
Contents

Part I Statistical Science

The Non-mathematical Side of Statistics	3
João A. Branco	
1 Statistics and Mathematics	3
2 Statistics Is Not Mathematics	6
3 The Non-mathematical Side of Statistics	8
3.1 The Problem	9
3.2 Data in Context	9
3.3 Fisher's Chi-Square Analysis	10
3.4 A Cute Little Theorem	12
4 Final Remarks	13
References	14
Outliers: The Strength of Minors	17
Fernando Rosado	
1 Statistics as a Science	18
2 Statistical Science: Inference and Decision	20
3 The Need of <i>Outliers</i>	21
4 Fortune/Chance Decide!/?	22
5 <i>Outliers</i> : A Path in Research	23
6 In Perspective	24
References	27
Resampling Methodologies in the Field of Statistics of Univariate Extremes	29
M. Ivette Gomes	
1 Extreme Value Theory: A Brief Introduction	29
2 EVI-Estimators Under Consideration	31
3 Resampling Methodologies	33
3.1 The Generalised Jackknife Methodology and Bias Reduction	34
3.2 The Bootstrap Methodology for the Estimation of Sample Fractions	36
4 Concluding Remarks	38
References	39

Robust Functional Principal Component Analysis	41
Juan Lucas Bali and Graciela Boente	
1 Introduction	41
2 Preliminaries and Notation	43
3 The Problem	43
4 Robust Proposals for FPCA	46
5 Lip Data Example	49
6 Final Comments	52
References	53
Testing the Maximum by the Mean in Quantitative Group Tests	55
João Paulo Martins, Rui Santos, and Ricardo Sousa	
1 Introduction	56
2 Dorfman's Procedures and Its Extensions	56
3 The Pooled Sample Tests	58
3.1 T_1 Methodology: Using the Distribution of the Sample Mean	59
3.2 T_2 Methodology: Using a Simulation Method	60
3.3 Simulations Results	60
4 Conclusion	61
References	62
Testing Serial Correlation Using the Gauss–Newton Regression	65
Efigénio Rebelo, Patrícia Oom do Valle, and Rui Nunes	
1 Introduction	65
2 The Gauss–Newton Regression	67
3 Testing for Evidence of Serial Correlation	67
4 Testing for Common Factor Restrictions	69
4.1 χ^2 Test	69
4.2 T Test	70
5 Conclusions	72
References	72
Part II Probability and Stochastic Processes	
Cantor Sets with Random Repair	75
M. Fátima Brilhante, Dinis Pestana, and M. Luísa Rocha	
1 Introduction	75
2 Stuttering Cantor-Like Random Sets Construction Procedure	76
3 Random Repair Benefits for Cantor-Like Sets	79
References	83
Nearest Neighbor Connectivity in Two-Dimensional Multihop MANETs	85
Gonçalo Jacinto, Nelson Antunes, and António Pacheco	
1 Introduction	85
2 Model Description	87

3	Hop Count Distribution	88
4	Numerical Results	92
5	Conclusion	93
	References	93

Modeling Human Population Death Rates: A Bi-Dimensional Stochastic Gompertz Model with Correlated Wiener Processes		95
Sandra Lagarto and Carlos A. Braumann		

1	Introduction	95
2	The Stochastic Mortality Model	96
2.1	The Bi-Dimensional Stochastic Gompertz Model with Correlated Wiener Processes	97
3	Application to Human Portuguese Population Death Rates	99
4	Testing for Correlations Between Sexes	101
5	Conclusions/Future Work	101
	References	102

Consequences of an Incorrect Model Specification on Population Growth		105
Clara Carlos and Carlos A. Braumann		

1	Introduction	105
2	Model	106
3	Extinction Times	108
4	Conclusions	113
	References	113

Individual Growth in a Random Environment: An Optimization Problem		115
---	--	------------

Patrícia A. Filipe, Carlos A. Braumann, Clara Carlos, and Carlos J. Roquete

1	Introduction	115
2	SDE Model for Individual Growth	116
3	Optimization	117
3.1	Profit Optimization by Age	117
3.2	Profit Optimization by Weight	120
4	Final Remarks	122
	References	123

Valuation of Bond Options Under the CIR Model: Some Computational Remarks		125
--	--	------------

Manuela Larguinho, José Carlos Dias, and Carlos A. Braumann

1	Introduction	126
2	Noncentral χ^2 Distribution and Alternative Methods	126
2.1	The Gamma Series Method	127
2.2	The Schroder Method	127
2.3	The Ding Method	128
2.4	The Benton and Krishnamoorthy Method	128

3	Bond Options Under the CIR Model	129
3.1	Zero-Coupon and Coupon Bonds	129
3.2	Bond Options	130
4	Numerical Analysis	131
4.1	Benchmark Selection	131
4.2	Bond Options with Alternative Methods.....	132
5	Conclusion.....	133
	References	133

Part III Extremes

A Semi-parametric Estimator of a Shape Second-Order Parameter.....	137
Frederico Caeiro and M. Ivette Gomes	

1	Introduction	137
2	Estimation of the Second-Order Parameter ρ	138
2.1	A Review of Some Estimators in the Literature	138
2.2	A New Estimator for the Second-Order Parameter ρ	139
3	Main Asymptotic Results	140
4	Applications to Simulated and Real Data	142
4.1	A Case Study in the Field of Insurance	142
4.2	Simulated Data	143
	References	144

Peaks Over Random Threshold Asymptotically Best Linear Estimation of the Extreme Value Index.....	145
Lígia Henriques-Rodrigues and M. Ivette Gomes	

