Module Manual

for the

M.Sc. Survey Statistics

04. Juli 2016

Key Skills Qualifications in the Master in Survey Statistics

The Master in Survey Statistics aims at educating the students in the subject matter, as well as in the key skills. Whilst all modules cover the key skills Communication, Application of Number and Problem solving, special focus is laid in each module group on special key skills.

Topic Survey Statistics: Basics	Problem formulation and formalization
Topic Statistical Programming and Com- puter-intensive Methods	Programming skills, presentations skills for scientific re- search poster presentations, ICT skills for preparing the presentation, interpersonal skills by working in groups, tar- get-setting for and planning and conducting of a small re- search agenda
Topic Survey Statistics	Problem formulation and formalization, literacy and numera- cy in complex data situation, interpersonal skills by working in groups, presentation skills
Topic Statistics	Problem formulation and formalization, literacy and numera- cy in sophisticated problem settings, interpersonal skills by working in groups and finding, exploring, developing and presenting cutting edge scientific research
Topic Statistics: Applications	Problem formulation and formalization, cross-disciplinary transfer of scientific methodology, see also th description of imported modules
Modul Research Project	ICT skills for preparing the presentation, interpersonal skills by working in groups, target-setting for and planning and conducting of a large research agenda
Modul Master's thesis	ICT skills for preparing the presentation, target-setting for and planning and conducting of a large research agenda, self-organization, presentation of scientific research to ex- perts and defend the work against in depth questions

Topic Survey Statistics: Basics

Learning Objectives / Competences

The modules gathered under the heading *Survey Statistics: Basics* aim at providing basic knowledge in Statistics, Econometrics and, in particular, Survey Statistics. Thereby, the foundation for an in-depth understanding of the contents of all subsequent courses is laid.. Students get familiarized with the specific way of thinking as well as with the central problems and topics in the field of Survey Statistics. The inclusion of numerous examples provides insight into both theoretical and practical issues, that have to be considered when dealing with problems of Survey Statistics. Furthermore, students are introduced to and trained in working with the statistical software R.

Contents

The modules deal with central elements, methods and problems of Survey Statistics. Students acquire theoretical knowledge and get familiarized with central fields of application of Survey Statistics. Furthermore, they gain insight into typical problems of practical applications. Real data applications and the implementation in R are also part of the curriculum.

Further information

All modules under this heading are mandatory.

Sur	Survey Sampling							
ID	Workload CP		Semester	scheduled	Duration			
1	Courses	150	5	1 Contact time	annually Self-study	1 semester Course size		
	Lecture + (Bamberg	- Tutorial Survey S g/Berlin/Trier)	Sampling	1.5 + 0.5 h/week (30 h)	120 h	20 students		
2	 2 Learning Objectives The module aims at providing basic knowledge in Survey Statistics. Therewith, it lays the foundation for an in-depth understanding of the contents of all subsequent courses. Students get to know the basic stages of the sampling process, central concepts and sample selection mechanisms as well as point and variance estimators. In the course of that, both theory and practice of survey sampling are considered. Competences Students will learn to design appropriate sampling schemes, to draw samples and to assess the impact of sampling on statistical methods. 							
3	• F • C • C • C • E	Process and basic Central sampling d Inequal probabilition Design-based and Both theoretical for	concepts of sur esigns such as es model-assisted undation and pra	vey sampling stratified samplir estimation meth actical application	ng, cluster sampling ods n of all methods cor	and sampling with sidered		
4	Type of a	courses Ind tutorial						
5	Requirements Formal: / Prereguisites: Solid knowledge of basics in descriptive and inferential statistics							
6	Assessm Written e	nent xam						
7	Requirer Passing t	nents for CPs he written exam						
8	Contact Prof. Dr.	person Ralf Münnich						

Elei	Elements of statistics and econometrics								
ID		Workload	СР	Semester	scheduled	Duration			
		300	10	1	annually	1 semester			
1	Courses			Contact time	Self-study	Course size			
	Lecture + and econ	Tutorial Elemen ometrics	ts of statistics	4+2 h/week (90 h)	210 h	20 students			
2	 Learning Objectives The module aims at providing basic knowledge in Statistics and Econometrics. Therewith, it lays the foundation for an in-depth understanding of the contents of all subsequent courses. The course provides a basic knowledge of mathematical statistics, which is essential for the un- derstanding of complex statistical and econometrical methods. Competences Students will learn the elementary mathematical and statistical methods that are necessary for most methods in statistics and econometrics. This toolbox shall enable students to understand the proofs in empirical research and to develop proofs for own theorems in the field of statistics and econometrics. 								
3	Inhalt	asic knowledge on- depth knowledg fools like transforr mportant sampling concepts of conve fistimation and sta	on multivariate ra e on properties nation theorems g distributions rgence tistical testing	ndom variables of the multivariat , generating and	and their distributior e normal distributior characteristic funct	า า ions			
4	Type of o	courses							
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics in descriptive and inferential statistics					CS			
6	Assessm Writton ov	nent vam							
7	Requiren	nents for CPs							
0	Passing t	he written exam							
ŏ	Prof. Dr.	Ralf Münnich							

Topic Statistical Programming and Computer-intensive Methods

Learning Objectives/ Competences

The modules in the field of statistical programming and computer-intensive methods aim at providing indepth skills in statistical programming and at providing basic insight into computer-intensive statistical methods. They, therewith, prepare students for research and applications in the field of statistics – tasks that nowadays require fundamental programming skills.

Content

The modules deal with statistical programming with R and with central methods of computer-intensive statistics.

Further information

The module Monte-Carlo simulation methods is mandatory.

