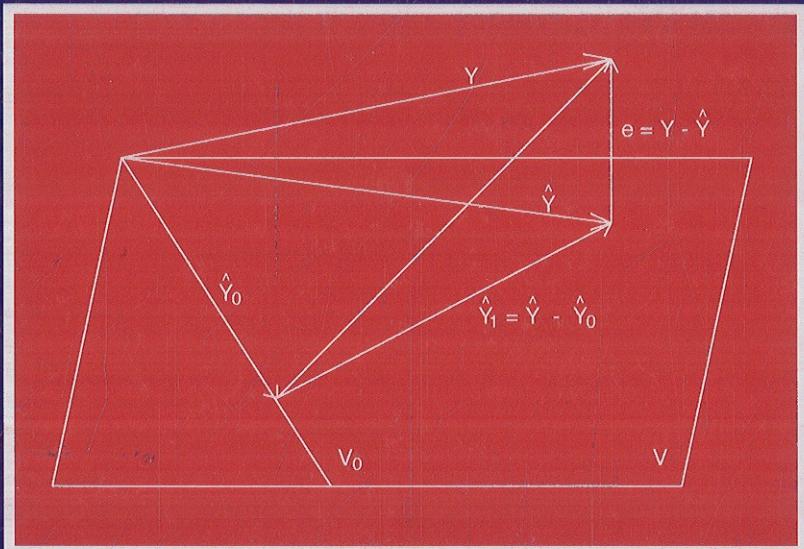


WILEY SERIES IN PROBABILITY AND STATISTICS

# Linear Statistical Models

Second Edition



James H. Stapleton

 WILEY

ftp://  
SITE AVAILABLE

# Contents

Preface	vii
<b>1 Linear Algebra, Projections</b>	<b>1</b>
1.1 Introduction . . . . .	1
1.2 Vectors, Inner Products, Lengths . . . . .	3
1.3 Subspaces, Projections . . . . .	7
1.4 Examples . . . . .	18
1.5 Some History . . . . .	24
1.6 Projection Operators . . . . .	29
1.7 Eigenvalues and Eigenvectors . . . . .	39
<b>2 Random Vectors</b>	<b>51</b>
2.1 Covariance Matrices . . . . .	51
2.2 Expected Values of Quadratic Forms . . . . .	56
2.3 Projections of Random Variables . . . . .	59
2.4 The Multivariate Normal Distribution . . . . .	64
2.5 The $\chi^2$ , F, and t Distributions . . . . .	68
<b>3 The Linear Model</b>	<b>83</b>
3.1 The Linear Hypothesis . . . . .	83
3.1.1 Some Philosophy for Statisticians: . . . . .	86
3.1.2 Estimation Theory . . . . .	88
3.2 Confidence Intervals and Tests on $\eta = c_1\beta_1 + \dots + c_k\beta_k$ . . . . .	93
3.3 The Gauss–Markov Theorem . . . . .	98
3.4 The Gauss–Markov Theorem for the General Case . . . . .	103
3.5 Interpretation of Regression Coefficients . . . . .	105
3.6 The Multiple Correlation Coefficient . . . . .	108
3.7 The Partial Correlation Coefficient . . . . .	111
3.8 Testing $H_0 : \theta \in V_0 \subset V$ . . . . .	116
3.9 Further Decomposition of Subspaces . . . . .	129
3.10 Power of the F-Test . . . . .	132
3.11 Confidence and Prediction Intervals . . . . .	136
3.12 An Example from SAS . . . . .	140
3.13 Another Example: Salary Data . . . . .	152

<b>4 Fitting of Regression Models</b>	<b>159</b>
4.1 Linearizing Transformations . . . . .	159
4.2 Specification Error . . . . .	167
4.3 Generalized Least Squares . . . . .	177
4.4 Effects of Additional or Fewer Observations . . . . .	181
4.5 Finding the "Best" Set of Regressors . . . . .	188
4.6 Examination of Residuals . . . . .	194
4.7 Collinearity . . . . .	198
4.8 Asymptotic Normality . . . . .	209
4.9 Spline Functions . . . . .	215
4.10 Nonlinear Least Squares . . . . .	220
4.11 Robust Regression . . . . .	225
4.12 Bootstrapping in Regression . . . . .	233
4.13 Quantile Regression . . . . .	241
<b>5 Simultaneous Confidence Intervals</b>	<b>257</b>
5.1 Bonferroni Confidence Intervals . . . . .	258
5.2 Scheffé Simultaneous Confidence Intervals . . . . .	258
5.3 Tukey Simultaneous Confidence Intervals . . . . .	263
5.4 Comparison of Lengths . . . . .	267
5.5 Bechhofer's Method . . . . .	270
<b>6 Two- and Three-Way Analyses of Variance</b>	<b>273</b>
6.1 Two-Way Analysis of Variance . . . . .	273
6.2 Unequal Numbers of Observations Per Cell: . . . . .	286
6.3 Two-Way Analysis of Variance, One Observation Per Cell . . . . .	290
6.4 Design of Experiments . . . . .	291
6.5 Three-Way Analysis of Variance . . . . .	293
6.6 The Analysis of Covariance . . . . .	303
<b>7 Miscellaneous Other Models</b>	<b>313</b>
7.1 The Random Effects Model . . . . .	313
7.2 Nesting . . . . .	318
7.3 Split Plot Designs . . . . .	322
7.4 Mixed Models . . . . .	326
7.5 Balanced Incomplete Block Designs . . . . .	337
<b>8 Analysis of Frequency Data</b>	<b>347</b>
8.1 Examples . . . . .	348
8.2 Distribution Theory . . . . .	350
8.3 Conf. Ints. on Poisson and Binomial Parameters . . . . .	366
8.4 Log-Linear Models . . . . .	377
8.5 Estimation for the Log-Linear Model . . . . .	389
8.6 Chi-Square Goodness-of-Fit Statistics . . . . .	407
8.7 Limiting Distributions of the Estimators . . . . .	414
8.8 Logistic Regression . . . . .	432

**CONTENTS****The Statistical Language R****445****Answers****459****Index****469**