

CONTENTS

PART 1. INTRODUCTION

Introduction to Bootstrap

3

Bradley Efron and Raoul LePage

Introduction, 3

Jackknife, 4

Bootstrap, 5

Consistency of Bootstrap, 7

Pivoting and Edgeworth Expansions, 8

New Directions, 9

References, 10

PART 2. GENERAL PRINCIPLES OF THE BOOTSTRAP

On the Bootstrap of M-Estimators and Other Statistical Functionals

13

Miguel A. Arcones and Evarist Giné

Abstract, 13

1. Introduction, 14

2. Empirical Processes, 15

3. The a.s. Bootstrap of M-Estimators, 23

4. The Bootstrap of Differentiable Functionals, 36

References, 45

Bootstrapping Markov Chains

49

K. B. Athreya and C. D. Fuh

Abstract, 49

1. Introduction, 49

2. Bootstrapping a Finite State Space Markov Chain, 50

3. Bootstrapping Markov Chains: Countable Case, 52

4. Accuracy of the Bootstrap in the Finite State Space Case, 62

5. Some Open Problems, 63

References, 63

P. J. Bickel

Summary, 65

1. Introduction, 66
 2. Second Order Correctness and Equivalence, 67
 3. Second Order Optimality and Robustness, 74
- References, 75

Somnath Datta and William P. McCormick

Abstract, 77

1. Introduction, 77
 2. Asymptotics for the Conditional Bootstrap, 79
 3. Some New Bootstrap Methods, 81
 4. Proofs, 87
- References, 97

B. Efron

Abstract, 99

Introduction, 99

1. Why Do Maximum Likelihood Estimated Distributions Tend to Be Short-Tailed?, 99
 2. Why Does the Delta Method Tend to Underestimate Standard Errors?, 103
 3. Why are Cross-Validation Estimators So Variable?, 108
 4. What Is a Correct Confidence Interval?, 112
 5. What Is a Good Nonparametric Pivotal Quantity?, 116
 6. What are Computationally Efficient Ways To Bootstrap?, 120
- References, 124

Peter Hall

Abstract, 127

1. Introduction, 127
2. Uniform Resampling, 128
3. Linear Approximation, 129
4. Centering Method, 131
5. Balanced Resampling, 133
6. Antithetic Resampling, 135
7. Importance Resampling, 137
8. Quantile Estimation, 141

References, 142

Bootstrapping U-Quantiles**145***R. Helmers, P. Janssen and N. Veraverbeke*

Abstract, 145

1. Introduction, 145
2. Consistency of the Bootstrap for U-Quantiles, 146
3. Accuracy of the Bootstrap for U-Quantiles, 150
4. Applications, 153

References, 154

An Invariance Principle Applicable to the Bootstrap**157***John G. Kinateder*

1. Introduction, 157
 2. The Stochastic Integral Representation, 160
 3. The Invariance Principle, 161
 4. The Limit Laws, 172
 5. Simulation Results, 173
 6. Remarks, 178
 - A. Appendix, 179
- References, 180

**Edgeworth Correction by ‘Moving Block’ Bootstrap for Stationary
and Nonstationary Data**

183

S. N. Lahiri

Abstract, 183

1. Introduction, 183
2. Results on \bar{X}_n , 187
3. Smooth Functions of Mean, 192
4. Nonstationary Data, 195
5. Proofs, 197

References, 212

Bootstrapping Signs

215

Raoul LePage

Abstract, 215

1. Introduction, 215
2. Bootstrapping Signs, 217
3. Examining the Conditional Distributions, 218
4. Performance on Randomly Signed Powers of Uniforms, 221
5. Symmetric Errors Attracted to a Stable Law, 222
6. Comments, 223