Mor	Nonte-Carlo simulation methods								
ID	Workload CP			Semester	Scheduled	Duration			
		200	10	1		1			
		300	10	1	annually	1 semester			
1	Courses	ana waali laatuwa	Ctatiatiaal	Contact time	Self-study	Course size			
	Compact	ONE-WEEK IECTURE	Statistical	6 n/day (30	210 h	20 atudanta			
	Program	ning with R		11	21011	20 Students			
	Lecture +	Tutorial Monte-(Carlo methods	(60 h)					
	Lootaro	rutonal monte c							
2	Loarning	Objectives							
2		I ODJECTIVES	ical and practica	Il aspects of simi	ulation mothods (Mr	nte-Carlo meth-			
	ods), com	putational statisti	cs and statistica	I programming w	vith R.				
	<i>,</i> ,,	1		1 5 5					
	The comp	pact one-week led	ture Statistical F	Programming with	h R will introduce the	e students to the			
	art of pro	gramming with R.	The Student lea	irns to implemen	t standard statistica	I and computa-			
	tional me	inods, to visualize	e statistical conte	ent and to produc	e reusable program	iming code in R.			
	Compete	nces							
	The lectu	re and tutorial on	Monte-Carlo me	thods enables th	ne student to plan ar	nd conduct a			
	simulation	n study and to illu	strate and interp	ret the results. F	urther, the presenta	tion of research			
	results wi	ll be trained.			•				
3	Content								
	• 5	statistical Program	nming with R						
		o Basic prin	ciples and centra	al commands					
		o Graphics			.,				
		o Programm	ling style / Progr	amming tools, e.	g., git version contro	Ol			
	• 1\	Ionte-Carlo metro	DOS p. of random pup	abore					
		\circ Planning a	and conducting s	inclos	s				
		o Monte-Ca	rlo methods		5				
		o Types of s	imulation studie	S					
4	Type of c	courses							
	Lecture a	nd tutorial							
_									
5	Requiren	nents							
	Formal: / Prorequisites: Solid Knowledge of basics			in descriptive ar	nd inferential statistic	°¢			
	Trerequi	SILUS, JUILI KIIUW	icaye or basies	in acouptive at					
6	Assessm	nent							
	Thesis/Po	oster + Presentati	on						
7	Requiren	nents for CPs							
	Posterpre	esentation							

8	Contact person Prof. Dr. Ralf Münnich

Topic Survey Statistics

Learning Objectives/ Competences

Aim of the modules gathered under the heading *Survey Statistics* is to provide an in-depth insight into methods and problems of different specific subareas of Survey Statistics. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge statistical methods from a theoretica, I as well as from a practical, point of view. Usually the implementation of the considered methods in the statistical software R is part of the course.

Content

The courses deal with specific methods and problems of Survey Statistics. The selection of topics covered is guided by the requirements that are posed by the practical process of planning, conducting and analysing a complex survey. These topics are, therewith, also subject to modern statistical research. Courses cover theoretical aspects as well as possible areas of application and the specific challenges of applying the elaborate statistical methods in practice. Selected data sets are used and the implementation in R is trained in regular computer tutorials.

Further information

All modules are semi-elective. Students can choose from the modules described on the following pages.

Wei	ghting	and calibra	tion			
ID		Workload	СР	Semester	Scheduled	Duration
		150	5	1-3	irregularly	1 semester
1	Courses			Contact time	Self-Study	Course size
	Lecture + <i>(Berlin)</i>	Tutorial Weighting	and Calibration	1.5 + 0.5 h/week (30 h)	120 h	20 students
2	 2 Learning Objectives The courses provide in-depth methodological knowledge on sampling designs and weighting methods. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. The courses also teach students how to implement the considered methods in R. Competences Students will be able to construct calibration weights appropriately due to different sources of survey errors and to apply them in a survey estimation context. 					
3	Content • 7 • 6 • 7 • 7 • 7	Theory and practic Design weights Veighting in the c Veighting in the c	ce of weighting a ase of outliers ase of unit-nonre	nd calibration in esponse	complex surveys	
4	Type of a	courses and tutorial				
5	Requirements Formal: / Prereguisites: Solid Knowledge of basics in descriptive and inferential statistics					
6	Assessn	nent	~	•		
_	Exam or	thesis				
/	Requirer	nents for CPs				
8	Prof. Dr.	person Ralf Münnich				

Vari	iance E	stimation				
ID		Workload	СР	Semester	Scheduled	Duration
		150	5	1-3	irregularly	1 semester
1	Courses			Contact time	Self-Study	Course size
	Lecture +	Tutorial <i>Variance E</i>	stimation	1.5 + 0.5 h/week (30 h)	120 h	20 students
2	 2 Learning Objectives Aim of the module is to provide an in-depth insight to methods and problems of variance estimation in survey statistics. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge respective methods from a theoretica, I as well as from a practical, point of view. The courses also teach students how to implement the considered methods in R. 					
	Students	will be enabled to	assess the qua	lity of survey est	imates in complex s	survey designs.
3	• N • L • F • S	Aethods of variand inearisation (e.g. Resampling metho Special topics o Variance e o Variance e	ce estimation Taylor-linearisat ods (Bootstrap, J estimation for me estimation in the	ion or Woodruff- ackknife) easures of chang case of missing	linearisation) je values	
4	Lecture a	courses Ind tutorial				
5	Requirements Formal: / Prereguisites: Solid Knowledge of basics in descriptive and inferential statistics					
6	Assessn	nent				
7	Oral exar	n or thesis				
	Passing t	he assessment				
8	Contact Prof. Dr.	person Ralf Münnich				

