CONTENTS

Acknowledgments

1. Introduction

Series Editor's Introduction

3

2. Linear Least-Squares Regression

The Regression Model

	Least-Squares Estimation 6
	Statistical Inference for Regression Coefficients 7
	The General Linear Model 9
3.	Collinearity 10
	Collinearity and Variance Inflation 10
	Coping with Collinearity: No Quick Fix 13
4.	Outlying and Influential Data 21
	Measuring Leverage: Hat-Values 24
	Detecting Outliers: Studentized Residuals 25
	Measuring Influence: Cook's Distance and Other
	Diagnostics 29
	Numerical Cutoffs for Diagnostic Statistics 32
	Jointly Influential Subsets of Observations: Partial-
	Regression Plots 34
	Should Unusual Data Be Discarded? 39
5.	Non-Normally Distributed Errors 40
	Normal Quantile-Comparison Plot of Residuals 41
	Histograms of Residuals 44
	Correcting Asymmetry by Transformation 46
6.	Nonconstant Error Variance 49
	Detecting Nonconstant Error Variance 49
	Correcting Nonconstant Error Variance 50
7.	Nonlinearity 53
	Residual and Partial-Residual Plots 54
	Transformations for Linearity 58

1

5

	Testing for Nonlinearity 64	
	Testing for Nonconstant Error Variance 66	
9.	, ,	
	Constructed Variables 66	
	Box-Cox Transformation of y 68	
	Box-Tidwell Transformation of the xs 70	
	Nonconstant Error Variance Revisited 73	
10.	Recommendations 75	
	Computing Diagnostics 79	
	Further Reading 79	
App	pendix 80	
	A2.1 Least-Squares Fit, Joint Confidence Regions,	
	and Tests 80	
	A3.1 Ridge Regression 82	
	A4.1 Hat-Values and the Hat Matrix 83	
	A4.2 The Distribution of the Least-Squares Residuals	83
	A4.3 Deletion Diagnostics 84	
	A4.4 The Partial-Regression Plot 84	
	A6.1 Smoothing Scatterplots by Lowess 85	
	A6.2 Weighted-Least-Squares Estimation 87	
	A6.3 Correcting Least-Squares Standard Errors for	
	Heteroscedasticity 88	
	A6.4 The Efficiency and Validity of Least-Squares	
	Estimation When Error Variances Are Not Constant	88
. -		
Kef	erences 89	

About the Author 92

8. Discrete Data 61