References, 224

Moving Blocks Jackknife and Bootstrap Capture Weak Dependence

225

Regina Y. Liu and Kesar Singh

Abstract, 225

1. Introduction, 226
2. Moving Blocks Jackknife, 231
3. Moving Blocks Bootstrap, 238
4. Concluding Remarks, 245

Appendix, 247

References, 248

J. S. Marron

Abstract, 249

1. Introduction, 249
2. Bootstrap MISE Estimation, 251
3. Asymptotics, 254
4. Connection to Other Methods, 256
5. Simulations and an Application, 258

References, 261

A Circular Block-Resampling Procedure for Stationary Data**263***Dimitris N. Politis and Joseph P. Romano*

Abstract, 263

1. Introduction, 264
2. A Circular Block-Resampling bootstrap, 266

References, 270

Some Applications of the Bootstrap in Complex Problems**271***Robert Tibshirani*

1. Introduction, 271
2. Prediction Limits for Exercise Output, 271
3. Clustering of Cortical Cells, 274
4. Acknowledgements, 277

References, 277

Approximating the Distribution of a General Standardized Functional Statistic with That of Jackknife Pseudo Values**279***D. S. Tu*

Abstract, 279

1. Introduction, 279
2. Some Preliminary Notations and Basic Ideas, 282
3. The Second Order Accuracy of the Random Weighting Approximation, 287
4. Two Examples, 297

Acknowledgements, 303

References, 343

PART 3. APPLICATIONS OF THE BOOTSTRAP

Bootstrapping for Order Statistics Sans Random Numbers

(Operational Bootstrapping)

309

William A. Bailey

Abstract, 309

1. Meshing and Von Mises Theory, 311
 2. Bivariate Generalized Numerical Convolutions, 313
- References and Acknowledgments, 318

A Generalized Bootstrap

319

Edward J. Bedrick and Joe R. Hill

Abstract, 319

1. Introduction, 319
2. Well-Known Examples, 321
3. A Conditional EB Bootstrap, 324

References, 325

Bootstrapping Admissible Linear Model Selection Procedures

327

David Brownstone

Abstract, 327

1. Introduction, 327
2. Bootstrapping and Jackknifing Multiple Regression
Model Estimators, 328
3. Stein-Rule Estimators and Model Selection, 329
4. Estimator Performance, 333
5. Bootstrap and Jackknife Variance Estimation, 335
6. Bootstrap Confidence Bands, 338
7. Further Refinements, 340

References, 343

John J. Hsieh

Abstract, 345

1. Introduction, 345
 2. Deterministic Hazards, 346
 3. The Hazard Process, 347
 4. Estimation of Deterministic Functions
 5. Asymptotic Distributions of Estimates and Hypothesis Testing, 351
 6. Censoring, Competing Risks and Time-Varying Covariates, 354
- References, 360

Bootstrap Assessment of Prediction in Exploratory Regression Analysis 363

Victor Kipnis

Abstract, 363

1. Introduction, 363
 2. Problem Formulation, 364
 3. Bootstrap Estimators, 367
 4. Experimental Comparison of the Conventional and the Bootstrap Estimators, 371
 5. Conclusion, 381
- References, 386

Bootstrapping Likelihood Ratios in Quantitative Genetics 389

Nicholas Schork

1. Introduction, 389
 2. Bootstrap Tests for Non-Nested Hypotheses, 390
 3. Quantitative Segregation Analysis, 392
 4. Conclusion, 393
- References, 393

A Nonparametric Density Estimation Based Resampling Algorithm	397
<i>Malcolm S. Taylor and James R. Thompson</i>	
Abstract, 397	
1. Discussion, 397	
References, 403	
Nonparametric Rank Estimation Using Bootstrap Resampling and Canonical Correlation Analysis	405
<i>Xin M. Tu, D. S. Burdick and B. C. Mitchell</i>	
Abstract, 405	
1. Introduction, 406	
2. Rank Estimation by Canonical Correlation, 407	
3. The Bootstrap Resampling, 408	
4. Results and Discussion, 412	
References, 418	
Index	419