Intr	Introduction to Bayes statistics								
ID		Workload	СР	Semester	Scheduled	Duration			
		150	-	1.0	annually (winter				
		150	5	1-3	semester)	l semester			
1	Courses			Contact time	Self-Study	Course size			
	Lecture + Tutorial Introduction to Bayes sta- tistics (Bamberg)			1.5 + 0.5 h/week (30 h)	120 h	20 students			
2	Learning The mode Compete Students	I Objectives ule provides an in ences will be able to ap	troduction to Ba	yesian Statistics	and Empirical Baye	es Methods.			
3	Content Introducti	on to Bayes-Stati	stics using conju	igate priors and	MCMC-methods.				
4	Type of o	courses							
	Lecture a	ind tutorial							
5	Requirer	nents							
	Formal:								
	Prerequisites: Solid Knowledge of basics in descriptive and inferential statistics					CS			
6	Assessment								
_	Exam or thesis								
/	7 Requirements for CPs								
0	Passing i								
ð	Drof Dr	persun Dalf Münnich							

Stat	Statistical analysis of incomplete data							
ID		Workload	СР	Semester	Scheduled	Duration		
					annually (summer			
	r	150	5	1-3	semester)	1 semester		
1	Courses			Contact time	Self-Study	Course size		
	Lecture + incomple (Bamberg	Tutorial <i>Statistical</i> te data)	analysis of	1.5 + 0.5 h/week (30 h)	120 h	20 students		
2	Learning Objectives The courses provide an introduction to the statistical analysis of incomplete data. They especially focus on multiple imputation methods for missing data. Competences Students will be taught how to properly handle missing values in a data set and how to derive correct estimation results from this completed data set.							
3	Content • T • N • F	heoretical and pra Nostly methods ba focus on multiple	actical aspects on sed on Bayes S Sed on Bayes S Simputation	of methods for de statistics	ealing with missing v	alues in surveys		
4	Type of of the Lecture a	c ourses nd tutorial						
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics in statistics and survey statistics; Knowledge of ba- sics in Bayes statistics							
6	Assessm	nent						
	Exam or	thesis						
7	Requirer	nents for CPs						
	Passing t	he assessment						
8	Contact Prof. Dr.	person Ralf Münnich						

Pan	el Surv	veys				
ID		Workload	СР	Semester	Scheduled	Duration
1	Courses	150	5	1-3	irregularly	1 semester
	Courses			Contact time	Sell-Study	Course size
	Lecture + <i>(Berlin)</i>	Tutorial Panel Surv	reys	1.5 + 0.5 h/week (30 h)	120 h	20 students
2	 2 Learning Objectives The courses cover complex methods of survey sampling. With this module, students acquir methodological and practical skills to understand und deal with current research problems is panel estimation in the field of survey methodology. The methods considered are applied to the Socio-economic Panel. Competences Students will learn how to correctly deduce results from panel surveys under a complex survey design. Content 					
	• \	Veighting method:	s for dealing with	n missing values		
4	Type of a	courses and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics					
6	Assass	nent				
	Exam or	thesis				
7	Requirer	nents for CPs				
	Passing t	he assessment				
8	Contact Prof. Dr.	person Ralf Münnich				

Indi	idicators of Economic and Social Statistics							
ID		Workload	СР	Semester	Scheduled	Duration		
	1	150	5	1-3	irregularly	1 semester		
1	Courses			Contact time	Self-Study	Course size		
	Lecture + Social Sta (Trier)	Tutorial Indicators of tistics	of Economic and	1.5 + 0.5 h/week (30 h)	120 h	20 students		
2	Learning The cours social sta Compete Students	objectives ses cover method tistics. ences learn to properly l	ological and pra	ctical aspects of	important indicators er, they learn to imp	s of economic and lement respective		
	methods	in R and to visual	ize, present and	interpret indicate	ors.			
3	Content • (• T • II • II • V	Central economic andicators) Theoretical aspect mportant areas of mplementation in Visualization and p	and social indica s: Theoretical re application R presentation of ir	tors (price indice quirements, prop ndicators	es, measures of inec	quality, composite al foundations		
4	Type of a Lecture a	c ourses Ind tutorial						
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics							
6	Assessm	nent						
	Exam or	thesis						
7	Requirer Passing t	nents for CPs he assessment						
8	Contact Prof. Dr.	pe <mark>rson</mark> Ralf Münnich						

Sta	Statistical Disclosure Control							
ID		Workload	СР	Semester	Scheduled	Duration		
		150	5	1-3	irregularly	1 semester		
1	Courses		-	Contact time	Self-Study	Course size		
	Seminar S	Statistical Disclosu	re Control	1.5 + 0.5 h/week (30 h)	120 h	20 students		
2	 Learning Objectives Aim of the courses is to convey an understanding of the importance and implementation of data protection. Competences 							
	acquire t en data s	he knowledge to set.	evaluate respec	tive methods and	I to judge the disclo	osure risk for a giv-		
3	Content							
	• \$	Stochastic and de	eterministic appro	aches to disclos	ure control for micro	o and macro data		
	• 1	Methods of inform	nation reduction a	and perturbative	protection methods			
	•	Pre- and posttabl	lar methods for t	abular data				
	• (Comparison of m	ethods and appro	baches				
1								
4	Seminar	coui 383						
5	Require	ments						
	Formal:	1						
	Prerequi	isites: Solid Kno	wledge of basics	statistics and su	rvey statistics			
6	Assessn	nent						
	Exam or	thesis						
7	Require	ments for CPs						
0	Passing	the assessment						
ŏ	Prof. Dr.	Ralf Münnich						

