 Minuten).

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements**
	- keine -

8	**Status of the Module**
	Wahlmodul im M.Sc. Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Andreas Behr	University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Empirical Finance	**ME6**

M.Sc. Program: Econometrics				
Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Empirical Finance	L	5	2

2	**Language of instruction** English or German

3	**Contents of the module** This course contains the theoretical background of current financial issues, the application of econometric methods to finance-related research questions, as well as the discussion of current empirical publications dealing with finance-related topics based on an inverted classroom approach.

4	**Competences** The objectives of the course are to strengthen skills in basic and advanced econometric methods and the application of econometric methods to concrete research questions in finance, the ability to discuss current topics in the field of finance, the preparation of students for empirical master theses, and the critical discussion of empirical research papers.

5	**Examinations** Written or oral exam. The mode of the exam will be assigned at the beginning of the course.

6	**Type of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** None. However, knowledge of statistical and econometric methods is strongly recommended.

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Martin Hibbeln	**Responsible Department** University of Duisburg-Essen, Mercator School of Management, Campus Duisburg

Module: Empirische Methoden				ME6	

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Wintersemester	1 Semester	1. bis 3. Semester	6	180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1a	Vorlesung: Empirische Methoden	V	3	2
	1b	Übung: Empirische Methoden	Ü	3	2

2	**Language of instruction**
	Deutsch

3	**Contents of the module**
	Im Rahmen der Vorlesung werden für das empirische Arbeiten mit umfangreichen Datensätzen besonders relevante statistische Methoden behandelt. Hierbei stehen Methoden für den Umgang mit Paneldaten und Methoden zur Abschätzung von Treatment Effekten im Vordergrund, insbesondere Verfahren zur Analyse von Verweildauerdaten und Methoden der statistischen Kausalanalyse. Die Übung befasst sich mit Anwendungen dieser Methoden mit Hilfe der statistischen Software R.

4	**Competences**
	Die Studierenden - kennen ausgewählte empirische Methoden - beherrschen den Umgang mit Daten, die Grundlage empirischer Analysen sind - wenden ausgewählte empirische Methoden mit geeigneter Software eigenständig an

5	**Examinations**
	Zum Modul erfolgte eine modulbezogene Prüfung in Form einer Präsentation (i.d.R. 10 - 20 Minuten, 50 % der Note) und einer Hausarbeit (10 - 20 Seiten, 50 % der Note) zu einer eigenständigen empirischen Analyse.

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements**
	- keine -

8	**Status of the Module**
	Wahlmodul im M.Sc. Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Andreas Behr	University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Financial Mathematics			**ME6**

M.Sc. Program: Econometrics

Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1a	Financial Mathematics	L	3	2
	1b	Financial Mathematics	T	3	2
2	**Language of instruction** English				
3	**Contents of the module** Discussion of essential mathematical valuation principles and techniques both in time-discrete and time-continuous models. Introduction and implementation of probabilistic and statistical methods. Analysis of stock, interest and commodity markets and also of the most common assets and derivatives in these markets. This includes mathematical models for price processes in stock, interest, and commodity markets, arbitrage theory and hedging strategies, stochastic models for financial markets: martingales and fundamental theorems in asset pricing, valuation and hedging of derivatives: European, American and exotic options, as well as incomplete markets and stochastic volatility.				
4	**Competences** Students - know the most important mathematical modelling techniques of financial markets and can apply them to real word problems - are able to value simple derivative assets and can apply the main principles of risk management - are able to solve basic risk management tasks arising in financial institutions and the energy industry				
5	**Examinations** Written exam (generally 90 minutes).				
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses				
7	**Requirements** - none -				
8	**Status of the Module** Elective module in M.Sc. Econometrics				
9	**Module Coordinator** Prof. Dr. Rüdiger Kiesel		**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen		

Module: Financial Risk Management	ME6

M.Sc. Program: Econometrics

Frequency Winter semester	Duration 1 semester	Study section 1st to 3rd semester	Credit Points 6	Time 180h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1a	Financial Risk Management	L	3	2
	1b	Financial Risk Management	T	3	2
2	**Language of instruction** English				
3	**Contents of the module** Regulation: Basel II/III, Solvency II Risk Categories Risk Measurements Valuation of Options, "Greeks" Hedging Strategies				
4	**Competences** At the end of this course, Students will be able to demonstrate that they can • understand the core principles of quantitative risk management. • understand mathematical and statistical techniques used in risk management. • use Monte-Carlo methods for risk measure calculations. • apply the theoretical principles discussed in class to real-world problems. • apply the knowledge gained to current problems in academic research. • discuss issues in the field of risk and bank management both in German and English. • communicate and debate topics of the lecture in a structured and professional way.				
5	**Examinations** Written exam (generally 60–90 minutes).				
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses				
7	**Requirements** - none -				
8	**Status of the Module** Elective module in M.Sc. Econometrics				
9	**Module Coordinator** Prof. Dr. Rüdiger Kiesel	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen			

