

Contents

Preface	15
Part I: First Steps	19
1 Getting Started	21
1.1 Using XploRe	21
1.1.1 Input and Output Windows	21
1.1.2 Simple Computations	22
1.1.3 First Data Analysis	23
1.1.4 Exploring Data	24
1.1.5 Printing Graphics	27
1.2 Quantlet Examples	29
1.2.1 Summary Statistics	30
1.2.2 Histograms	30
1.2.3 2D Density Estimation	31
1.2.4 Interactive Kernel Regression	33
1.3 Getting Help	34
1.4 Basic XploRe Syntax	36
1.4.1 Operators	36
1.4.2 Variables	38

1.4.3	Variable Names	38
1.4.4	Functions	39
1.4.5	Quantlet files	40
2	Descriptive Statistics	43
	<i>Marlene Müller</i>	
2.1	Data Matrices	43
2.1.1	Creating Data Matrices	44
2.1.2	Loading Data Files	46
2.1.3	Matrix Operations	47
2.2	Computing Statistical Characteristics	49
2.2.1	Minimum and Maximum	50
2.2.2	Mean, Variance and Other Moments	51
2.2.3	Median and Quantiles	52
2.2.4	Covariance and Correlation	55
2.2.5	Categorical Data	57
2.2.6	Missing Values and Infinite Values	59
2.3	Summarizing Statistical Information	63
2.3.1	Summarizing Metric Data	63
2.3.2	Summarizing Categorical Data	66
3	Graphics	69
	<i>Sigbert Klink</i>	
3.1	Basic Plotting	70
3.1.1	Plotting a Data Set	70
3.1.2	Plotting a Function	71
3.1.3	Plotting Several Functions	72

3.1.4	Coloring Data Sets	73
3.1.5	Plotting Lines from Data Sets	74
3.1.6	Several Plots	76
3.2	Univariate Graphics	79
3.2.1	Boxplots	80
3.2.2	Dotplots	82
3.2.3	Bar Charts	83
3.2.4	Quantile-Quantile Plots	85
3.2.5	Histograms	86
3.3	Multivariate Graphics	90
3.3.1	Three-Dimensional Plots	91
3.3.2	Surface Plots	92
3.3.3	Contour Plots	92
3.3.4	Sunflower Plots	94
3.3.5	Linear Regression	95
3.3.6	Bivariate Plots	97
3.3.7	Star Diagrams	99
3.3.8	Scatter-Plot Matrices	100
3.3.9	Andrews Curves	102
3.3.10	Parallel Coordinate Plots	103
3.4	Advanced Graphics	105
3.4.1	Moving and Rotating	105
3.4.2	Simple Predefined Graphic Primitives	106
3.4.3	Color Models	108
3.5	Graphic Commands	109
3.5.1	Controlling Data Points	110
3.5.2	Color of Data Points	111

3.5.3	Symbol of Data Points	113
3.5.4	Size of Data Points	115
3.5.5	Connection of Data Points	116
3.5.6	Label of Data Points	121
3.5.7	Title and Axes Labels	124
3.5.8	Axes Layout	125
4	Regression Methods	129
	<i>Jörg Aßmus</i>	
4.1	Simple Linear Regression	131
4.2	Multiple Linear Regression	137
4.3	Nonlinear Regression	143
5	Teachware Quantlets	147
	<i>Nathaniel Derby</i>	
5.1	Visualizing Data	149
5.2	Random Sampling	150
5.3	The p -Value in Hypothesis Testing	153
5.4	Approximating the Binomial by the Normal Distribution	155
5.5	The Central Limit Theorem	157
5.6	The Pearson Correlation Coefficient	159
5.7	Linear Regression	162
	Bibliography	165

Part II: Statistical Libraries 167**6 Smoothing Methods** 169*Marlene Müller*

6.1	Kernel Density Estimation	169
6.1.1	Computational Aspects	171
6.1.2	Computing Kernel Density Estimates	173
6.1.3	Kernel Choice	176
6.1.4	Bandwidth Selection	177
6.1.5	Confidence Intervals and Bands	181
6.2	Kernel Regression	185
6.2.1	Computational Aspects	185
6.2.2	Computing Kernel Regression Estimates	186
6.2.3	Bandwidth Selection	188
6.2.4	Confidence Intervals and Bands	192
6.2.5	Local Polynomial Regression and Derivative Estimation	194
6.3	Multivariate Density and Regression Functions	197
6.3.1	Computational Aspects	197
6.3.2	Multivariate Density Estimation	197
6.3.3	Multivariate Regression	201
	Bibliography	203

