

CONTENTS

	<i>Preface</i>	<i>vii</i>
CHAPTER 1.	SOME ELEMENTARY STATISTICAL CONCEPTS	1
1.1	<i>Introduction</i>	<i>1</i>
1.2	<i>Random Variables</i>	<i>1</i>
1.3	<i>Normal Random Variables</i>	<i>7</i>
1.4	<i>Random Samples and Estimation</i>	<i>11</i>
1.5	<i>Tests of Hypotheses for the Parameters of Normal Populations</i>	<i>17</i>
1.6	<i>Testing the Equality of Several Means: The Analysis of Variance</i>	<i>28</i>
1.7	<i>References</i>	<i>35</i>
CHAPTER 2.	MATRIX ALGEBRA	37
2.1	<i>Introduction</i>	<i>37</i>
2.2	<i>Some Definitions</i>	<i>38</i>
2.3	<i>Elementary Operations with Matrices and Vectors</i>	<i>40</i>
2.4	<i>The Determinant of a Square Matrix</i>	<i>45</i>
2.5	<i>The Inverse Matrix</i>	<i>46</i>
2.6	<i>The Rank of a Matrix</i>	<i>48</i>
2.7	<i>Simultaneous Linear Equations</i>	<i>53</i>
2.8	<i>Orthogonal Vectors and Matrices</i>	<i>58</i>
2.9	<i>Quadratic Forms</i>	<i>59</i>
2.10	<i>The Characteristic Roots and Vectors of a Matrix</i>	<i>61</i>
2.11	<i>Partitioned Matrices</i>	<i>64</i>
2.12	<i>Differentiation of Functions of Vectors</i>	<i>67</i>
2.13	<i>Exercises</i>	<i>69</i>
2.14	<i>References</i>	<i>72</i>
CHAPTER 3.	SAMPLES FROM THE MULTIVARIATE NORMAL POPULATION	75
3.1	<i>Introduction</i>	<i>75</i>
3.2	<i>Multidimensional Random Variables</i>	<i>75</i>
3.3	<i>The Multivariate Normal Distribution</i>	<i>80</i>
3.4	<i>Conditional and Marginal Distributions of Multinormal Variates</i>	<i>86</i>

3.5	<i>Samples from the Multinormal Population</i>	94
3.6	<i>Simultaneous Tests and Confidence Intervals for Regression Coefficients</i>	107
3.7	<i>A Test for Complete Independence</i>	111
3.8	<i>Exercises</i>	114
3.9	<i>References</i>	115
CHAPTER 4.	TESTS OF HYPOTHESES ON MEANS	117
4.1	<i>Introduction</i>	117
4.2	<i>Tests on Means and the T^2 Statistic</i>	117
4.3	<i>The Case of Two Samples</i>	125
4.4	<i>Tests on Mean Vectors with Known Covariance Matrix</i>	129
4.5	<i>The Linear Discriminant Function</i>	130
4.6	<i>The Analysis of Repeated Measurements</i>	133
4.7	<i>Profile Analysis for Two Independent Groups</i>	141
4.8	<i>The Power of Tests on Mean Vectors</i>	148
4.9	<i>The Assumption of Equal Covariance Matrices</i>	152
4.10	<i>Exercises</i>	154
4.11	<i>References</i>	157
CHAPTER 5.	THE MULTIVARIATE ANALYSIS OF VARIANCE	159
5.1	<i>Introduction</i>	159
5.2	<i>The Multivariate General Linear Model</i>	159
5.3	<i>The Multivariate Analysis of Variance</i>	168
5.4	<i>Multiple Comparisons in the Multivariate Analysis of Variance</i>	182
5.5	<i>Profile Analysis</i>	186
5.6	<i>Other Test Criteria</i>	197
5.7	<i>Exercises</i>	199
5.8	<i>References</i>	204
CHAPTER 6.	INDEPENDENCE OF SETS OF VARIATES AND CANONICAL CORRELATION	207
6.1	<i>Introduction</i>	207
6.2	<i>Testing the Independence of Two Sets of Variates</i>	207
6.3	<i>Canonical Correlation</i>	213
6.4	<i>Exercises</i>	218
6.5	<i>References</i>	219
CHAPTER 7.	THE STRUCTURE OF MULTIVARIATE OBSERVATIONS: I. PRINCIPAL COMPONENTS	221
7.1	<i>Introduction</i>	221
7.2	<i>The Principal Components of Multivariate Observations</i>	222
7.3	<i>The Geometrical Meaning of Principal Components</i>	230
7.4	<i>The Computation of Principal Components</i>	234
7.5	<i>The Interpretation of Principal Components</i>	241

7.6	<i>Some Patterned Matrices and Their Principal Components</i>	244
7.7	<i>The Sampling Properties of Principal Components</i>	247
7.8	<i>Exercises</i>	254
7.9	<i>References</i>	256
CHAPTER 8. THE STRUCTURE OF MULTIVARIATE OBSERVATIONS:		
II. FACTOR ANALYSIS		259
8.1	<i>Introduction</i>	259
8.2	<i>The Mathematical Model for Factor Structure</i>	261
8.3	<i>Estimation of the Factor Loadings</i>	264
8.4	<i>Testing the Goodness of Fit of the Factor Model</i>	268
8.5	<i>Numerical Solution of the Estimation Equations</i>	270
8.6	<i>Examples of Factor Analyses</i>	273
8.7	<i>Factor Rotation</i>	277
8.8	<i>An Alternative Model for Factor Analysis</i>	286
8.9	<i>Sampling Variation of Loading Estimates</i>	289
8.10	<i>The Evaluation of Factors</i>	291
8.11	<i>Models for the Dependence Structure of Ordered Responses</i>	293
8.12	<i>Exercises</i>	300
8.13	<i>References</i>	302
APPENDIX: TABLES AND CHARTS		305
Table 1.	Cumulative Normal Distribution Function	307
Table 2.	Percentage Points of the Chi-squared Distribution	308
Table 3.	Upper Percentage Points of the t Distribution	309
Table 4.	Upper Percentage Points of the F Distribution	310
Charts A.1–A.8.	Upper Percentage Points of the Distribution of the Largest Characteristic Root	312
Charts B.1–B.8.	Power Functions of the F Test	320
<i>Index</i>		329