

Contents

I. Quality Control, Engineering and Monitoring	1
Quality Engineering Using Robust Design and Analysis	3
SUNG H. PARK AND JAE J. KIM	
1. Introduction.....	3
2. Quality engineering and quality management.....	4
3. Parameter design	7
The Calibration Problem in Industry	17
CHRISTOS P. KITSOS AND V. L. NINI	
1. Introduction.....	17
2. Background	18
3. Optimal design approach.....	20
4. Applications.....	21
Case Study of Applying Statistical Techniques for the Quality Assurance in a Paint Industry	27
C. VOURVAHI, J.VOUTSINAS AND J. KIRIAKIDIS	
1. Introduction.....	27
2. Generally about SPC.....	28
3. SPC in CHROTEX until 1996.....	28
4. New steps for CHROTEX with SPC.....	30
5. Process capability indexes	33
6. Applications of SPC.....	34
7. Conclusions	35

Taking Multivariate Statistics out into Industry - Multivariate Statistical Progress Control and Process Performance Monitoring	51
ELAINE B. MARTIN AND A. JULIAN MORRIS	
1. Introduction.....	51
2. Strategic importance of the approach.....	52
3. An overview of statistical process control	52
4. Multivariate statistical process control	53
5. Process performance monitoring charts.....	55
6. An industrial application of PCA and PLS based process performance monitoring.....	57
7. Conclusions	63
Robust Estimation of Variance Components with High Breakdown Point in the 1-Way Random Effect Model	65
STEFFEN UHLIG	
1. Introduction.....	65
2. Definitions	66
3. Breakdown point and consistency	70
4. Simulation study and discussion	71
5. Example	72
Sources of Inaccuracy in the Mean and Variance Models for Quality Improvement Problems	75
IVAN N. VUCHKOV AND LIDIA N. BOYADJIEVA	
1. Introduction.....	75
2. Inaccuracy due to incorrect regression model structure	80

3. Inaccuracy due to neglecting the high order error distribution moments and the high order terms on the variance model.....	82
4. Inaccuracy due to random character of the regression coefficients estimates	83

II. Reliability and Failure Time Analysis 87

Accelerated Life Test with Some Parameter Change in Life Stress Relation 89

HUANG WEN-TAO AND LIN HUEI-TSAN

1. Introduction.....	89
2. Model assumptions	91
3. Examples.....	92

Accurate Inferences for the Reliability Function Considering Accelerated Life Tests 99

JORGE ALBERTO ACHCAR AND JOSE CARLOS FOGO

1. Introduction.....	99
2. An useful reparametrization for the reliability function at time t_0	101
3. The exponential case.....	102
4. An example.....	103
5. Concluding remarks.....	107

Prediction of Failures that Have Never Occured - Exponential Case	111
JAROMIR ANTOCH AND JOSEF MACHEK	
1. Problem	111
2. Statistical model and criteria of reliability used	112
3. Model and basic estimators	112
4. Possible modifications of $\hat{\lambda}$	114
5. Bayesian approach	115
6. Neyman-Pearson's approach	119
7. Probability of the all year round service without failures.....	120
 Algorithm of Confidence Limits Calculation for the Probability of the Value 1 of a Monotone Boolean Function of Random Variables 123	
ALEXANDER M. ANDRONOV	
1. Introduction.....	123
2. Method of confidence limits calculation	124
3. Algorithm for a calculation of the lower confidence limit	129
4. Concluding remarks	133
 Developing a Graphical Interface for Pre-Posterior Bayesian Analysis 135	
PASQUALE ERTO, ANTONIO LANZOTTI AND MICHELE STAIANO	
1. Introduction.....	135
2. Graphical interface for input and output	137
3. Bayesian approach to Weibull reliability estimation	139
4. Application results	140
5. Concluding remarks	146

III. Experimental Design

149

Nonlinear-Optimal-Sequential Experiment Designs and Applications

151

CHRISTOS P. KITSOS

1. Introduction.....	151
2. Background	152
3. Optimality criteria	155
4. Sequential approach.....	157
5. Applications.....	159
6. Discussion	162