7 Generalized Linear Models 205*Marlene Müller*

7.1	Estimating GLMs	206
7.1.1	Models	206
7.1.2	Maximum-Likelihood Estimation	208

7.2	Computing GLM Estimates	208
7.2.1	Data Preparation	208
7.2.2	Interactive Estimation	209
7.2.3	Noninteractive Estimation	213
7.3	Weights & Constraints	215
7.3.1	Prior Weights	216
7.3.2	Replications in Data	217
7.3.3	Constrained Estimation	217
7.4	Options	218
7.4.1	Setting Options	219
7.4.2	Weights and Offsets	219
7.4.3	Control Parameters	219
7.4.4	Output Modification	221
7.5	Statistical Evaluation and Presentation	221
7.5.1	Statistical Characteristics	221
7.5.2	Output Display	223
7.5.3	Significance of Parameters	223
7.5.4	Likelihood Ratio Tests for Comparing Nested Models	225
7.5.5	Subset Selection	226
	Bibliography	228
8	Neural Networks	229
	<i>Wolfgang Härdle and Heiko Lehmann</i>	
8.1	Feed-Forward Networks	231
8.2	Computing a Neural Network	232
8.2.1	Controlling the Parameters of the Neural Network	234
8.2.2	The Resulting Neural Network	235

8.3	Running a Neural Network	236
8.3.1	Implementing a Simple Discriminant Analysis	237
8.3.2	Implementing a More Complex Discriminant Analysis	241
	Bibliography	246
9	Time Series	247
	<i>Petr Franěk and Wolfgang Härdle</i>	
9.1	Time Domain and Frequency Domain Analysis	247
9.1.1	Autocovariance and Autocorrelation Function	248
9.1.2	The Periodogram and the Spectrum of a Series	251
9.2	Linear Models	253
9.2.1	Autoregressive Models	253
9.2.2	Autoregressive Moving Average Models	254
9.2.3	Estimating ARMA Processes	256
9.3	Nonlinear Models	259
9.3.1	Several Examples of Nonlinear Models	259
9.3.2	Nonlinearity in the Conditional Second Moments	264
9.3.3	Estimating ARCH Models	266
9.3.4	Testing for ARCH	267
	Bibliography	270
10	Kalman Filtering	273
	<i>Petr Franěk</i>	
10.1	State–Space Models	273
10.1.1	Examples of State–Space Models	275
10.1.2	Modeling State–Space Models in XploRe	276
10.2	Kalman Filtering and Smoothing	277

10.3 Parameter Estimation in State–Space Models	280
Bibliography	283
11 Finance	285
<i>Stefan Sperlich and Wolfgang Härdle</i>	
11.1 Outline of the Theory	286
11.1.1 Some History	286
11.1.2 The Black–Scholes Formula	287
11.2 Assets	289
11.2.1 Stock Simulation	290
11.2.2 Stock Estimation	292
11.2.3 Stock Estimation and Simulation	292
11.3 Options	294
11.3.1 Calculation of Option Prices and Implied Volatilities . .	294
11.3.2 Option Price Determining Factors	298
11.3.3 Greeks	301
11.4 Portfolios and Hedging	304
11.4.1 Calculation of Arbitrage	304
11.4.2 Bull-Call Spreads	305
12 Microeconometrics and Panel Data	307
<i>Jörg Breitung and Axel Werwatz</i>	
12.1 Limited-Dependent and Qualitative Dependent Variables . . .	308
12.1.1 Probit, Logit and Tobit	308
12.1.2 Single Index Models	310
12.1.3 Average Derivatives	311
12.1.4 Average Derivative Estimation	312

12.1.5	Weighted Average Derivative Estimation	314
12.1.6	Average Derivatives and Discrete Variables	315
12.1.7	Parametric versus Semiparametric Single Index Models	318
12.2	Multiple Index Models	320
12.2.1	Sliced Inverse Regression	321
12.2.2	Testing Parametric Multiple Index Models	322
12.3	Self-Selection Models	324
12.3.1	Parametric Model	325
12.3.2	Semiparametric Model	327
12.4	Panel Data Analysis	330
12.4.1	The Data Set	333
12.4.2	Time Effects	335
12.4.3	Model Specification	336
12.4.4	Estimation	338
12.4.5	An Example	339
12.5	Dynamic Panel Data Models	343
12.6	Unit Root Tests for Panel Data	347
	Bibliography	349

