Contents

Pre Ack Con	v ix xviii	
1.	OVERVIEW Ralph B. D'Agostino and Michael A. Stephens	1
	1.1 Goodness-of-Fit Techniques	1
	1.2 Objectives of the Book 1.3 The Topics of the Book	3
2.	1. 3 The Topics of the Book GRAPHICAL ANALYSIS Ralph B. D'Agostino	7
		-
	2.1 Introduction2.2 Empirical Cumulative Distribution Function	7 8
	2.3 General Concepts of Probability Plotting	24
	2.4 Normal Probability Plotting	35
	2.5 Lognormal Probability Plotting	47
	2.6 Weibull Probability Plotting	54
	2.7 Other Topics	57
	2.8 Concluding Comment	59
	References	59

3.		S OF CHI-SQUARED TYPE S. Moore	63
	0 1	Tutmo du ation	63
		Introduction Classical Chi-Squared Statistics	64
	3.3	General Chi-Squared Statistics	75
	3.4	Recommendations on Use of Chi-Squared Tests	91
	5.4	References	93
4.		S BASED ON EDF STATISTICS	97
	Mich	ael A. Stephens	97
	4.1	Introduction	97
	4.2	Empirical Distribution Function Statistics	102
	4.3	Goodness-of-Fit Tests Based on the EDF (EDF Tests)	102
	4.4	EDF Tests for a Fully Specified Distribution (Case 0)	104
	4.5	Comments on EDF Tests for Case 0 Power of EDF Statistics for Case 0	110
	4.6	EDF Tests for Censored Data: Case 0	111
	4.7	EDF Tests for Censored Data: Case of EDF Tests for the Normal Distribution with	
	4.8	Unknown Parameters	122
	4.9	EDF Tests for the Exponential Distribution	133
		EDF Tests for the Extreme-Value Distribution	145
		EDF Tests for the Weibull Distribution	149
		EDF Tests for the Gamma Distribution	151
		EDF Tests for the Logistic Distribution	156
	4.14	EDF Tests for the Cauchy Distribution	160
	4.15	EDF Tests for the von Mises Distribution	164
		EDF Tests for Continuous Distributions:	
		Miscellaneous Topics	166
	4.17	EDF Tests for Discrete Distributions	171
	4.18	Combinations of Tests	176
	4.19	EDF Statistics as Indicators of Parent Populations	180
	4.20	Tests Based on Normalized Spacings	180
		References	185
5		TS BASED ON REGRESSION AND CORRELATION nacl A. Stephens	195
	5.1	Introduction	195
	5.2	Regression Tests: Models	196
	5.3	Measure of Fit	197
	5.4	Tests Based on the Correlation Coefficient	198
	5.5	The Correlation Tests for the Uniform Distribution	
		with Unknown Limits	199

CONTENTS	xiii

	5.6	The Correlation Test for U(0, 1)	201
	5.7	Regression Tests for the Normal Distribution 1	201
	5.8	Regression Tests Based on Residuals	205
	5.9	Tests Based on the Ratio of Two Estimates of Scale	206
	5.10	Regression Tests for the Normal Distribution 2	207
		Regression Tests for the Exponential Distribution	215
	5.12	Tests Based on the Ratio of Two Estimates of Scale:	
		Further Comments	223
	5.13	Regression Tests for Other Distributions:	
		General Comments	224
		Correlation Tests for the Extreme-Value Distribution	225
	5.15	Correlation Tests for Other Distributions	225
		References	230
6.		E TRANSFORMATION METHODS IN GOODNESS-OF-FIT	235
	Char.	les P. Quesenberry	
	6.1	Introduction	235
	6.2	Probability Integral Transformations	239
	6.3	- · · · · ·	244
		Testing Simple Uniformity	$\frac{246}{252}$
	6.5	Transformations for Particular Families	
	6.6	Numerical Examples	$\frac{260}{275}$
		References	210
7	MOM	ENT $(\sqrt{b_1}, b_2)$ TECHNIQUES	279
٠.		Bowman and L. R. Shenton	210
	к. О	. Bowilian and L. R. Shenon	
	7.1	Introduction	279
	7.2	Normal Distribution	280
	7.3	Nonnormal Sampling	287
	7.4	Moments of Sample Moments	288
	7.5		292
	7.6	- <i>u</i>	295
		A Bivariate Model	306
	7.8	Experimental Samples	316
		References	318
0	mpor	OG DOD WHE HATEODM DICTRIPION	331
ŏ∙	TESTS FOR THE UNIFORM DISTRIBUTION Michael A. Stephens		
		Introduction	331
	8.1 8.2	Introduction Notation	332
	0 • 4	TACHERITOTI	002