Small Area Estimation							
ID		Workload	СР	Semester	Scheduled	Duration	
		150	5	1-3	irregularly	1 semester	
1	Courses			Contact time	Self-Study	Course size	
	Lecture +	Tutorial Small Area	Estimation	1.5 + 0.5 h/week (30 h)	120 h	20 students	
2	 2 Learning Objectives The module covers theoretical and practical aspects of small area statistics. Students acquire advanced methodological knowledge and are, therewith, prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. Competences Competences 						
3	Content						
	• F	oundations: desig	n-based, model	-based and synt	hetic estimators		
	• 5	Standard methods	of small area es	stimation			
	• (Current developme	ents				
	•	mplementation in	R				
4	Type of a	courses Ind tutorial					
5	Requirer	nents					
	Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assessm	nent					
7	Oral exar	n or exam or thesi	S				
/	Passing t	he assessment					
8	Contact Prof. Dr.	person Ralf Münnich					

Survey Econometrics							
	Workload	СР	Semester	Scheduled	Duration		
	150	5	1-3	irregularly	1 semester		
Courses			Contact time	Self-Study	Course size		
Lecture +	Tutorial Survey I	Econometrics	1.5 + 0.5 h/week (30 h)	120 h	20 students		
	Ohiostinos						
The cours	UDJECTIVES	s how methods	of survey statist	tics can be annlied	and in which situa.		
tions they	have to be consi	dered when dea	aling with practic	al economic resear	ch questions.		
5			0		·		
Compete	ences	alu curuou ctatic	stical mathada ta	aconomatria applia	ations		
Content		oly survey statis			.alions.		
• F	Process of obtainin	ng micro data fo	or economic mod	lels/economic analy	vses		
• (Consequences of	the survey proc	ess for the estim	ation of econometri	ic models		
• A	Application of cons	sidered method	s (case studies v	vith selected data se	ets)		
• li	mplementation in	R					
Type of o	courses						
Lecture a	nd tutorial						
Formal	nents						
Prereaui	sites: Solid Knov	vledge of basic	cs statistics, bas	ic knowledge in ec	onometrics, survey		
sampling	and MC-methods	recommended					
Assessm	nent						
Exam or (electronic exam						
Requiren	nents for CPs						
Passing t	ne assessment						
Contact person							
	<pre>/ey Ecc /ey Ecc Courses Lecture + Lecture + Learning The cours tions they Compete Students Content • F • C • A • In Type of c Lecture a Requirer Formal: A Prerequi sampling Assessm Exam or Requirer Passing t</pre>	/ey Econometrics Workload 150 Courses Lecture + Tutorial Survey B Lecture + Tutorial Survey B Lecture + Tutorial Survey B Competences Students will be able to app Content Process of obtainin Consequences of to Application of conse Implementation in Type of courses Lecture and tutorial Requirements Formal: / Prerequisites: Solid Know sampling and MC-methods Assessment Exam or electronic exam Requirements for CPs Passing the assessment Contact person	Vey Econometrics Workload CP 150 5 Courses Lecture + Tutorial Survey Econometrics Learning Objectives The courses teach students how methods tions they have to be considered when de Competences Students will be able to apply survey statis Content Process of obtaining micro data for Consequences of the survey proc Application of considered method: Implementation in R Type of courses Lecture and tutorial Requirements Formal: / Prerequisites: Solid Knowledge of basic sampling and MC-methods recommended Assessment Exam or electronic exam Requirements for CPs Passing the assessment Contact person	Vey Econometrics Workload CP Semester 150 5 1-3 Courses Contact time Lecture + Tutorial Survey Econometrics 1.5 + 0.5 h/week (30 h) Learning Objectives The courses teach students how methods of survey statistions they have to be considered when dealing with practic Competences Students will be able to apply survey statistical methods to Content • Process of obtaining micro data for economic mod • Consequences of the survey process for the estim • Application of considered methods (case studies v • Implementation in R Type of courses Lecture and tutorial Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics, bas sampling and MC-methods recommended Assessment Exam or electronic exam Requirements for CPs Passing the assessment Contact person Contact person	Vey Econometrics Workload CP Semester Scheduled 150 5 1-3 irregularly Courses Contact time Self-Study Lecture + Tutorial Survey Econometrics 1.5 + 0.5 120 h Learning Objectives 1.5 + 0.5 120 h The courses teach students how methods of survey statistics can be applied tions they have to be considered when dealing with practical economic resear Competences Students will be able to apply survey statistical methods to econometric applic Content Process of obtaining micro data for economic models/economic analy Consequences of the survey process for the estimation of econometric Application of considered methods (case studies with selected data s Implementation in R Type of courses Lecture and tutorial Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics, basic knowledge in ec sampling and MC-methods recommended Assessment Exam or electronic exam Requirements for CPs Passing the assessment Contact person Contact person		

Modern Methods in Survey Statistics							
ID		Workload	СР	Semester	Scheduled	Duration	
	I	150	5	1-3	irregularly	1 semester	
1	Courses			Contact time	Self-Study	Course size	
	Lecture + <i>Survey S</i>	- Tutorial Modern Statistics	Methods in	1.5 + 0.5 h/week (30 h)	120 h	20 students	
2	 Learning Objectives The courses deal with cutting-edge methods and problems of survey statistics. They, therewith, provide up-to-date in-depth knowledge in specific, highly advanced subareas of the discipline and permit insight into topics of modern statistical research. Competences Students will get deeper insight into hot topics in survey statistics and learn to decide on which method to apply in a specific situation. 						
	Specific ι	up-to-date probler	ns and methods	of survey statisti	CS		
4	Type of a Lecture a	courses Ind tutorial					
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics; Depending on the top- ics covered, possible further prerequisites will be communicated						
6	Assessm	nent					
-	Oral exar	n or Exam or thes	sis				
/	Requirer	nents for CPS					
8	Contact	Derson					
	Prof. Dr.	Ralf Münnich					