13 Extreme Value Analysis

353

Rolf-Dieter Reiss and Michael Thomas

13.1	Extreme Value Models	354
13.2	Generalized Pareto Distributions	356
13.3	Assessing the Adequacy: Mean Excess Functions	358
13.4	Estimation in EV Models	359
13.4.1	Linear Combination of Ratios of Spacings (LRS)	359
13.4.2	ML Estimator in the EV Model	360

13.4.3 ML Estimator in the Gumbel Model	360
13.5 Fitting GP Distributions to the Upper Tail	361
13.6 Parametric Estimators for GP Models	362
13.6.1 Moment Estimator	363
13.6.2 ML Estimator in the GP Model	364
13.6.3 Pickands Estimator	364
13.6.4 Drees–Pickands Estimator	365
13.6.5 Hill Estimator	366
13.6.6 ML Estimator for Exponential Distributions	366
13.6.7 Selecting a Threshold by Means of a Diagram	367
13.7 Graphical User Interface	368
13.8 Example	369
Bibliography	373
14 Wavelets	375
<i>Yuri Golubev, Wolfgang Härdle, Zdeněk Hlávka, Sigbert Klinke, Michael H. Neumann and Stefan Sperlich</i>	
14.1 Quantlib twave	377
14.1.1 Change Basis	378
14.1.2 Change Function	379
14.1.3 Change View	380
14.2 Discrete Wavelet Transform	381
14.3 Function Approximation	383
14.4 Data Compression	385
14.5 Two Sines	388
14.6 Frequency Shift	389
14.7 Thresholding	392

14.7.1	Hard Thresholding	393
14.7.2	Soft Thresholding	395
14.7.3	Adaptive Thresholding	397
14.8	Translation Invariance	402
14.9	Image Denoising	404
	Bibliography	407
Part III: Programming		409
15 Reading and Writing Data		411
<i>Sigbert Klinke, Jürgen Symanzik and Marlene Müller</i>		
15.1	Reading and Writing Data Files	411
15.2	Input Format Strings	414
15.3	Output Format Strings	417
15.4	Customizing the Output Window	419
15.4.1	Headline Style	421
15.4.2	Layer Style	422
15.4.3	Line Number Style	424
15.4.4	Value Formats and Lengths	425
15.4.5	Saving Output to a File	426
16 Matrix Handling		429
<i>Yasemin Boztug and Marlene Müller</i>		
16.1	Basic Operations	429
16.1.1	Creating Matrices and Arrays	430
16.1.2	Operators for Numeric Matrices	435
16.2	Comparison Operators	440
16.3	Matrix Manipulation	442

16.3.1	Extraction of Elements	442
16.3.2	Matrix Transformation	445
16.4	Sums and Products	448
16.5	Distance Function	450
16.6	Decompositions	451
16.6.1	Spectral Decomposition	451
16.6.2	Singular Value Decomposition	454
16.6.3	LU Decomposition	455
16.6.4	Cholesky Decomposition	456
16.7	Lists	457
16.7.1	Creating Lists	457
16.7.2	Handling Lists	459
16.7.3	Getting Information on Lists	462
17	Quantlets and Quantlibs	465
	<i>Wolfgang Härdle, Zdeněk Hlávka and Sigbert Klink</i>	
17.1	Quantlets	465
17.2	Flow Control	476
17.2.1	Local and Global Variables	476
17.2.2	Conditioning	478
17.2.3	Branching	480
17.2.4	While-Loop	481
17.2.5	Do-Loop	482
17.2.6	Optional Input and Output in Procedures	483
17.2.7	Errors and Warnings	486
17.3	User Interaction	488
17.4	APSS	495

17.5 Quantlibs	499
--------------------------	-----

Appendix 503

A Customizing XploRe 505

A.1 XploRe.ini	505
A.1.1 The ini File	505
A.1.2 Composing Paths	507
A.2 startup.xpl	508

B Data Sets 509

B.1 Netincome–Food Expenditures	509
B.2 U.S. Companies	509
B.3 CPS 1985	510
B.4 Boston Housing	510
B.5 Lizard Data	511
B.6 Kyphosis Data	512
B.7 Swiss Bank Notes	513
B.8 Earnings Data	513
B.9 Westwood Data	514
B.10 Pullover Data	514
B.11 Geyser Data	514
Bibliography	515

Index 516

XploRe — Learning Guide

Learning Guide

Härdle, W.; Klinke, S.; Müller, M.

2000, IV, 526 p. 86 illus., Softcover

ISBN: 978-3-540-66207-5