Module: Inequality in Health	**ME6**

M.Sc. Program: Econometrics

Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1	Inequality in Health	L + T	6	4
2	**Language of instruction** English				
3	**Contents of the module** The students gain a sound knowledge of the theory and empirical contributions in the area of inequality in health. Topics discussed include, measurement, decomposition and quantitative analysis of inequality, the relationship between poverty and health / income inequality and health and the emergence of a social gradient in health as well as distributive justice and health.				

4	**Competences**
	Students taking this course will
	      -get familiar with quantitative measurement and decomposition methods for health and income inequality
	      -learn how health is related to socioeconomic status, poverty, economic development, demographic transition, income inequality and equity
	      -deepen their theoretical and empirical knowledge of health economics
	      -acquire a broad understanding of the importance of health-related factors for economy and society				

5	**Examinations** Final written exam on the teaching materials covered in lectures and tutorials (usually 60-90 min.).				
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses				
7	**Requirements** - none -				
8	**Status of the Module** Elective module in M.Sc. Econometrics				
9	**Module Coordinator** Prof. Dr. Martin Karlsson	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen			

Module: Mikroökonometrie	**ME6**

M.Sc. Program: Econometrics				
Frequency Sommersemester	**Duration** 1 Semester	**Study section** 2. Semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	Courses	Typ	Credit Points	Credit Hours
	1a	Mikroökonometrie	V	3	2
	1b	Mikroökonometrie	Ü	3	2
2	**Language of instruction** Englisch				
3	**Contents of the module** Einführung in nichtlineare mikroökonometrische Modelle und Schätzverfahren. Insbesondere werden behandelt: - Fragestellungen der empirischen Analyse - Datengrundlagen und Auswertungsmethoden - Deskriptive und kausale Analyse - Das Paradigma der experimentellen Analyse und die Probleme nicht-experimenteller Daten in den Sozialwissenschaften - Das Problem der Kausalanalyse am Beispiel der Evaluation wirtschafts- und sozialpolitischer Maßnahmen - Regressionsmodelle als Spezialfälle statistischer Modelle - Spezielle mikroökonometrische Verfahren und Modelle (lineare Panelmodelle, Modelle für diskrete abhängige Variablen, Zensierung, Matching, Duration Analysis)				
4	**Competences** Die Studierenden - können formale Darstellungen empirischer Modelle nachvollziehen und erklären - können aufbauend auf den vorhandenen Kenntnissen aktuelle Entwicklungen der ökonometrischen Methoden nachvollziehen - können sich die empirische Literatur auf Grundlage der erlernten Methoden selbständig erarbeiten und diese bewerten - können mikroökonometrische Methoden dem gestellten Problem adäquat einsetzen - können grundlegende Auswertungen und Analysen mittels STATA durchführen				
5	**Examinations** Zum Modul erfolgt eine modulbezogene Prüfung in der Gestalt einer Klausur (in der Regel: 60-90 Minuten).				
6	**Type of Examinations** ☒ Modulprüfung ☐ Teilleistungen				
7	**Requirements** - keine -				
8	**Status of the Module** Wahlmodul im M.Sc. Econometrics				

9	**Module Coordinator** Prof. Dr. Reinhold Schnabel	**Responsible Department** University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Portfolio Management	**ME6**

M.Sc. Program: Econometrics

Frequency Every Summer semester	Duration 1 semester	Study section 1st to 3rd semester	Credit Points 6	Time 180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1a	Portfolio Management	L	3	2
	1b	Portfolio Management	T	3	2

