

TABLE OF CONTENTS

Preface	xi
1. Introduction	1
2. Bayesian Statistical Analysis	5
A. The Bayesian Paradigm.....	5
B. An Example	7
C. Prior Distributions	10
D. Model Selection and Evaluation.....	13
1. Graphical Analysis	14
2. A Selection Criterion	15
3. Computational Aspects of Bayesian Analysis.....	17
A. An Example	17
B. Numerical Integration	19
1. Adaptive Gaussian Integration.....	20
2. Gauss-Hermite Integration	21
3. Estimating the Mean and Covariance.....	24
4. An Example	25
C. Monte Carlo Integration.....	29
D. Adjustments to the Posterior Mode.....	32
E. Empirical Bayes Style Approximations.....	33
F. Summary	35
4. Prediction with Parameter Uncertainty.....	37
A. The Model	37
B. A Life Insurance Example.....	38
C. A Casualty Insurance Example.....	42
D. The Kalman Filter.....	46
E. Return of the Casualty Insurance Example.....	50
5. The Credibility Problem	57
A. A Simple Model	58
B. Estimating the Class Mean.....	58
C. Credibility Issues	62
6. The Hierarchical Bayesian Approach	65
A. What It Is	65
B. An Example	67
C. The General Hierarchical Model.....	71

D. Simplifying Assumptions	76
1. Normality	76
2. Linearity	78
3. Variance Independent of the Mean.....	78
7. The Hierarchical Normal Linear Model.....	81
A. The Model	81
B. Examples – Description	82
1. One-Way	82
2. Two-Way	83
3. Linear Trend	85
4. Kalman Filter.....	86
5. Graduation	89
C. Analysis of the Model	89
1. Preliminaries	89
2. The Analysis	90
D. Examples – Analysis	97
1. One-Way	98
2. Two-Way	100
3. Linear Trend	107
4. Kalman Filter.....	109
5. Graduation	109
E. Prior Distributions	110
F. Model Selection and Evaluation.....	111
8. Examples	115
A. Data Sets	115
B. Analyses	118
1. One-way Model, Data Set 1.....	118
2. One-way Model, Data Set 2.....	125
3. Empirical Bayes Style Approaches.....	129
4. An Iterative Approach	131
5. Other Priors	133
6. Diagnostics	135
7. Two-way Model, Data Set 4.....	143
8. Linear Trend Model, Data Set 3.....	145
9. Kalman Filter, Data Set 3.....	146
10. Graduation	148

9. Modifications to the Hierarchical Normal Linear Model.....	151
A. Lognormal	151
B. Poisson	152
C. Non-normal Models Based on Parameter Estimates.....	154
 Appendix. Algorithms, Programs, and Data Sets.....	159
A. The Simplex Method of Function Maximization.....	159
B. Adaptive Gaussian Integration.....	163
C. Gauss-Hermite Integration	165
D. Polar Method for Generating Normal Deviates.....	166
E. GAUSS Programs	166
1. Simplex Maximization.....	166
2. Adaptive Gaussian Integration	170
3. Gauss-Hermite Integration	173
4. Monte Carlo Integration.....	179
5. Tierney-Kadane Integration.....	182
F. Data Sets	184
1. Data Set 1	184
2. Data Sets 2—4	184
 Bibliography	229
 Index	235