

Contents

<i>Preface</i>	ix
1 Statistical modelling: An overview	1
1.1 Introduction	1
1.2 Why model?	1
1.3 The general linear statistical model	3
1.4 Model development	6
1.5 Model selection by computer	8
1.6 Statistical software	9
2 Research designs and data	11
2.1 Units of analysis	11
2.2 Research designs	12
2.3 Sampling, surveys and weighting	12
2.4 Variables and their measurement	14
2.5 Missing data	17
2.6 Data structures	20
3 Statistical preliminaries	21
3.1 Odds and odds ratios	21
3.2 Logarithms	24
3.3 z , t and chi-squared (χ^2)	25
3.4 Tests of significance	30
3.5 Categorical explanatory variables; dummy variables; reference or base category	31
3.6 Multicollinearity	34
3.7 Interaction terms	35
3.8 Incorporating nonlinear relationships	37
3.9 Residuals	37
3.10 Unobserved variables and unobserved heterogeneity	39

4	Multiple regression for continuous response variables	41
4.1	Introduction	41
4.2	Example: Determinants of pay	41
4.3	Fitting a multiple regression model in SPSS	43
4.4	How good is the regression model?	45
4.5	Expanding the model	48
4.6	Adding interaction terms	52
4.7	Automated model selection procedures	54
4.8	Diagnostics: Analysis of residuals	55
4.9	Fitting the regression model in Stata	60
4.10	Tobit model	61
5	Logistic regression for binary response variables	63
5.1	Introduction	63
5.2	Example: Victim of car crime	64
5.3	Undertaking logistic regression in SPSS	65
5.4	Expanding the model	69
5.5	Automated model selection procedures	73
5.6	Diagnostics: Analysis of residuals	74
5.7	Fitting the logistic regression model in Stata	75
5.8	Probit model	75
6	Multinomial logistic regression for multinomial response variables	77
6.1	Background	77
6.2	Fitting the multinomial in SPSS to data on sentences awarded by the court	78
6.3	Diagnostics: Analysis of residuals	82
6.4	Expanding the model	84
6.5	Relationship between SPSS logistic and SPSS multinomial	87
6.6	Fitting the multinomial in Stata to voting data, incorporating complex design factors	87
7	Loglinear models	93
7.1	Introduction	93
7.2	Three-factor model	94
7.3	Expanding the model	95
7.4	Loglinear models specifying a response variable	96
8	Ordinal logistic regression for ordered categorical response variables	98
8.1	Introduction	98
8.2	Example: Ability to influence local political decisions	98

8.3	Fitting the ordinal logistic regression model in SPSS	101
8.4	Fitting the ordinal logistic regression model in Stata	104
9	Multilevel modelling	107
9.1	Introduction	107
9.2	Methods of analysis and their deficiencies	108
9.3	Multilevel models	111
9.4	Statistical software	116
9.5	Fitting models in MLwiN to employment data	117
10	Latent variables and factor analysis	125
10.1	Introduction	125
10.2	How are latent variables constructed?	126
10.3	Factor analysis	127
10.4	Example: Fear of crime	130
10.5	Interpreting factors and rotation	136
10.6	Exploratory and confirmatory factor analysis	139
10.7	Other latent variable models	139
11	Causal modelling: simultaneous equation models	141
11.1	Introduction	141
11.2	Recursive models: Path analysis, determinants of pay	141
11.3	Non-recursive models: Deterrent effect of solving crime	147
11.4	Structural equation modelling (SEM)	154
12	Longitudinal data analysis	156
12.1	Introduction	156
12.2	Time series analysis	158
12.3	Repeated cross-sectional surveys	159
12.4	Panel and cohort studies	160
12.5	Statistical models for panel data	161
12.6	Fitting panel data models in Stata	165
12.7	Example from the British Household Panel Study, time spent on housework	166
12.8	Relationship between panel models and multilevel models	171
13	Event history models	173
13.1	Time to an event: Survival models	173
13.2	Cox's proportional hazards model	177
13.3	Comparing survival times between two or more groups	179
13.4	Fitting Cox's proportional hazards regression model to Training for work data	182

13.5	Discrete time models	184
13.6	Data structures	184
13.7	Time to a single event	189
13.8	Competing risk models	190
13.9	Repeated events or multiple spells	191
13.10	Multiple states	192
13.11	Guidance on restructuring data to fit survival and discrete time models	193
 <i>References</i>		197
<i>Appendix 1 The generalised linear model</i>		201
<i>Appendix 2 Handling tabular data</i>		203
<i>Index</i>		207