2	**Language of instruction** English
3	**Contents of the module** The students study the general Markowitz portfolio theory on optimal portfolio selection with and without risk-free asset. They study problems in the application concerning estimation risk, like the Jobson-Korkie experiment and possible solutions. The theory is applied to problem in financial and commodity markets.
4	**Competences** Students - have an advanced understanding in portfolio management - study modern portfolio optimization methods that take uncertainty into account - are able to apply the portfolio theory to real problems, especially in financial and commodity markets
5	**Examinations** Final written exam on the teaching materials covered in lectures and tutorials (usually 90-120 min.).
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** - none -
8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Jun-Prof. Dr. Florian Ziel	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Practising Econometric Research	**ME6**

M.Sc. Program: Econometrics

Frequency Winter semester	**Duration** 1 semester	**Study section** 1st to 3rd semester	**Credit Points** 6	**Time** 180 h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
		Seminar: Practising Econometric Research	L	6	180 h

2	**Language of instruction** English

3	**Contents of the module**

4	**Competences** The students
	- gain insight into recent developments of econometric research in selected fields - are trained in following scientific talks and are able to critically evaluate these - are able to apply specialist and methodological knowledge obtained during their studies and from scientific talks to a particular research topic - manage to work self-sufficiently at a scientific level under time constraints and thus are also prepared for writing seminar papers and a master thesis

5	**Examinations**
	Students attend at least 7 presentations in economic research seminars hosted at TU Dortmund University, Ruhr University Bochum and University of Duisburg-Essen. Attendance needs to be signed by a present member of the faculty of the MSc Econometrics, or else some other faculty member of the contributing faculties. Admissible seminars will be announced at the introductory meeting. Students also may put forward their own suggestions.
	A 1-2 page report must be written on each presentation. The summaries should evaluate the talk, i.e. briefly summarise the topic, explain the scientific contribution and reflect whether or not the talk was comprehensible and useful for the student. The report is due one week after the presentation.
	Based on one of the talks, students will perform a small research project on their own. This might consist of coding and simulating a new statistical technique put forward in the presentation, replicating part of the empirical work, providing detailed proofs of a theoretical result, compiling a detailed literature review etc. The length of the research report is up to six pages.
	The assessment of the course will be based (50% each) on the summaries and the research project. Based on the project, students give a presentation. The grade for the project is based 4:1 on the research report.

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module**	
	Elective module in M.Sc. Econometrics	
9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Christoph Hanck	University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Module: Quantitative Modelle internationaler Wirtschaftsbeziehungen				**ME6**

M.Sc. Program: Econometrics

Frequency Wintersemester	Duration 1 Semester	Study section 1. bis 3. Semester	Credit Points 6	Time 180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1a	Quantitative Modelle internationaler Wirtschaftsbeziehungen	V	3	2
	1b	Quantitative Modelle internationaler Wirtschaftsbeziehungen	Ü	3	2
2	**Language of instruction** Deutsch				
3	**Contents of the module** Die Veranstaltung vermittelt vertiefte Kenntnisse über die neuere theoretische und empirische Forschung im Bereich der quantitativen Analyse internationaler Wirtschaftsbeziehungen. Dazu gehören die Analyse der Auswirkungen der Globalisierung auf das Wirtschaftswachstum von Volkswirtschaften, die Analyse der Determinanten internationaler Konjunkturübertragung, der Bestimmungsgründe der Reaktion der Handelsbilanz auf Wechselkursänderungen sowie die Untersuchung der Determinanten ausländischer Direktinvestitionen und der Organisation multinationaler Unternehmen.				
4	**Competences** Die Studierenden - beherrschen den aktuellen Stand der Forschung im Bereich der Theorie und Empirie der realen Außenwirtschaft und der internationalen Wirtschaftsbeziehungen - sind in der Lage, die Methoden der angewandten Wirtschaftsforschung selbständig anzuwenden - können Fragestellungen aus dem Bereich der internationalen Wirtschaftsbeziehungen theoretisch analysieren und praktisch überprüfen - sind in der Lage die relevanten Theorien herzuleiten und zu vergleichen - hinterfragen aktuelle empirische Studien kritisch				
5	**Examinations** Zum Modul erfolgt eine modulbezogene Prüfung in der Gestalt einer Klausur (in der Regel: 60-90 Minuten).				
6	**Type of Examinations**				
	☒ Modulprüfung		☐ Teilleistungen		
7	**Requirements** - keine -				
8	**Status of the Module** Wahlmodul im M.Sc. Econometrics				
9	**Module Coordinator** Prof. Dr. Volker Clausen	**Responsible Department** University of Duisburg-Essen (Essen), Department of Business Administration and Economics			

Module: Quantitative Climate Finance	**ME6**

M.Sc. Program: Econometrics				
Frequency Summer semester	**Duration** 1 semester	**Study section** 2. semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1a	Quantitative Climate Finance	L	3	2
	1b	Quantitative Climate Finance	T	3	2

2	**Language of instruction** English

3	**Contents of the module** Discussion and analysis of financial instruments in the context of economics of climate change. Introduction to emission trading scheme and valuation methods for emission certificates and financial contracts based on emission certificates.

