

CONTENTS

PREFACE	xi
---------------	----

PROLOGUE

MORE TEA?	1
-----------------	---

1

A REFRESHING GLASS OF MATH	11
----------------------------------	----

Building a Foundation	12
-----------------------------	----

Inverse Functions	14
-------------------------	----

Exponents and Logarithms	19
--------------------------------	----

Rules for Exponents and Logarithms	21
--	----

Differential Calculus	24
-----------------------------	----

Matrices	37
----------------	----

Adding Matrices	39
-----------------------	----

Multiplying Matrices	40
----------------------------	----

The Rules of Matrix Multiplication	43
--	----

Identity and Inverse Matrices	44
-------------------------------------	----

Statistical Data Types	46
------------------------------	----

Hypothesis Testing	48
--------------------------	----

Measuring Variation	49
---------------------------	----

Sum of Squared Deviations	50
---------------------------------	----

Variance	50
----------------	----

Standard Deviation	51
--------------------------	----

Probability Density Functions	52
-------------------------------------	----

Normal Distributions	53
----------------------------	----

Chi-Squared Distributions	54
---------------------------------	----

Probability Density Distribution Tables	55
---	----

F Distributions	57
-----------------------	----

2

SIMPLE REGRESSION ANALYSIS	61
----------------------------------	----

First Steps	62
-------------------	----

Plotting the Data	64
-------------------------	----

The Regression Equation	66
-------------------------------	----

General Regression Analysis Procedure	68
---	----

Step 1: Draw a scatter plot of the independent variable versus the dependent variable. If the dots line up, the variables may be correlated	69
---	----

Step 2: Calculate the regression equation	71
---	----

Step 3: Calculate the correlation coefficient (R) and assess our population and assumptions	78
--	----

Samples and Populations	82
-------------------------------	----

Assumptions of Normality	85
Step 4: Conduct the analysis of variance	87
Step 5: Calculate the confidence intervals	91
Step 6: Make a prediction!	95
Which Steps Are Necessary?	100
Standardized Residual	100
Interpolation and Extrapolation	102
Autocorrelation	102
Nonlinear Regression	103
Transforming Nonlinear Equations into Linear Equations	104

3

MULTIPLE REGRESSION ANALYSIS	107
Predicting with Many Variables	108
The Multiple Regression Equation	112
Multiple Regression Analysis Procedure	112
Step 1: Draw a scatter plot of each predictor variable and the outcome variable to see if they appear to be related	113
Step 2: Calculate the multiple regression equation	115
Step 3: Examine the accuracy of the multiple regression equation	119
The Trouble with R^2	122
Adjusted R^2	124
Hypothesis Testing with Multiple Regression	127
Step 4: Conduct the Analysis of Variance (ANOVA) Test	128
Finding S_{11} and S_{22}	132
Step 5: Calculate confidence intervals for the population	133
Step 6: Make a prediction!	136
Choosing the Best Combination of Predictor Variables	138
Assessing Populations with Multiple Regression Analysis	142
Standardized Residuals	143
Mahalanobis Distance	144
Step 1	144
Step 2	145
Step 3	146
Using Categorical Data in Multiple Regression Analysis	147
Multicollinearity	149
Determining the Relative Influence of Predictor Variables on the Outcome Variable	149

4

LOGISTIC REGRESSION ANALYSIS	153
The Final Lesson	154
The Maximum Likelihood Method	160
Finding the Maximum Likelihood Using the Likelihood Function	163
Choosing Predictor Variables	164

Logistic Regression Analysis in Action!	168
Logistic Regression Analysis Procedure	168
Step 1: Draw a scatter plot of the predictor variables and the outcome variable to see whether they appear to be related	169
Step 2: Calculate the logistic regression equation.	170
Step 3: Assess the accuracy of the equation	173
Step 4: Conduct the hypothesis tests.	178
Step 5: Predict whether the Norns Special will sell	182
Logistic Regression Analysis in the Real World	190
Logit, Odds Ratio, and Relative Risk	190
Logit.	190
Odds Ratio	191
Adjusted Odds Ratio	192
Hypothesis Testing with Odds	194
Confidence Interval for an Odds Ratio	194
Relative Risk	195
APPENDIX	
REGRESSION CALCULATIONS WITH EXCEL	197
Euler's Number	198
Powers	200
Natural Logarithms	200
Matrix Multiplication	201
Matrix Inversion.	202
Calculating a Chi-Squared Statistic from a p-Value	204
Calculating a p-Value from a Chi-Squared Statistic	205
Calculating an F Statistic from a p-Value	206
Calculating a p-Value from an F Statistic	208
Partial Regression Coefficient of a Multiple Regression Analysis	209
Regression Coefficient of a Logistic Regression Equation	210
INDEX	213