Contents

Dedication ..... *iii*

About the Authors ..... *iv*

Introduction ..... *xi*

Acknowledgments ..... *xvi*

Chapter 1 Basic Statistical Principles and Diagnostic Tree *1*

Categories of Data *2*
Sampling Methods *2*
Diagnostic Tree *5*
SQL Data Extraction Examples *7*

Chapter 2 Measures of Central Tendency and Dispersion *9*

Measures of Central Tendency *10*
Mean *10*
Median *12*
Mode *16*
Geometric Mean *17*
Weighted Mean *20*
Measures of Dispersion *22*
Histogram Construction *22*
Range *32*
Standard Deviation *33*
Conclusion *40*

Chapter 3 Goodness of Fit 41

Tests of Hypothesis 43
Goodness of Fit Test 46
Fitting a Normal Distribution to Observed Data 47
Fitting a Poisson Distribution to Observed Data 62
Fitting an Exponential Distribution to Observed Data 68
Conclusion 71
T-SQL Source Code 72
Make_Intervals 73
Combine_Intervals 74
Compare_Observed_And_Expected 80
Procedure Calls 82

Chapter 4 Additional Tests of Hypothesis 85

Comparing a Single Mean to a Specified Value 88
Comparing Means and Variances of Two Samples 94
Comparisons of More Than Two Samples 101
Conclusion 104
T-SQL Source Code 105
Calculate_T_Statistic 105
Calculate_Z_Statistic 107
Compare_Means_2_Samples 108
Contingency_Test 113
Procedure Calls 117

Chapter 5 Curve Fitting 119

Linear Regression in Two Variables 121
Linear Correlation in Two Variables 127
Polynomial Regression in Two Variables 130
Other Nonlinear Regression Models 136
Linear Regression in More Than Two Variables 141
Conclusion 147
T-SQL Source Code 147
Linear_Regression_2_Variables 148
Gaussian_Elimination 150
Array_2D 158
Polynomial_Regression 160
Exponential_Model 169
Multiple_Linear_Regression 172
Procedure Calls 179

Chapter 6 Control Charting 181

Common and Special Causes of Variation 183
Dissecting the Control Chart 193
Control Charts for Sample Range and Mean Values 195
Control Chart for Fraction Nonconforming 206
Control Chart for Number of Nonconformities 213
Conclusion 215
T-SQL Source Code 216
Sample_Range_and_Mean_Charts 216
Standard_P_Chart 219
Stabilized_P_Chart 222
C_Chart 224
Procedure Calls 227

Chapter 7 Analysis of Experimental Designs 229

One-Way ANOVA 231
Two-Way ANOVA 238
ANOVA Involving Three Factors 245
Conclusion 260
T-SQL Source Code 261
ANOVA 261
Procedure Calls 275

Chapter 8 Time Series Analysis 277

Simple Moving Average 278
Single Exponential Smoothing 286
Double Exponential Smoothing 292
Incorporating Seasonal Influences 300
Criteria for Selecting the Most Appropriate Forecasting Technique 308
Conclusion 311
T-SQL Source Code 311
Simple Moving Average 312
Weighted Moving Average 315
Single Exponential Smoothing 318
Double Exponential Smoothing 322
Seasonal Adjustment 327
Procedure Calls 332

Appendix A Overview of Relational Database Structure and SQL 337

Appendix B Statistical Tables 359

Appendix C Tables of Statistical Distributions and Their Characteristics 373

Appendix D Visual Basic Routines 381

Bibliography 397

Index 399