Contents

1	Introduction		
	1.1 Failure Time Data	1 5	
	1.2 Failure Time Distributions	5	
	1.3 Estimation of the Survivor Function	10	
	1.4 Comparison of Survival Curves	16	
	Bibliographic Notes	19	
2	Failure Time Models		
	2.1 Introduction	21	
	2.2 Some (Continuous) Failure Time Models	21	
	2.3 Regression Models	30	
	2.4 Discrete Failure Time Models	35	
	Bibliographic Notes	38	
3	Inference in Parametric Models and Related Topics		
	3.1 Introduction	39	
	3.2 Censoring Mechanisms	39	
	3.3 Sampling from a Censored Exponential Distribution	41	
	3.4 Large Sample Likelihood Theory	43	
	3.5 Exponential Regression	50	
	3.6 Estimation in Log-Linear Regression Models	54	
	3.7 The Newton-Raphson Technique	55	
	3.8 Illustrations in More Complex Data Sets	58	
	3.9 Discrimination Among Parametric Models	63	
	3.10 Discussion	67	
	Bibliographic Notes	68	
4	The Proportional Hazards Model		
	4.1 Introduction	70	
	4.2 Methods of Estimation	71	
		, 1	

X CONTENTS

	4.3 Estimation of the Survivor Function	84			
	4.4 The Inclusion of Strata	87			
	4.5 Illustrations	89			
	4.6 Sampling from the Discrete Model	98			
	4.7 Efficiency of the Regression Estimator	103			
	4.8 Asymptotic Distribution Theory	113			
	Bibliographic Notes	117			
5	Likelihood Construction and Further				
	Results on the Proportional Hazards				
	Model	119			
	5.1 Introduction	119			
	5.2 Independent Censoring and Likelihood Construction5.3 Time Dependent Covariates and Further Remarks on	119			
	Likelihood Construction	122			
	5.4 Partial Likelihood	127			
	5.5 Application to the Proportional Hazards Model	132			
	5.6 Efficiency of the Regression Estimator	140			
	Bibliographic Notes	142			
6	Inference Based on Ranks in the				
	Accelerated Failure Time Model	143			
	6.1 Introduction	143			
	6.2 Some Examples: Linear Rank Tests and Their Cen-				
	sored Data Counterparts 6.3 Rank Regression with Uncensored Data	144			
	Brossion with Chechbored Data	149			
	6.4 Rank Regression with Censored Data6.5 Properties and Discussion	152			
	6.6 Illustration	158 159			
	Bibliographic Notes	161			
	Diolographic Notes	101			
7	Multivariate Failure Time Data and				
	Competing Risks	163			
	7.1 Some Generalizations	163			
	7.2 Competing Risks	163			
	7.3 Multivariate Failure Time Data with Competing Risks	179			
	Bibliographic Notes	187			

		CONTENTS	xi	
8	Miscellan	neous Topics	189	
		s of Paired Failure Times	189	
		tudy Period Survival and Biological Assay	195	
		pective Studies	198	
	8.4 A Bay	esian Analysis of the Proportional Hazards		
	Model		201	
	8.5 Some P	ractical Problems Arising in the Analysis of a		
		ar Data Set	210	
	Bibliographic	e Notes	221	
Ap	pendix 1	Some Sets of Data	223	
Ap	pendix 2	Exercises and Further Results	239	
Ap	pendix 3	Fortran Programs for the Proportional Hazards Model	260	
Bib	Bibliography			
Author Index				
Subject Index				