4	**Competences** The students -will investigate current issues in the field of economics of climate change with a focus on quantitative modelling -understand stochastic valuation methods for financial contracts related to climate issues and learn how to apply them -question the models critically, interpret model results and extend them

5	**Examinations** Written exam (usually 90 minutes).

6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Elective module in M.Sc. Econometrics

9	**Module Coordinator** Prof. Dr. Rüdiger Kiesel	**Responsible Department** University of Duisburg-Essen, Faculty of Business Administration and Economics, Campus Essen

Fortgeschrittene Ökonometrie					ME7	

M.Sc. Program: Econometrics

Frequency As offered		Duration 1 Semester	Study section 1st to 3rd semester		Credit Points 6	Time 180h

1	No.	Module		Type	Credit Points	Credit Hours
	1	Bayesian Econometrics		V+Ü	6	4
	2	Nonparametric Econometrics		V+Ü	6	4
	3	Statistical Learning		V+Ü	6	4
	6	Statistical Modelling of Extremes		V+Ü	6	4
2	**Language of instruction** Deutsch/Englisch					

3	**Contents of the module**
	
	Note: only one of the above courses can be credited.
	
	Selected topics:
	
	  1. **Statistical Learning**:
	    Linear regression and k-nearest neighbours
	    Classification
	    Resampling methods
	    Linear Model selection and regularization
	    Polynomial regression, splines and local regression
	    Tree-Based methods
	    Support vector machines
	    Unsupervised learning
	
	  2. **Nonparametric Econometrics**:
	    Univariate density estimation
	    Multivariate density estimation
	    Inference about the density
	    Nonparametric regression
	    Smoothing discrete variables
	    Regression with discrete covariates
	    Semiparametric methods
	    Instrumental variables
	
	  3. **Bayesian Econometrics**:
	    Bayesian inference
	    Classical simulation methods
	    Markov chains
	    Markov chain Monte-Carlo methods
	    Gibbs-Sampler, Metropolis-Hastings algorithm
	    Applications, such as linear regression, Lasso, (multivariate) time series, latent variable models
	
	  4. **Statistical Modelling of Extremes:**
	    Models for maxima
	    Peaks over threshold					

		Extremes of dependent sequences Extremes of non-stationary sequences Multivariate extremes
4	**Competences**	

	Die Studierenden
	    - verfügen über umfassende Kenntnisse moderner statistischer und ökonometrischer Methoden und beherrschen deren Anwendung bei der Lösung empirischer, ökonometrischer Fragestellungen
	    - kennen die formalen Eigenschaften zentraler Verfahren und können sie mathematisch zeigen
	    - können ökonomische Probleme sachgerecht in ein ökonometrisches Modell überführen, die ökonometrischen und statistischen Schätz- sowie Testverfahren hinsichtlich ihrer Problemadäquanz beurteilen, die geeigneten Daten auswählen und die empirischen Befunde kritisch kommentieren
	    - sind in der Lage, eigenständig und mit Hilfe geeigneter statistischer und ökonometrischer Software praktische Probleme zu lösen
	    - können selbständig ausgewählte Übungsaufgaben bearbeiten	

5	**Examinations**	
	Zum Modul erfolgt eine modulbezogene Prüfung in der Gestalt einer Klausur (in der Regel: 60-90 Minuten) oder einer mündlichen Prüfung. Alternativ: Empirisches Prognoseprojekt (70% der Note) und Präsentation (in der Regel: 20 Minuten. 30% der Note). Die Art der Prüfung wird jeweils zu Semesterbeginn vom Dozenten festgelegt.	
6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen
7	**Requirements**	
	- keine -	
8	**Status of the Module**	
	Wahlmodul im M.Sc. Econometrics	
9	**Module Coordinator** Prof. Dr. Christoph Hanck	**Responsible Department** University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Causality and Programme Evaluation				**ME7**

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Summer semester	1 semester	1st to 3rd semester	6	180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Causality and Programme Evaluation	L + T	6	4