Methods of Survey Statistics							
ID		Workload	СР	Semester	Scheduled	Duration	
		150	5	1-3	irregularly	1 semester	
1	Courses			Contact time	Self-Study	Course size	
	Seminar A	Nethods of Survey S	Statistics	2h/week (30 h)	120 h	20 students	
2	2 Learning Objectives Aim of the module is to provide an in-depth insight into cutting-edge methods and problems of survey statistics.						
	Students area. Fur	ences learn to autonom thermore, they ga	nously acquire a in advanced me	nd present the orthodological kno	current state of res wledge in a topical	earch in a specific research field.	
3	Content Specific ι	up-to-date problen	ns and methods	in selected area	as of survey statistic	S	
4	Type of of Seminar	courses					
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assessm Presenta	nent tion and thesis					
7	Requirer	ments for CPs					
	Passing t	he assessment					
8	Contact Prof. Dr.	person Ralf Münnich					

Survey Methodology							
ID		Workload	СР	Semester	Scheduled	Duration	
		150	5	1-3	irregularly	1 semester	
1	Courses	1		Contact time	Self-Study	Course size	
	Lecture +	Tutorial		2h/week (30 h)	120 h	20 students	
2	 2 Learning Objectives Aim of the module is to provide relevant basic competences in survey research and methodology. It studies the associated survey data collections techniques, for example questionnaire design and other aspects of survey methodology, such as interviewer effect, nonresponse handling, and follow-up techniques. Competences Students will be able to handle survey methodological issues and to decide on which method to use in a specific situation. 						
3	Content						
	 Cognitive and perceptual psychological basics of data collection Questionnaire design Different data collection forms (observation, non-reactive measuring methods, evaluations, quasi-experiments, cohort studies, etc.) Development of different instruments for data collection Evaluate and test questions Handling problems like intensioner effect, perceptore and other 						
4	Type of a Lecture +	c ourses - Tutorial					
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assessn	nent					
7	Oral Exa	m or Exam or Th	esis				
/	Requirer	nents for CPs					
8	Prof. Dr.	person Johannes Kopp					

ID		Workload	СР	Semester	Scheduled	Duration
		150	5	1-3	irregularly	1 semester
1	Courses	100	0	Contact time	Self-Study	Course size
	Lecture + Tutorial			2h/week (30 h)	120 h	20 students
2	 Learning Objectives Modern survey statistics has a strong need for computational methods allowing for, e.g., desig efficient surveys under constraints and estimation of model parameters in a high dimensional parameter space. Solutions to such problems are generally computationally complex and tim demanding. Hence, mathematical optimization methods are needed to speed up computations of make them feasible at all. This course provides insights in different optimization methods used i modern survey statistics. Competences Students will be able to optimize computational algorithms and to decide on which method to us 					
3	Content					
	Different sample s	up to date optir ize under constr	nization methods aints and machin	in survey statist e learning algorit	ics. E.g., optimal al hms.	llocation of a given
4	Type of Lecture a	courses and tutorial				
5	Requirements Formal: / Prerequisites: Solid Knowledge of survey statistics and mathematics and a strong interest in optimization. Depending on the topics covered, possible further prerequisites will be communi- cated.					
6	Assessr	nent				
	Thesis/P	oster or oral exa	m			
7	Require	ments for CPs				
	Passing	the assessment				
8	Prof. Dr.	person Ralf Münnich				

Use	of Nor	n-sampling	Data			
ID		Workload	СР	Semester	Scheduled	Duration
		150	5	1-3	irregularly	1 semester
1	Courses	100	5	Contact time	Self-Study	Course size
•	000					
	Lecture +	Tutorial		2h/week (30 h)	120 h	20 students
2	Loomino	Ohioativoo				
2	 Learning Objectives The module covers theoretical and practical aspects of dealing with data not obtained via classi- cal sampling. Since increasingly more data is acquired via non-probability sampling techniques, especially in the big data context, new methodology has to be employed. The course includes a considerable amount of exercises to convey the theoretical knowledge taught into practice. Competences 					
	lenges.		ion camping aa			
3	Content					
	• [)ata mining vs. da	ita sampling			
	• [Determining the sa	ampling universe	<u>}</u>		
	• (Overcoming the la	ck of representa	tivitv		
	• F	Practical consideration	ations for the use	e of non-probabil	ity samples	
4	Type of o	courses			<u> </u>	
	Lecture/S	Seminar				
5	Requirer	nents				
	Formal: /	r sitas: Salid Know	lodge of basics	etatistics and s	invovistatistics: Dor	onding on the ten
	ics cover	ed possible furthe	er prerequisites	vill be communic	ated	ending on the top-
6	Assessm	nent				
	Thesis/Po	oster or presentat	ion or oral exam			
7	Requirer	ments for CPs				
	Passing t	he assessment				
8	Contact	person				
	Prot. Dr.	Kalt Munnich				

Topic Statistics

Learning Objectives/ Competences

Aim of the modules gathered under the heading *Statistics* is to provide an in-depth insight into methods and problems in different specific subareas of the discipline Statistics. Students acquire profound methodological knowledge and are, therewith, prepared to thoroughly understand and judge statistical methods from a theoretical, as well as from a practical, point of view. Usually the implementation of the considered methods in the statistical software R is part of the course.

Content

The courses deal with specific methods and problems of Statistics. They provide in-depth knowledge of complex methods. The selection of topics covered is guided by the current state of research in the respective area. Courses cover theoretical aspects as well as possible areas of application and the specific challenges of applying the elaborate statistical methods in practice. Selected data sets are used and the implementation in R is trained in regular computer tutorials.

