Contents

List of Abbreviations XIII

1 Statistical Signs and Symbols 1

2 Descriptive Statistics 3

2.1 Empirical Distributions 3
2.1.1 Frequencies 3
2.1.2 Cumulative Frequencies 4

2.2 Mean Values and Measures of Dispersion 6
2.2.1 Mean Values 6
2.2.2 Measures of Dispersion 12

2.3 Ratios and Index Figures 22
2.3.1 Ratios 22
2.3.2 Index Figures 25
2.3.3 Peren-Clement Index (PCI) 38

2.4 Correlation Analysis 50

2.5 Regression Analysis 51
2.5.1 Simple Linear Regression 51
2.5.1.1 Confidence Intervals for the Regression Coefficients of a Simple Linear Regression Function 55
2.5.1.2 Student's t-Tests for the Regression Coefficients of a Simple Linear Regression Function 57
2.5.2 Multiple Linear Regression 62
2.5.2.1 Confidence Intervals for the Regression Coefficients of a Multiple Linear Regression Function 64

2.5.2.2 Student's t-Tests for the Regression Coefficients of a Multiple Linear Regression Function 66
2.5.3 Double Linear Regression 66
2.5.3.1 Confidence Intervals for the Regression Coefficients of a Double Linear Regression Function 69
2.5.3.2 Student's t-Tests for the Regression Coefficients of a Simple Linear Regression Function 71

3 Inferential Statistics **77**

3.1 Probability Calculation 77
3.1.1 Fundamental Terms/Definitions 77
3.1.2 Theorems of Probability Theory 82

3.2 Probability Distributions 88
3.2.1 Concept of Random Variables 88
3.2.2 Probability, Distribution and Density Function 89
3.2.2.1 Discrete Random Variables 89
3.2.2.2 Continuous Random Variables 90
3.2.3 Parameters for Probability Distributions 91

3.3 Theoretical Distributions 92
3.3.1 Discrete Distributions 92
3.3.2 Continuous Distributions 95

3.4 Statistical Estimation Methods (Confidence Intervals) .. 99

3.5 Determination of the Required Sample Size 102

3.6 Statistical Testing Methods 102
3.6.1 Parameter Tests 103
3.6.2 Distribution Tests (Chi-Square Tests) 106

4 Probability Calculation **111**

4.1 Terms and Definitions 111

4.2 Definitions of Probability 112
4.2.1 The Classical Definition of Probabilty 112
4.2.2 The Statistical Definition of Probability 113
4.2.3 The Subjective Definition of Probability 113
4.2.4 Axioms of Probability Calculation 114

4.3 Theorems of Probability Calculation 115
4.3.1 Theorem of Complementary Events 115
4.3.2 The Multiplication Theorem with Independence of Events 116
4.3.3 The Addition Theorem 116
4.3.4 Conditional Probability 118
4.3.5 Stochastic Independence 118
4.3.6 The Multiplication Theorem in General Form 119
4.3.7 The Theorem of Total Probability 119
4.3.8 Bayes' Theorem (Bayes' Rule) 120
4.3.9 Overview of the Probability Calculation of Mutually Exclusive and Non-Exclusive Events 123

4.4 Random Variable 124
4.4.1 The Concept of Random Variables 124
4.4.2 The Probability Function of Discrete Random Variables 124
4.4.3 The Distribution Function of Discrete Random Variables 125
4.4.4 Probability Density and Distribution Function of Continuous Random Variables 125
4.4.5 Expected Value and Variance of Random Variables 130

A Statistical Tables **135**

B Bibliography **211**

Index **219**