2	**Language of instruction**
	English

3	**Contents of the module**
	This is a Master/Ph.D.-level course in causal inference and program evaluation methodology. We will focus on using the potential outcomes approach as a general organizing principle and examine identification and estimation of treatment effects under various types of assumptions. The course will not go into great depth in regard to any particular applied econometric method but will instead aim to provide you with enough knowledge about each one to know when, and when not, to use it in empirical work.
	Course outline:
	- Theories of Causation Conducting Experiments in Economics - Randomisation - Differences-in-Differences - Instrumental Variables - Fuzzy DiD / Multiple Testing - Regression Discontinuity Design - Methods based on Unconfoundedness - Quantile Regression - Evaluating Evaluation Techniques

4	**Competences**
	The students have an advanced understanding of electricity markets understand regression based modelling methods for electricity prices. They can apply estimation and forecasting algorithms to real data using the statistical Software R and are able to interpret and to visualize the results.

5	**Examinations**
	Equally weighted average of a group R-project and a presentation (usually about 20 minutes).

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements**
	- none -

8	**Status of the Module**
	Elective module in M.Sc. Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Martin Karlsson	University of Duisburg-Essen, Faculty of Business

	Administration and Economics, Campus Essen

Module: Seminar Ökonometrische Methoden	**ME7**

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
unregelmäßig	1 Semester	1. bis 3. Semester	6	180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Fachseminar Ökonometrische Methoden	S	6	2

2	**Language of instruction**
	Deutsch/Englisch

3	**Contents of the module**
	Im Rahmen des Fachseminars Ökonometrische Methoden erarbeiten, präsentieren und diskutieren die Studierenden aktuelle Forschungsergebnisse aus der methodischen sowie unter Umständen angewandten Ökonometrie.

4	**Competences**
	Die Studierenden
	- wenden in den Vorlesungen behandelte Theorien und ökonometrische Methoden auf eine konkrete empirische Fragestellung an
	- führen eigenständig eine ökonometrische Analyse auf aktuellem wissenschaftlichem Niveau durch
	- interpretieren ihre Ergebnisse und vergleichen diese mit relevanten Ergebnissen aus der wissenschaftlichen Literatur
	- ziehen Schlussfolgerungen bzgl. der Theorie und geben Politikempfehlungen

5	**Examinations**
	Zum Modul erfolgt eine modulbezogene Prüfung, die sich auf folgende Prüfungsformen erstreckt:
	- Anfertigung einer Seminararbeit mit einer eigenen ökonometrischen Analyse (ca. 20 Seiten ohne Berücksichtigung der Abbildungen und Tabellen, 50% der Note)
	- Präsentation und Disputation der Ergebnisse (in der Regel: 30-40 Minuten, 50% der Note)

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements**
	- keine -

8	**Status of the Module**
	Wahlmodul im M.Sc. Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Christoph Hanck	University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Stichprobentheorie		**ME7**

M.Sc. Program: Econometrics				
Frequency Unregelmäßig zum Sommersemester (im Wechsel mit „Empirischer Bilanzanalyse")	**Duration** 1 Semester	**Study section** 1. bis 3. Semester	**Credit Points** 6	**Time** 180h

1	**Structure of the module**				
	No.	**Courses**	**Type**	**Credit Points**	**Credit Hours**
	1a	Stichprobentheorie	V	3	2
	1b	Stichprobentheorie	Ü	3	2

2	**Language of instruction** Deutsch
3	**Contents of the module** Stichproben stellen eine wichtige und oftmals die einzige Informationsgrundlage über interessierende Grundgesamtheiten dar. Im Rahmen der Veranstaltungen werden Methoden der Stichprobentheorie vorgestellt und am Computer umgesetzt. Die Lehrinhalte umfassen - Erhebungsverfahren - einfache Stichproben - Schichtenstichproben - Klumpenstichproben - Gebundene Hochrechnung
4	**Competences** Die Studierenden - kennen ausgewählte Methoden der Ziehung, Hochrechnung und Fehlerrechnung - kennen die Vor- und Nachteile wichtiger Erhebungsmethoden - können im jeweiligen Kontext des spezifischen Untersuchungsprojektes alternative Erhebungsmethoden bezüglich ihrer Eignung beurteilen - sind befähigt, auf Daten aus Stichprobenerhebungen Schätzfunktionen anzuwenden und Fehlerrechnungen durchzuführen - wenden ausgewählte empirische Methoden mit geeigneter Software eigenständig an
5	**Examinations** Zum Modul erfolgt eine modulbezogene Prüfung in der Gestalt einer Klausur (in der Regel: 60-90 Minuten).