Further information

All modules are semi-elective. Students can choose from the modules described on the following pages. Additionally, students can select the modules *Applied time series analysis* and *Financial Econometrics* (further information in the module guide of the MSc. Economics).

Multivariate Statistics							
ID		Workload	СР	Semester	Scheduled	Duration	
		300	10	2	irregularly	1 semester	
1	Courses	·		Contact time	Self-study	Course size	
	Lecture + Seminar	Tutorial <i>Multivaria</i>	e Verfahren	2+1 h/week (45 h) 2 h week/ (30 h)	225 h	20 students	
2	 2 Learning Objectives Aim of the module is to provide an in-depth insight into methods and problems of multivariate statistics. Students acquire advanced methodological knowledge. The courses also teach students how to implement the considered methods in R. Competences 						
	Students cal, as w ture withi	are prepared to ell as from a pra n a short thesis.	thoroughly undectical, point of vi	erstand and judg ew. They learn t	e respective metho o condense the vas	ds from a theoreti- st amount of litera-	
3	 Content Statistical methods for multidimensional problems Structure detection methods (Principal component analysis, factor analysis, cluster analysis) Tests for multivariate structure (Conjoint analysis, confirmatory factor analysis) Graphical tools for analysing multidimensional data 						
4	Type of a Lecture a Seminar	c ourses Ind Tutorial					
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assessn	nent					
7	"Prüfungs	svorleistung" and	thesis				
/	Passing t	he assessment					
8	Contact Prof. Dr.	person Ralf Münnich					

Statistical Modeling							
ID		Workload	СР	Semester	Scheduled	Duration	
		300	10	2	irregularly	1 semester	
1	Courses			Contact time	Self-study	Course size	
	Lecture + Seminar	Tutorial Statistic	al Modeling	2+1 h/week (45 h) 2 h week/ (30 h)	225 h	20 students	
2	Learning Objectives Aim of the module is to provide an in-depth insight into methods and problems of statistical mod- elling. Students acquire advanced methodological knowledge. The courses also teach students how to implement the considered methods in R.						
	Competences Students are prepared to thoroughly understand and judge respective methods from a theoretical, as well as from a practical, point of view. Further, they learn how to write empirical or methodological articles and prepare these formally ready for submission to a journal						
3	 Content Different statistical models for economic and social research problems Generalized linear regression models Mixed models Robust methods Taking account of the survey design in statistical modelling 						
4	Type of a Lecture a Seminar	c ourses and Tutorial					
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assessn "Drüfunge	nent	thosis				
7	Requirer	ments for CPs	แเรงเง				
8	Contact Prof. Dr.	person Ralf Münnich					

Experimental Design							
ID		Workload	СР	Semester	Scheduled	Duration	
1	0	300	10	2	irregularly	1 semester	
1	Courses			Contact time	Self-study	Course size	
	Lecture + Seminar	- Tutorial Experim	ental Design	2+1 h/week (45 h) 2 h week/ (30 h)	225 h	20 students	
2	2 Learning Objectives Aim of the module is to provide an in-depth insight into methods and problems of experimental design. Students acquire advanced methodological knowledge. The courses also teach students how to implement the considered methods in R.						
	Competer Students cal, as we	ences are prepared to t ell as from a pract	horoughly unde	rstand and judg w.	e respective metho	ds from a theoreti-	
3	Content • [• N	Different designs fo Aethodological iss	or experimental ues and applica	analysis in econ tions	omics and social sc	iences	
4	Type of a Lecture a Seminar	c ourses and Tutorial					
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assessn	nent	hacia				
7	Requirer	ments for CPs	Inesis				
	Passing t	the assessment					
8	Contact Prof. Dr.	person Ralf Münnich					

Modern Methods in Statistics							
ID		Workload	СР	Semester	Scheduled	Duration	
		300	10	2	irregularly	1 semester	
1	Courses			Contact time	Self-study	Course size	
	Lecture + Tutorial <i>Modern Methods of Statistics</i> Seminar			2+1 h/week (45 h) 2 h week/ (30 h)	225 h	20 students	
2	Learning Objectives Aim of the module is to provide an in-depth insight into cutting-edge methods and problems of statistics. Students learn to autonomously acquire and present the current state of research in a specific area. They furthermore gain advanced methodological knowledge in a topical research field.						
	Competer Students cal, as we	ences are prepared to t ell as from a pract	thoroughly unde ical, point of view	rstand and judg w.	e respective metho	ds from a theoreti-	
3	Content Specific u	up-to-date problen	ns and methods	in selected area	s of statistics		
4	Type of a Lecture a Seminar	c our ses and Tutorial					
5	Requirer	nents /					
	Prerequi	sites: Solid Know	ledge of basics	statistics and su	rvey statistics		
6	Assessn	nent					
7	"Prüfungs	svorleistung" and i	ihesis				
/	Passing	the assessment					
8	Contact Prof. Dr.	person Ralf Münnich					

Optimization Methods in Statistics							
ID		Workload	СР	Semester	Scheduled	Duration	
		300	10	2-3	irregularly	1 semester	
1	Courses			Contact time	Self-study	Course size	
	Lecture + Tutorial Seminar			2+1 h/week (45 h) 2 h week/ (30 h)	225 h	20 students	
2	 Learning Objectives The course aims at providing insights in different optimization methods used in modern statistics. Statistical methods become more and more sophisticated. Often, closed form solutions are not easily attainable anymore. This module covers different optimizations methods and algorithms used in practice to find numerical solutions in such cases. Competences Students are prepared to thoroughly understand and judge respective methods from a theoreti- 						
3	Content Different and LASS	up to date optimi SO regression.	zation methods	in statistics use	d for, e.g., Support	Vector Machines,	
4	Type of a Lecture a Seminar	courses Ind Tutorial					
5	Requirements Formal: / Prerequisites: Solid Knowledge of basic statistics and mathematics and a strong interest in op- timization. Depending on the topics covered, possible further prerequisites will be communicated.						
6	Assessm	nent					
-	"Prüfungs	svorleistung" and	Thesis/Poster				
/	Passing t	he assessment					
8	Contact Prof. Dr.	person Ralf Münnich					

