

---

# Contents

---

Contributors	ix
Preface	xi
Sir David Cox, FRS	xiii
Publications of Sir David Cox, FRS	xv
<b>1 Statistical theory</b>	<b>1</b>
<i>D.V. Hinkley and N. Reid</i>	
1.1 Introduction	1
1.2 Theoretical concepts	4
1.3 Significance tests	10
1.4 Theory of optimal tests	15
1.5 Estimation	20
1.6 Asymptotic theory	26
Suggestions for further reading	28
<b>2 Applied statistics</b>	<b>30</b>
<i>E.J. Snell and D.V. Hinkley</i>	
2.1 Introduction	30
2.2 Preliminary considerations	31
2.3 Statistical models	38
2.4 Statistical inference	43
2.5 Model adequacy	46
2.6 Exploratory and robust methods	46
2.7 Multivariate methods	49
2.8 Use of computers	51
Suggestions for further reading	53
<b>3 Generalized linear models</b>	<b>55</b>
<i>D. Firth</i>	
3.1 Introduction	55
3.2 A class of nonlinear regression models	56

3.3	Likelihood functions	60
3.4	Estimation	62
3.5	Analysis of deviance	66
3.6	Checking the model	74
3.7	Further topics	77
	Suggestions for further reading	82
<b>4</b>	<b>Residuals and diagnostics</b>	<b>83</b>
	<i>A.C. Davison and E.J. Snell</i>	
4.1	General remarks	83
4.2	Normal theory linear model	85
4.3	A general definition	88
4.4	General regression models	92
4.5	Further comments	101
	Suggestions for further reading	105
<b>5</b>	<b>Life-table analysis</b>	<b>107</b>
	<i>D. Oakes</i>	
5.1	Introduction	107
5.2	Survival distributions	109
5.3	Inference for a single sample	112
5.4	Dependence on explanatory variables	115
5.5	Inference for models involving explanatory variables	118
5.6	Graphical methods: goodness of fit	121
5.7	Several types of failure: competing risks	124
5.8	Multivariate failure distributions	125
5.9	Other topics	126
	Suggestions for further reading	128
<b>6</b>	<b>Sequential methods</b>	<b>129</b>
	<i>P. Armitage</i>	
6.1	Introduction	129
6.2	Wald's theory of the SPRT	131
6.3	Sequential tests with nuisance parameters	137
6.4	Sequential estimation	141
6.5	Sequential clinical trials	142
6.6	Decision theory and optimality in clinical trials	145
6.7	Inference and decisions	147
6.8	Sequential design and related topics	149
	Suggestions for further reading	151

<b>7</b>	<b>Time series methods</b>	<b>152</b>
	<i>P. Bloomfield</i>	
7.1	Introduction	152
7.2	Stationary models	152
7.3	Frequency domain	156
7.4	Parametric models	159
7.5	Nonparametric estimation	164
7.6	Regression with correlated errors	168
7.7	Other topics	170
	Suggestions for further reading	176
<b>8</b>	<b>Modelling stochastic phenomena</b>	<b>177</b>
	<i>V. Isham</i>	
8.1	Introduction	177
8.2	Independence and the Markov property	178
8.3	Semi-Markov and Markov renewal processes	180
8.4	Point processes	182
8.5	Spatial processes	186
8.6	Applications	188
	Suggestions for further reading	203
<b>9</b>	<b>Optimum design of experiments</b>	<b>204</b>
	<i>A.C. Atkinson</i>	
9.1	Introduction	204
9.2	Convex design theory	207
9.3	Numerical methods	211
9.4	Some specific designs for standard problems	214
9.5	Non-standard problems	221
9.6	Further topics	226
	Suggestions for further reading	230
<b>10</b>	<b>Likelihood theory</b>	<b>232</b>
	<i>O.E. Barndorff-Nielsen</i>	
10.1	Introduction	232
10.2	The primary theory	232
10.3	Some refinements	246
10.4	Pseudo-likelihoods	254
10.5	Further topics	256
	Suggestions for further reading	262

<b>11</b>	<b>Quasi-likelihood and estimating functions</b>	<b>265</b>
	<i>P. McCullagh</i>	
11.1	Introduction	265
11.2	Least squares	266
11.3	Quasi-likelihood estimation	269
11.4	Quasi-likelihood function	271
11.5	Estimating functions	273
11.6	Confidence sets	278
11.7	An open problem	284
	Suggestions for further reading	285
<b>12</b>	<b>Approximations and asymptotics</b>	<b>287</b>
	<i>N. Reid</i>	
12.1	Introduction	287
12.2	Basic theory and notation	288
12.3	Edgeworth expansion	291
12.4	Saddlepoint expansion	294
12.5	Laplace approximations	300
12.6	Stochastic asymptotic expansions	302
	Suggestions for further reading	304
	<b>References</b>	<b>306</b>
	<b>Author index</b>	<b>335</b>
	<b>Subject index</b>	<b>340</b>