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements** - keine -

8	**Status of the Module**	
	Wahlmodul im M.Sc. Econometrics	
9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Andreas Behr	University of Duisburg-Essen (Essen), Department of Business Administration and Economics

Module: Statistisches Seminar	**ME7**

M.Sc. Program: Econometrics

Frequency	Duration	Study section	Credit Points	Time
Sommersemester	1 Semester	1. bis 3. Semester	6	180h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Statistisches Seminar	S	6	2

2	**Language of instruction**
	Deutsch

3	**Contents of the module**
	Im Rahmen des Seminars sollen die teilnehmenden Studierenden eine eigenständige empirische Auswertung eines bereitgestellten umfangreichen Datensatzes anfertigen und die Ergebnisse in einer Präsentation im Plenum vorstellen.

4	**Competences**
	Die Studierenden
	- sind befähigt empirische Analysen nachzuvollziehen und die wichtigsten methodischen Aspekte zu erläutern
	- sind befähigt zur eigenständigen Anfertigung einer empirischen Analyse
	- beherrschen die professionellen Darstellung der zugehörigen Ergebnisse mit Hilfe geeigneter Software

5	**Examinations**
	Zum Modul erfolgt eine modulbezogene Prüfung, die sich auf folgende Prüfungsformen erstreckt: Hausarbeit (15-20 Seiten) und Präsentation (in der Regel: 20-40 Minuten). Hausarbeit und Präsentation gehen zu jeweils 50% in die Modulnote ein.

6	**Type of Examinations**	
	☒ Modulprüfung	☐ Teilleistungen

7	**Requirements**
	- keine -

8	**Status of the Module**
	Wahlmodul im M.Sc. Econometrics

9	**Module Coordinator**	**Responsible Department**
	Prof. Dr. Andreas Behr	University of Duisburg-Essen (Essen), Department of Business Administration and Economics

POSSIBLE REQUIREMENTS IN CASE OF CONDITIONAL ADMISSION:			
NAME	**No.**	**Lectures/courses**	**Credit Points**
MACROECONOMICS	ME Req1	Reading Course Macroeconomics	7,5
MICROECONOMICS	ME Req2	Reading Course Microeconomics	7,5
ADVANCED MATHEMATICS	ME Req3	Advanced Engineering Mathematics	7
PROBABILITY	ME Req4	Reading Course Probability	5
INFERENCE	ME Req5	Reading Course Inference	5
LINEAR MODELS	ME Req6	Reading Course Linear Models	5
MINOR INTRODUCTORY CASE STUDIES	ME Req7	Minor Introductory Case Studies	5

Module: Macroeconomics		**Module ME Req1**

M.Sc. Program: Econometrics (requirements in case of conditional admission)

Frequency Each semester	Duration 1 semester	Semester beginning of programme	Credit Points 7,5	Time 225 h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Reading Course Macroeconomics	reading course	7,5	-

2	**Language of instruction** English
3	**Contents of the module** The module covers essential dynamic macroeconomic models that are required as a background for more advanced theories covered in specialized master level courses. The contents follow chapters 2 – 5 and 8 of the textbook by Michael Wickens, Macroeconomic Theory. A dynamic general equilibrium approach, 2nd ed., Princeton University Press (2011).
4	**Competences** Students acquire knowledge of core models and methods of dynamic macroeconomics. They become familiar with intertemporal optimization and its uses in the construction of baseline models of real and monetary business cycle fluctuations and long-run growth.
5	**Examinations** Oral exam based on the book chapters
6	**Type of Examinations** ☒ covering the entire module ☐ Relating to individual courses
7	**Requirements** -none-
8	**Status of the Module** Possible requirement in case of conditional admission to the M.Sc. Econometrics

9	**Module Coordinator** Lecturers from TU Dortmund	**Responsible Department** TU Dortmund University, Department of Business and Economics

Module: Microeconomics				**Module ME Req2**

M.Sc. Program: Econometrics (requirements in case of conditional admission)

Frequency Each semester	**Duration** 1 semester	**Semester** beginning of programme	**Credit Points** 7,5	**Time** 225 h