Statistical Literacy							
ID		Workload	СР	Semester	Scheduled	Duration	
_		300	10	2-3	irregularly	1 semester	
1	Courses			Contact time	Self-study	Course size	
	Lecture + Seminar	Tutorial		2+1 h/week (45 h) 2 h week/ (30 h)	225 h	20 students	
2	Learning	Objectives/Com	petences				
	Aim of this module is the ability to present elaborate statistical results in an appropriate and un- derstandable manner. Students learn to process, express and visualize methods and findings of state-of-the-art research. It also aims at strengthen the ability to read and critically judge pub- lished statistical findings. Competences Students are prepared to thoroughly understand and judge respective methods from a theoreti- cal, as well as from a practical, point of view. They learn to condense the vast amount of litera-						
3	Content						
	Specific ι	up-to-date method	s and visualizati	on techniques in	selected areas of s	statistics.	
4	Type of courses Lecture and Tutorial Seminar						
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assessment						
7	Requirer	nents for CPs	1115313/17 03151				
	Passing t	he assessment					
8	Contact Prof. Dr.	person Ralf Münnich					

Topic Statistics: Applications

Learning Objectives/Competences

All modules under the heading Statistics: Applications are elective. They provide the opportunity to set a specific individual focus.

Content

Students can select from a range of different courses so that they can set a specific focus depending on their individual interests and carrier plans. They have the opportunity to further deepen and broaden their methodological knowledge by opting for additional modules from the topic Statistics. Alternatively, they can select courses from an area of application such as social sciences, economics or geography. Finally, there is the opportunity to specialize in methods and problems of official statistics in Europe by electing the module Official Statistics.

Further information

All modules are elective modules. Students can choose from the modules on the following pages. Alternatively, they can select a further module from the topic Statistics.

Application							
ID		Workload	СР	Semester	Scheduled	Duration	
		300	10	3	irregularly	1 semester	
1	Courses			Contact time	Self-study	Course size	
	Miscellaneous			Depends on the courses elected	Depends on the courses elected	Depends on the courses elected	
2	Learning Objectives This module gives students the opportunity to set a specific focus depending on their individual interests and carrier plans. They have the opportunity to further deepen and broaden their meth odological knowledge by opting for additional modules from the topic Statistics. Alternatively, they can select courses from an area of application such as social sciences, economics or geography Competences Depends on the courses elected						
3	Content Depends on the courses elected						
4	Type of courses Depends on the courses elected						
5	Requirements Depends on the courses elected						
6	Assessment Depends on the courses elected						
7	Requirements for CPs Depends on the courses elected						
8	Contact person Prof. Dr. Ralf Münnich , N.N.						

Official Statistics							
ID		Workload	СР	Semester	Scheduled	Duration	
		300	10	1-3	irregularly	1 semester	
1	Courses			Contact time	Self-study	Course size	
	Miscellaneous			Depends on the courses elected	Depends on the courses elected	Depends on the courses elected	
2	Learning This mod tistics in E	J Objectives lule gives students Europe.	s the opportu	unity to specialize in	methods and prob	lems of official sta-	
	Competer Students cal, as we ropean st	ences are prepared to t ell as from a prac tatistical system a	horoughly u tical, point of nd their impli	nderstand and judg f view. A deep unde cations in statistical	e respective metho erstanding of metho institutes is aimed f	ds from a theoreti- ds used in the Eu- for.	
3	Content Import from EMOS. Focus on methods and problems of official statistics in Europe (statistical production process, ESS, methods of official statistics)						
4	Type of courses Depends on the courses elected						
5	Requirements Formal: / Prerequisites: Solid Knowledge of basics statistics and survey statistics						
6	Assesme	ent					
-	Exam/ Oral exam in cooperation with Eurostat/ ESS						
7	Requirements for CPs Passing the assessment						
8	Contact person Prof. Dr. Ralf Münnich, N.N.						

EMOS							
ID		Workload	СР	Semester	scheduled	Duration	
		300	10	1	irregularly	1 semester	
1	Courses	000	10	Contact time	Self-study	Course size	
					,		
	Different	lectures		2 h/week	120 h		
				or			
				EMOS sum- mer/spring school			
2	 2 Learning Objectives The EMOS core module covers topics of European Official Statistics and aim broad overview on the ESS, the data production process as well as on methods data and presenting respective results. 						
	Competences Students are prepared to thoroughly understand and judge respective methods from a theoreti- cal, as well as from a practical, point of view						
3	Content E.g. Data Quality, Sampling Theory, Statistical Disclosure Control, Big Data, Metadata, Statistical Data Editing, National Accounts, Price indices						
4	Type of courses Weekly lecture or EMOS summer/spring school						
5	Requirements Formal: / Prereguisites: Solid Knowledge of basics statistics						
6	Assessm	nent					
7	Requirements for CPs Passing the assessment						
8	Contact person Prof. Dr. Ralf Münnich, N.N.						
9	Further informationCourses are provided in cooperation of the Bamberg/Berlin/Trier network and Official Statistics.The module can be substituted by an EMOS spring or summer school.						