Robust Inference and Experimental Design for Multi-Factor Models

165

CHRISTINE H. MÜLLER

1. Introduction.....	165
2. Robust and efficient estimation	167
3. Robust and efficient testing	171

Construction of Some New Orthogonal Main-Effect Designs

175

CHRISTOS KOUKOUVINOS

1. Introduction.....	175
2. Orthogonal designs and their construction.....	177
3. New orthogonal designs and sequences with zero autocorrelation function.....	179

Extended V-robustness for Two-level Orthogonal Resolution

V Designs

183

CINZIA MORTARINO AND LUIGI SALMASO

1. Introduction.....	183
2. V-robust covariance patterns	184
3. V-robustness for orthogonal designs with N=48, 96 runs	186
4. V-robustness for orthogonal designs with N=80, 112 runs	189

Computational Algebraic Geometry in Industrial Experimental Design

193

E. RICCOMAGNO AND HENRY P. WYNN

1. Algebraic geometry in the design of experiments.....	193
2. The background algebra.....	194
3. Fans und computer experiments.....	195
4. Models as varieties.....	196

IV. Pharmaceutical Statistics

199

New Statistical Methods for Analyzing Mutagenicity Assays

Real Data Problems in Biopharmaceutical Drug Development:

201

LUDWIG A. HOTHORN

1. Introduction.....	201
2. Proof and hazard versus proof on safety.....	203
3. Real data problems in the testing procedure on difference	204
4. The example	206
5. Conclusions	207

UTE RÖMISCH AND S. GARGOVA

1. Introduction.....	209
2. General remarks on selection procedures	210
3. Biotechnology example.....	214
4. Results and discussion.....	219

Modeling and Computation in Pharmaceutical Statistics**when Analyzing Drug Safety** **221**

LUTZ EDLER

1. Introduction.....	221
2. Safety described as stochastic process.....	222
3. State specific safety analysis.....	224
4. Longitudinal models for safety analysis	227
5. Example: A multicenter randomized trial.....	229
6. Discussion	230

Isotonic Inference with Particular Interest in Application to**Clinical Trials** **233**

CHIHIRO HIROTSU

1. Introduction.....	233
2. The case of isotonic inference	234
3. Various extensions of the monotone relationship	235
4. A complete class lemma	236
5. Testing a simple ordered alternative in the normal means.....	237
6. Testing ordered alternatives in Binomial Probabilities.....	239
7. Analyzing a two-way contingency table with ordered column categories.....	239

8. Two-way contingency table with natural orderings in both of rows and columns	240
---	-----

Tests for Linearity and Tests for Zero Slope in Crossover Studies 243

GÜNTHER HEIMANN

1. Introduction.....	244
2. The statistical model	246
3. The F-Test for linearity	248
4. The F-Test for dose dependency	250
5. Derivation and optimality of the tests	252

V. Repeated Measurements - Multiple Inference 257

A Nonparametric Combination Method for Dependent Permutation Tests with Application to Some Problems with Repeated Measures 259

FORTUNATO PESARIN

1. Introduction.....	259
2. A model with additive effects.....	260
3. The hypotheses of interest.....	261
4. The nonparametric combination method.....	263
5. Solutions of testing problems.....	265
6. Some evaluations for the stochastic dominance test.....	266

Adaptive Tests for Trend 269

MARKUS NEUHÄUSER AND LUDWIG A. HOTHORN

1. Introduction.....	269
2. Adaptive nonparametric trend test.....	270
3. Adaptive parametric trend test	272

**Convergence Rates of Simulated Annealing-Type of
Recursive Algorithms**

277

GEORGE YIN

1. Introduction.....	277
2. Main results.....	278
3. Further discussion.....	280

Spatial Statistics in the Material Research

285

HYNEK LAUSCHMANN AND VIKTOR BENES

1. Introduction.....	285
2. Stereological unfolding problem.....	286
3. Modeling and estimating the particle damage	288
4. Quantitative fractography.....	289
5. The image bluring method.....	291

**Exact Solutions to the Problem of Predicting a Vast Class
of Weakly Stationary, Linearly Singular, Discrete Parameter
Stochastic Processes**

295

GEORGIO CELANT

1. Introduction.....	295
2. Singular processes: Definitions and characteristics	296
3. Analytical properties of the process.....	296
4. Calculation of coefficients for a few simple cases	298
5. Calculation of coefficients in a general case.....	299