1	**Structure of the module**				
	No.	Courses	Type	Credit Points	Credit Hours
	1	Reading Course Microeconomics	reading course	7,5	-

2	**Language of instruction** English
3	**Contents of the module** The module covers the essential microeconomic model of rational choices in a general equilibrium. The topics of this course form the theoretical foundation for the contents of more advanced master level courses. The contents follow chapters 1 – 10 and 13 of the textbook by Hal R. Varian, Microeconomic Analysis. 3rd ed., W.W. Norton (2010).
4	**Competences** Students acquire knowledge of core models of decision theory for firms and consumers and solve problems of constraint optimization. They learn how to conduct comparative statics and gain knowledge of efficiency and welfare of a competitive equilibrium.
5	**Examinations** Oral exam based on the book chapters

6	**Type of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** -none-
8	**Status of the Module** Possible requirement in case of conditional admission to the M.Sc. Econometrics

9	**Module Coordinator** Lecturers from TU Dortmund	**Responsible Department** TU Dortmund University, Department of Business and Economics

Module: Advanced Mathematics	**Module ME Req3**

M.Sc. study programme: Econometrics (requirements in case of conditional admission)

Frequency Winter semester, annual	**Duration** 1 semester	**Semester** beginning of programme	**Credit Points** 7	**Time** 210 h

1	**Structure of the module**				
	No.	Lecture/Course	Type	Credit Points	Credit Hours
	1	Advanced Engineering Mathematics	L + T	7	3 + 2

2	**Language** English

3	**Content**
	- Linear Algebra: Vector spaces, matrices and equation systems, linear maps, Jordan-, LU-, QR-, and singular value decomposition, numerical aspects. - Differential Equation: Linear systems, differential equations with constant coefficients. - Laplace-Transform: Definition, convolution and application to differential equations. - Differential Calculus with several variables: Derivatives, inverse and implicit functions, Taylor expansion and extreme values. - Stability of Differential Equations: Theorems of Ljapunov and Poincaré-Ljapunov. - Variational Calculus. **Literature**: - Bajpai, Avinash C. , Mathematics for engineers and scientists - Meyer, R.M., Essential mathematics for applied fields - Lancaster, P., Tismenetsky, M., The theory of matrices - Lang, S., Linear algebra - Slides

4	**Competences** The course gives an introduction to fundamental mathematical techniques used in almost every course. Attention is given to the underlying mathematical structure.

5	**Examination** Written exam (2 hours).

6	**Types of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Possible requirement in case of conditional admission to the M. Sc. Econometrics

9	**Module Coordinator** Chairman of board of examiners	**Responsible Department** Mathematics

Module: Probability			**Module ME Req4**

M.Sc. study programme: Econometrics (requirements in case of conditional admission)

Frequency every semester	**Duration** 1 semester	**Semester** beginning of programme	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	Lecture/Course	Type	Credit Points	Credit Hours
	1	Reading Course Probability	reading course	5	

2	**Language** English

3	**Content**
	• Concepts of probability, distributions, conditional probability and independence, Bayes' rule, sequences of events.
	• Sampling, Binomial distribution, Normal approximation, Poisson distribution.
	• Random variables, expectation and variance.
	• Probability densities, Exponential and Gamma distributions, substitutions, cumulative distribution functions.
	• Joint distributions, Uniform and Normal distributions.
	• Dependence, conditional distributions, covariance and correlation.
	Literature:
	Jim Pitman: Probability. Springer 1993: Chapters 1, 2.1, 2.2, 2.5, 3.1-3.5, 4.1, 4.2, 4.4, 4.5, 5.1-5.3, 6.

4	**Competences** Students gain a deep understanding of probability. They independently integrate statistical problems in the context of probability theory and solve them using appropriate methods. Students apply mathematical proof techniques.

5	**Examination** Examination based on the book chapters.

6	**Types of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Possible requirement in case of conditional admission to the M. Sc. Econometrics

9	**Module Coordinator** Chairman of board of examiners	**Responsible Department** Statistics

Module: Inference	**Module ME Req5**

M.Sc. study programme: Econometrics (requirements in case of conditional admission)

Frequency every semester	**Duration** 1 semester	**Semester** beginning of programme	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	Lecture/Course	Type	Credit Points	Credit Hours
	1	Reading Course Inference	reading course	5	

2	**Language** English

3	**Content**
	• Parametric point estimation: method of moments and maximum likelihood; consistency; sufficiency; error, bias and loss; completeness; Rao-Cramer-bound; invariance; Bayesian estimation.
	• Parametric interval estimation: confidence intervals, especially for Normal distribution parameters, finding methods, Bayesian estimation.
	• Tests of hypotheses: simple and composite hypotheses, loss function, (uniformly) most powerful tests, unbiased tests, tests for (multivariate) Normal distribution parameters, Chi-square tests, relation to confidence intervals.
	Literature: Alexander M. Mood, Franklin A. Graybill, Duane C. Boes: Introduction to the Theory of Statistics. McGraw-Hill 1974: Chapters VII, VIII, IX.1-IX.6.