8.3 Transformations to Uniforms

332

xiv . CONTENTS

	8.4	Transformation from Uniforms to Uniforms	333
	8.5	Superuniform Observations	334
	8.6	Tests Based on the Empirical Distribution	
	0.0	Function (EDF)	334
	8.7	Regression and Correlation Tests	336
	8.8	Other Tests Based on Order Statistics	336
	8.9	Statistics Based on Spacings	338
	8.10	a a 1 1 11 Alexan	345
		The Neyman-Barton Smooth Tests	351
	8 12	Components of Test Statistics	355
	8.13	The Effect on Test Statistics of Certain Patterns	
	0.10	of U-Values	356
	8.14	Power of Test Statistics	357
	8.15	Statistics for Combining Independent Tests	
	0.10	for Several Samples	357
	8, 16	Tests for a Uniform Distribution with Unknown Limits	360
	8.17	Tests for Censored Uniform Samples	361
	0.1.	References	361
9.	TEST	S FOR THE NORMAL DISTRIBUTION	367
	Ralph	B. D'Agostino	
	9.1	Introduction	367
	9.1	Complete Random Samples	368
	9.3	Classification of Existing Tests	370
	9.4	Comparisons of Tests	403
	9.5	Recommendations	405
	9.6	Tests of Normality on Residuals	406
	9.7	Multivariate Normality	409
	J. 1	References	413
		Helotolicos	
10.	TEST	S FOR THE EXPONENTIAL DISTRIBUTION	421
		nel A. Stephens	
	10.1	Introduction and Contents	421
	10.2	Notation	424
	10.3	Tests for Exponentiality: The Four Cases	425
	10.4		426
	10.5	Transformations from Exponentials to Exponentials	
	_5.9	or to Uniforms	429
	10.6	Test Situations and Choice of Procedures	432
	10.7	Tests with Origin Known: Groups 1, 2, and 3	435
	10.8	Group 1 Tests	435
	10.9	Group 2 Tests, Applied to U = JX	438

CONTENTS XV

	10.10	The Effect of Zero Values, and of Ties	444
	10.11	· ·	445
	10.12		451
	10.13	Evaluation of Tests for Exponentiality	451
	10.14	Tests with Origin and Scale Unknown	455
	10.15		456
		References	457
11.		YSIS OF DATA FROM CENSORED SAMPLES . Michael and William R. Schucany	461
	11.1	Introduction	461
	11.2	Probability Plots	463
	11.3		480
	11.4	Testing a Composite Hypothesis	487
		References	493
12.		NALYSIS AND DETECTION OF OUTLIERS . Tietjen	497
	12.1	Introduction	497
	12.2	A Single Outlier in a Univariate Sample	500
	12.3	Multiple Outliers in a Univariate Sample	504
	12.4	The Identification of a Single Outlier in Linear Models	507
	12.5	Multiple Outliers in the Linear Model	516
	12.6	Accommodation of Outliers	517
	12.7	Multivariate Outliers	520
	12.8	Outliers in Time Series	520 521
		References	521
	APPE	NDIX	523
	1.	Table 1, Cumulative Distribution Function of the	524
	0	Standard Normal Distribution Table 2, Critical Values of the Chi-Square Distribution	526
	2.		527
	3.	Simulated Data Sets Real Data Sets	546
	4.	Real Data Scis	- 10

INDEX

551