Modul Research Project

Survey Statistics: Research Project							
	Workload	СР	Semester	Scheduled	Duration		
	300	10	3	annually	1 semester		
Courses			Contact time	Self-study	Course size		
Colloquiu	m/Seminar		2 h/week (30 h)	270 h	Up to 5 students		
Learning Objectives/Competences In this module, students can either participate in an existing research project or autonomously pursue and answer a specific research question in an individual project. They, therewith, gain experiences in planning and conducting statistical research. Competences Students practice the intensive engagement with a complex statistical problem, the implementation of respective methods in R, and the writing of a scientific thesis. Alternatively, in the EMOS context, the students are expected to conduct a research project and an internship in official statistics.							
Content The topic	is chosen after co	onsultation with	the individual adv	visor.			
Type of c Individual	courses counselling, mee	tings in small gr	oups, seminar, c	olloquium			
Requirements Formal: / Prerequisites: Solid Knowledge of basic survey statistics							
Assessm Presentat	nent ion of intermediat	e and final resul	ts; research repo	ort			
Requiren Passing t	nents for CPs he assessment						
Contact person							
Further in This mod Upon req project (a statistical	nformation ule is mandatory. uest, the module t least 3 month). -methodological p	can be substitut In this case the art.	ed by an interns assessment is	hip or by the assista a report, which con	ance in a research tains an adequate		
	 Vey Sta Vey Sta Courses Colloquiu Learning In this mode pursue and experience Compete Students tion of rest Alternativ an interns Content The topic Type of content The topic Requirem Formal: / Prerequistical Assessme Presentat Requirem Passing ti Contact performation of the topic of topic of the topic of topic of the topic of topic	Vey Statistics: Reso Workload 300 Courses Colloquium/Seminar Learning Objectives/Com In this module, students ca pursue and answer a spec experiences in planning and Competences Students practice the inten- tion of respective methods Alternatively, in the EMOS an internship in official stati Content The topic is chosen after co Type of courses Individual counselling, mee Requirements Formal: / Prerequisites: Solid Know Assessment Presentation of intermediat Requirements for CPs Passing the assessment Contact person Prof. Dr. Ralf Münnich, N.N Further information This module is mandatory. Upon request, the module of project (at least 3 month). statistical-methodological p	Vey Statistics: Research Proj Workload CP 300 10 Courses Colloquium/Seminar Learning Objectives/Competences In this module, students can either partici pursue and answer a specific research quexperiences in planning and conducting statistic respective methods in R, and the wr Alternatively, in the EMOS context, the student internship in official statistics. Content The topic is chosen after consultation with a individual counselling, meetings in small gr Requirements Formal: / Prerequisites: Solid Knowledge of basic s Assessment Presentation of intermediate and final result Requirements for CPs Passing the assessment Contact person Prof. Dr. Ralf Münnich, N.N. Further information This module is mandatory. Upon request, the module can be substitut project (at least 3 month). In this case the statistical-methodological part.	Very Statistics: Research Project 300 CP Semester 300 10 3 Courses Contact time Colloquium/Seminar 2 h/week (30 h) Learning Objectives/Competences 10 a In this module, students can either participate in an existi pursue and answer a specific research question in an incexperiences in planning and conducting statistical research Competences Students practice the intensive engagement with a completion of respective methods in R, and the writing of a scientif Alternatively, in the EMOS context, the students are expect an internship in official statistics. Type of courses Individual counselling, meetings in small groups, seminar, compresentation of intermediate and final results; research report Requirements Formal: / Presentation of intermediate and final results; research report Requirements for CPs Passing the assessment Contact person Prof. Dr. Ralf Münnich, N.N. Further information This module is mandatory. Upon request, the module can be substituted by an interns project (at least 3 month). In this case the assessment is statistical-methodological part.	Vey Statistics: Research Project Workload CP Semester Scheduled 300 10 3 annually Courses Contact time Self-study Colloquium/Seminar 2 h/week (30 h) 270 h Learning Objectives/Competences an existing research project pursue and answer a specific research question in an individual project. The experiences in planning and conducting statistical research. Competences Students practice the intensive engagement with a complex statistical problem tion of respective methods in R, and the writing of a scientific thesis. Alternatively, in the EMOS context, the students are expected to conduct a re- an internship in official statistics. Content The topic is chosen after consultation with the individual advisor. Type of courses Individual counselling, meetings in small groups, seminar, colloquium Requirements Formal: / Presentation of intermediate and final results; research report Requirements For CPs Passing the assessment Contact person Prof. Dr. Ralf Munnich, N.N. Further information This module is mandatory. Upon request, the module can be substituted by an internship or by the assist project (at least 3 month). In this case the assessment is a report, which con statistical-methodological part.		

Modul Master's thesis

Master's thesis							
ID		Workload	СР	Semester	Scheduled	Duration	
1	Courses Research Master's	750 n Colloquium thesis	30	4 Contact time 1 h week/ (15 h) 1 h week/ (15 h)	Annualy Self-study 720 h	1 semester Course size 15 students 1 student	
2	Learning Objectives/Competences Writing of a scientific thesis. Presentation skills.						
3	Content The topic is chosen after consultation with the individual advisor.						
4	Lehrformen Individual counselling, colloquium						
5	Requirements Formal: Survey Statistics: Basis and Monte-Carlo-Methods plus 30CP Prerequisites: /						
6	Assessment Presentation of immediate results, thesis						
7	Requirements for CPs Passing the assessment						
8	Contact person Prof. Dr. Ralf Münnich, N.N.						
9	Further information This module is mandatory. Possibility of cooperating with a statistical institution (e.g. Eurostat, ESS).						