4	**Competences** Students calculate point and interval estimators and carry out significance tests. They prove basic properties of estimators and tests. Students apply the methods to real data.

5	**Examination** Examination based on the book chapters.

6	**Types of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module** Possible requirement in case of conditional admission to the M. Sc. Econometrics

9	**Module Coordinator** Chairman of board of examiners	**Responsible Department** Statistics

Module: Linear Models	**Module ME Req6**

M.Sc. study programme: Econometrics (requirements in case of conditional admission)

Frequency every semester	**Duration** 1 semester	**Semester** beginning of programme	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	**Lecture/Course**	**Type**	**Credit Points**	**Credit Hours**
	1	Reading Course Linear Models	reading course	5	-

2	**Language** English

3	**Content**
	• Introduction to regression models: real data examples, simple and multiple linear models, binary response models.
	• Linear model components: parameters, covariates, residuals, assumptions.
	• Parameter estimation: coefficients and error variance.
	• Hypothesis tests and confidence intervals: F-Tests, confidence regions, prediction intervals.
	• Model choice: variable selection, prediction evaluation, criteria.
	Literature:
	Thomas Kneib, Stefan Lang, Ludwig Fahrmeir, Brian D. Marx: Regression: Models, Methods and Applications. Springer 2015: Chapters 1, 2.1-2.3, 3.

4	**Competences**
	Students calculate point and interval estimators and carry out significance tests in the context of the linear model. They have knowledge on model selection.
	Students apply the methods to real data.

5	**Examination**
	Examination based on the book chapters.

6	**Types of Examinations**
	☒ covering the entire module ☐ Relating to individual courses

7	**Requirements** - none -

8	**Status of the Module**
	Possible requirement in case of conditional admission to the M. Sc. Econometrics

9	**Module Coordinator** Chairman of board of examiners	**Responsible Department** Statistics

Module: Minor Introductory Case Studies	**Module ME Req7**

M.Sc. study programme: Econometrics (requirements in case of conditional admission)

Frequency every semester	**Duration** 1 semester	**Semester** beginning of programme	**Credit Points** 5	**Time** 150 h

1	**Structure of the module**				
	No.	Lecture/Course	Type	Credit Points	Credit Hours
	1	Minor Introductory Case Studies (parts of the course "Fallstudien I" of the module BD 17 of the Bachelor programme Data Science)	P	5	4 (for 3/7 of the sem.)

2	**Language** English, enclosed in a German course
3	**Content** The aim of the course is to familiarise students with the independent evaluation of statistical data sets. In addition to the provision of a catalogue of basic standard procedures for data evaluation, a central learning objective is the appropriate presentation of the methodological approach and the evaluation results in verbal and written form. In order to achieve these learning goals, students have to work in small groups (three to four members) on projects for a total of 3 method complexes. The time frame for each project is one to two weeks, depending on the level of difficulty. The intermediate and final results of the statistical evaluation are presented alternately by the groups. After completion of each project, each student must write a short, written report in which the results achieved in the group and the methodology used are presented in an appropriate manner. Data Science Master students work on the first 3 of 7 projects.
4	**Competences** Students work independently according to scientific criteria and report orally and in writing on their work. Students apply statistical methods to real data sets, modify the methods if necessary and work out methods unknown to them. They derive solutions to problems and reflect on them. They work together in groups. They prepare and give presentations, explaining statistical methods and communicating results. They discuss their own and other methods, results and reports with others. They complete the projects within a short, given time.
5	**Examination** Written reports and oral presentations.

6	**Types of Examinations**	
	☒ covering the entire module	☐ Relating to individual courses

7	**Requirements** - none -
8	**Status of the Module** Possible requirement in case of conditional admission to the M. Sc. Econometrics

9	**Module Coordinator** Chairman of board of examiners	**Responsible Department** Statistics