

CONTENTS

PREFACE	v
1 INTRODUCTION	1
1.1 The Need.....	1
1.2 Why a Book?	1
1.3 Different Users.....	2
1.4 Sketch of the Chapters	2
1.5 Computer Programs	7
1.6 How to Proceed from Here.....	7
2 STRUCTURAL MODELS FOR COUNTED DATA	9
2.1 Introduction	9
2.2 Two Dimensions—The Fourfold Table.....	11
2.3 Two Dimensions—The Rectangular Table.....	24
2.4 Models for Three-Dimensional Arrays.....	31
2.5 Models for Four or More Dimensions.....	42
2.6 Exercises.....	48
2.7 Appendix: The Geometry of a 2 x 2 Table.....	49
3 MAXIMUM LIKELIHOOD ESTIMATES FOR COMPLETE TABLES	57
3.1 Introduction	57
3.2 Sampling Distributions	62
3.3 Sufficient Statistics	64
3.4 Methods of Obtaining Maximum Likelihood Estimates	73
3.5 Iterative Proportional Fitting of Log-Linear Models	83
3.6 Classical Uses of Iterative Proportional Fitting.....	97
3.7 Rearranging Data for Model Fitting	102
3.8 Degrees of Freedom	114
4 FORMAL GOODNESS OF FIT: SUMMARY STATISTICS AND MODEL SELECTION	123
4.1 Introduction	123
4.2 Summary Measures of Goodness of Fit.....	124
4.3 Standardized Rates.....	131
4.4 Internal Goodness of Fit.....	136
4.5 Choosing a Model	155
4.6 Appendix: Goodman's Partitioning Calculus	169
5 MAXIMUM LIKELIHOOD ESTIMATION FOR INCOMPLETE TABLES.....	177
5.1 Introduction	177
5.2 Incomplete Two-Way Tables.....	178
5.3 Incomplete Two-Way Tables for Subsets of Complete Arrays	206
5.4 Incomplete Multiway Tables.....	210
5.5 Representation of Two-Way Tables as Incomplete Multiway Arrays.....	225

6	ESTIMATING THE SIZE OF A CLOSED POPULATION	229
6.1	Introduction	229
6.2	The Two-Sample Capture-Recapture Problem.....	231
6.3	Conditional Maximum Likelihood Estimation of N	236
6.4	The Three-Sample Census	237
6.5	The General Multiple Recapture Problem	246
6.6	Discussion	254
7	MODELS FOR MEASURING CHANGE	257
7.1	Introduction	257
7.2	First-Order Markov Models.....	261
7.3	Higher-Order Markov Models.....	267
7.4	Markov Models with a Single Sequence of Transitions	270
7.5	Other Models	273
8	ANALYSIS OF SQUARE TABLES: SYMMETRY AND MARGINAL HOMOGENEITY	281
8.1	Introduction	281
8.2	Two-Dimensional Tables	282
8.3	Three-Dimensional Tables.....	299
8.4	Summary.....	309
9	MODEL SELECTION AND ASSESSING CLOSENESS OF FIT: PRACTICAL ASPECTS.....	311
9.1	Introduction	311
9.2	Simplicity in Model Building.....	312
9.3	Searching for Sampling Models.....	315
9.4	Fitting and Testing Using the Same Data.....	317
9.5	Too Good a Fit	324
9.6	Large Sample Sizes and Chi Square When the Null Model is False	329
9.7	Data Anomalies and Suppressing Parameters	332
9.8	Frequency of Frequencies Distribution	337
10	OTHER METHODS FOR ESTIMATION AND TESTING IN CROSS-CLASSIFICATIONS.....	343
10.1	Introduction	343
10.2	The Information-Theoretic Approach	344
10.3	Minimizing Chi Square, Modified Chi Square, and Logit Chi Square	348
10.4	The Logistic Model and How to Use It	357
10.5	Testing via Partitioning of Chi Square	361
10.6	Exact Theory for Tests Based on Conditional Distributions	364
10.7	Analyses Based on Transformed Proportions	366
10.8	Necessary Developments.....	371
11	MEASURES OF ASSOCIATION AND AGREEMENT.....	373
11.1	Introduction	373
11.2	Measures of Association for 2×2 Tables.....	376
11.3	Measures of Association for $I \times J$ Tables.....	385
11.4	Agreement as a Special Case of Association.....	393

12	PSEUDO-BAYES ESTIMATES OF CELL PROBABILITIES	401
12.1	Introduction	401
12.2	Bayes and Pseudo-Bayes Estimators.....	404
12.3	Asymptotic Results for Pseudo-Bayes Estimators.....	410
12.4	Small-Sample Results	416
12.5	Data-Dependent λ 's.....	419
12.6	Another Example: Two Social Mobility Tables	426
12.7	Recent Results and Some Advice.....	429
13	SAMPLING MODELS FOR DISCRETE DATA	435
13.1	Introduction	435
13.2	The Binomial Distribution	435
13.3	The Poisson Distribution.....	438
13.4	The Multinomial Distribution.....	441
13.5	The Hypergeometric Distribution	448
13.6	The Multivariate Hypergeometric Distribution.....	450
13.7	The Negative Binomial Distribution.....	452
13.8	The Negative Multinomial Distribution	454
14	ASYMPTOTIC METHODS	457
14.1	Introduction	457
14.2	The O , o Notation	458
14.3	Convergence of Stochastic Sequences.....	463
14.4	The O_p , o_p Notation for Stochastic Sequences.....	475
14.5	Convergence of Moments.....	484
14.6	The δ Method for Calculating Asymptotic Distributions	486
14.7	General Framework for Multinomial Estimation and Testing.....	502
14.8	Asymptotic Behavior of Multinomial Maximum Likelihood Estimators.....	509
14.9	Asymptotic Distribution of Multinomial Goodness-of-Fit Tests	513
	REFERENCES.....	531
	INDEX TO DATA SETS	543
	AUTHOR INDEX	547
	SUBJECT INDEX	551

Discrete Multivariate Analysis

Theory and Practice

Bishop, Y.M.; Fienberg, S.E.; Holland, P.W.

2007, IX, 559 p., Softcover

ISBN: 978-0-387-72805-6