1	Introduction and Scope of the Paper	145
2	PORT EVI-Estimation	146
2.1	Second-Order Framework for Heavy-Tailed Models Under a Non-Null Shift	147
3	Asymptotically Best Linear Unbiased Estimation of the EVI.....	148
4	Adaptive PORT-ABL-Hill Estimation.....	149
5	An Application to Financial Data	150
5.1	Some Final Remarks	151
	References	152

Extremal Quantiles, Value-at-Risk, Quasi-PORT and DPOT.....	155
P. Araújo Santos and M.I. Fraga Alves	

1	Introduction	155
2	VaR Models.....	156
2.1	Quasi-PORT	156
2.2	DPOT	157
2.3	Other Models	157
3	Out-of-Sample Study with the DJIA Index	158
	References	160

The MOP EVI-Estimator Revisited	163
M. Fátima Brilhante, M. Ivette Gomes, and Dinis Pestana	
1 Introduction and Preliminaries	163
2 The Class of MOP EVI-Estimators	165
3 Finite Sample Properties of the MOP Class of EVI-Estimators	167
4 A Brief Note on the Asymptotic Comparison of MOP EVI-Estimators at Optimal Levels	168
5 Simple Adaptive Selections of the Tuning Parameters	171
References	174
Tail Dependence of a Pareto Process	177
Marta Ferreira	
1 Introduction	177
2 Measures of Tail Dependence	179
3 Tail Dependence of YARP(III)(1)	181
References	184
Application of the Theory of Extremes to the Study of Precipitation in Madeira Island: Statistical Choice of Extreme Domains of Attraction	187
Délia Gouveia, Luiz Guerreiro Lopes, and Sandra Mendonça	
1 Introduction	187
2 Methods and Data	188
3 Results and Discussion	190
4 Final Remarks	193
References	194
The Traveling Salesman Problem and the Gnedenko Theorem	197
Tiago Salvador and Manuel Cabral Morais	
1 Traveling Salesman Problem: Definition and a Few Milestones	197
2 Complexity, Approximate Algorithms, and Statistical Approach	198
3 Statistical Analysis of the Results of the λ -Optimal and λ -Optimal Greedy Algorithms; Concluding Remarks	201
References	205
Part IV Statistical Applications	
Brugada Syndrome Diagnosis: Three Approaches to Combining Diagnostic Markers	209
Carla Henriques, Ana Cristina Matos, and Luís Ferreira dos Santos	
1 Introduction	210
2 ECG Markers to Identify Mutation Carriers	211
3 Combining the Markers: Multivariate Analysis	212
3.1 Discriminant Analysis	213
3.2 Distribution-Free Approach	214
3.3 Logistic Regression	215

4	Conclusions	217
	References	217
	Hierarchical Normal Mixture Model to Analyse HIV/AIDS LOS	219
	Sara Simões Dias, Valeska Andreozzi, and Maria Oliveira Martins	
1	Introduction	219
2	Hierarchical Finite Mixture Model	220
3	Application to HIV/AIDS LOS	221
3.1	Data	221
3.2	Results	222
4	Discussion	225
5	Conclusion	226
	References	226
	Volatility and Returns of the Main Stock Indices	229
	Thelma Sáfadi and Airlane P. Alencar	
1	Introduction	230
2	Methods	231
3	Results	232
4	Conclusions	236
	References	236
	Using INLA to Estimate a Highly Dimensional Spatial Model for Forest Fires in Portugal	239
	Isabel Natário, M. Manuela Oliveira, and Susete Marques	
1	Introduction	240
2	A Model for Forest Fires	241
3	Bayesian Estimation	242
3.1	Markov Chain Monte Carlo	242
3.2	Integrated Nested Laplace Approximation	243
4	Application: Forest Fires in Mainland Portugal	244
5	Concluding Remarks	246
	References	247
	Forecast Intervals with Boot.EXPOS	249
	Clara Cordeiro and M. Manuela Neves	
1	Introduction	249
2	Bootstrap and EXPOS Together: Boot.EXPOS, a Team Work	251
2.1	Forecast Intervals in EXPOS	252
2.2	Forecast Intervals in Boot.EXPOS	253
3	Case Study	253
4	Conclusions	254
	References	256

Table-Graph: A New Approach to Visualize Multivariate Data.	
Analysis of Chronic Diseases in Portugal	257
Alexandra Pinto	
1 Introduction	257
2 Objectives, Material and Methods	258
3 Table-Graph	259
4 Results and Discussion	260
5 Conclusion	263
References	264
Application of Item Response Theory to Mathematics High	
School Exams in Portugal	265
Gonçalo Jacinto, Paulo Infante, and Claudia Pereira	
1 Introduction	265
2 Unidimensional IRT Models for Dichotomous Responses	266
3 Critical Analysis of the Obtained Results	268
3.1 Results for the First and Second Calls of the 2008 Exams	268
3.2 Results for the First and Second Calls of the 2010 Exams	271
4 Some Remarks	273
References	274
Évora Residents and Sports Activity	275
Luísa Carvalho, Paulo Infante, and Anabela Afonso	
1 Introduction	275
2 Methodology	276
3 Sports Practice Characterization	277
4 Practitioner Profile	280
5 Final Remarks	282
References	282
Index	285

New Advances in Statistical Modeling and Applications

Pacheco, A.; Santos, R.; Oliveira, M.d.R.; Paulino, C.D.

(Eds.)

2014, XIX, 285 p. 77 illus., 16 illus. in color., Hardcover

ISBN: 978-3-319-05322-6