Table of Contents

Introduction ..... **VII**

Chapter 1: Concept of Research and Data Types in Research Analytics **1**

1.1 Research Process 2
1.2 Data and Related Concepts 3
1.3 Types of Data 4
1.3.1 Primary and Secondary Data 5
1.3.2 Data in Qualitative Research 6
1.3.3 Data in Quantitative Research 6
1.3.4 Other Types of Data 9
1.4 Data Dictionary 10
1.5 Statistical Software for Data Analysis 10
1.6 Summary 11
1.7 Exercises 11
Multiple-Choice Questions 11
Long-Answer Questions 12

Chapter 2: Reliability and Validity Analysis **13**

2.1 Meaning of Reliability and Validity 14
2.2 Reliability Analysis 14
2.2.1 Testing Internal Consistent Reliability in SPSS 16
2.2.2 Testing Inter-Rater Reliability Using Cohen's Kappa Statistics 21
2.3 Validity Analysis 24
2.3.1 Content Validity 24
2.3.2 Construct Validity 25
2.3.3 Internal and External Validity 27
2.3.4 Criterion Validity 28
2.4 Testing of Construct Validity with CFA Using AMOS Software 28
2.5 Summary 30
2.6 Exercises 31
Multiple-Choice Questions 31
Long-Answer Questions 32

Chapter 3: Data Cleaning, Imputation, and Outlier Testing 33

3.1 Concept of Data Cleaning 34
3.2 Data Imputation (for Replacing Missing Data) 36
3.2.1 Types of Missing Data 36
3.2.2 Methods for Handling Missing Data 36
3.3 Outlier Testing 37
3.3.1 Identification and Treatment of Outliers 38
3.4 Summary 50
3.5 Exercises 50
Multiple-Choice Questions 50
Long-Answer Questions 51

Chapter 4: SPSS Commands 53

4.1 Data View and Variable View 54
4.2 Compute (Using Mathematical Computations to Create New Scale Variables) 55
4.2.1 Simple Computation 56
4.2.2 Using Built-in SPSS Functions to Create a Variable 58
4.3 Select Cases – Filtering Data 58
4.4 Split File 61
4.5 Sorting Data 63
4.6 Visual Binning 64
4.7 Recode Variables 68
4.8 Merge Files 71
4.9 Commands for Import and Export of Data in SPSS 73
4.10 Summary 73
4.11 Exercises 74
Multiple-Choice Questions 74
Long-Answer Questions 74

Chapter 5: Descriptive Statistics 75

5.1 Frequency Distributions 76
5.2 Measures of Central Tendency 81
5.3 Measures of Dispersion 85
5.4 Distribution Analysis 86
5.5 Summary 89
5.6 Exercises 89

Multiple-Choice Questions ... 89
Long-Answer Questions ... 90

Chapter 6: Hypothesis Testing: An Introduction ... 91

6.1 Hypothesis and Its Types ... 92
6.2 Concept of Hypothesis Testing ... 93
6.2.1 Two Types of Errors in Hypothesis Testing ... 93
6.3 Decision Rules for Hypothesis Testing ... 94
6.4 Summary ... 95
6.5 Exercises ... 95
Multiple-Choice Questions ... 95
Long-Answer Questions ... 96

Chapter 7: Test of Difference ... 97

7.1 One-Sample T-Test ... 98
7.2 Independent-Samples T-Test ... 101
7.3 Paired-Samples T-Test ... 106
7.4 Summary ... 110
7.5 Exercises ... 110
Multiple-Choice Questions ... 110
Long-Answer Questions ... 111

Chapter 8: Analysis of Variance – One-Way ANOVA ... 113

8.1 Concept of ANOVA ... 113
8.2 Using ANOVA over T-test ... 114
8.3 Hypothesis Testing in One-Way ANOVA ... 115
8.4 Summary ... 123
8.5 Exercises ... 123
Multiple-Choice Questions ... 123
Long-Answer Questions ... 124

Chapter 9: Non-Parametric Tests ... 125

9.1 Chi-square Test: The Test of Association ... 126
9.1.1 Assumptions of Chi-square Test ... 127
9.1.2 Cross-Tabulation ... 132
9.1.3 Different Measures of Chi-square Statistics ... 133

9.2 Comparing Two Independent Conditions: Wilcoxon Rank-Sum Test and Mann-Whitney Test 135
9.3 Kruskal-Wallis Test 143
9.4 Friedman ANOVA 147
9.5 Summary 151
9.6 Exercises 152
Multiple-Choice Questions 152
Long-Answer Questions 153

Chapter 10: Correlation Analysis 155

10.1 Concept of Correlation Analysis 156
10.2 Covariance 157
10.2.1 Coefficient of Correlation 158
10.3 Non-parametric Correlation 163
10.3.1 Spearman's Coefficient of Correlation 163
10.3.2 Kendall's Tau Correlation Coefficient 164
10.4 Partial Correlation 166
10.5 Summary 170
10.6 Exercises 170
Multiple-Choice Questions 170
Long-Answer Questions 171

Chapter 11: Regression Analysis 173

11.1 Concept of Regression Analysis 174
11.1.1 Dependence and Causality 175
11.1.2 Assumptions of the Regression Model 176
11.1.3 Problems in Regression Models 177
11.2 Illustration of Regression Analysis 178
11.3 Regression Diagnostics 186
11.3.1 Tests for Multi Collinearity 187
11.3.2 Tests for Heteroscedasticity 188
11.4 Summary 189
11.5 Exercises 189
Multiple-Choice Questions 189
Long-Answer Questions 190

Chapter 12: Web Analytics: An Introduction 191

12.1 Concept of Web Analytics 191
12.1.1 Types of Web Analytics 192
12.1.2 Importance of Web Analytics Software 193
12.1.3 Using Web Analytics Reports 193
12.2 Summary 194
12.3 Exercises 195
Multiple-Choice Questions 195
Long-Answer Questions 196

Chapter 13: Dummy Regression Models 197

13.1 Regression with Dummy (Categorical) Variables 198
13.1.1 Applications of Dummy Regression Models 199
13.2 Dummy Regression Models as a Substitute for One Way ANOVA 200
13.3 Precautions While Using Dummy Variables 205
13.4 Summary 206
13.5 Exercises 206
Multiple-Choice Questions 206
Long-Answer Questions 207

Chapter 14: Logistic Regression Model 209

14.1 Linear Probability Models 210
14.1.1 Limitations of Linear Probability Model 215
14.2 Logit or Logistic Regression Model 217
14.2.1 Important Features of the Logit Model 220
14.2.2 Logistic Regression with R 228
14.3 Summary 229
14.4 Exercises 229
Multiple-Choice Questions 229
Long-Answer Questions 230

Chapter 15: Panel Data Analytics 231

15.1 An Introduction to Panel Data 232
15.1.1 Characteristics of Panel Data 234
15.1.2 Types of Variables in Panel Data 235
15.1.3 Type of Variance in the Variables of Panel Data 235

15.1.4 Advantages of Panel Data 237
15.2 Types of Panel Data Regression Models 238
15.2.1 Common Constant Model (All Coefficients are Constant across Time and Individuals) 240
15.2.2 Fixed Effect Models 240
15.2.4 Precautions in Using Fixed Effect Models 247
15.3 Random Effect Models 247
15.4 Summary 253
15.5 Exercises 253
Multiple-Choice Questions 253
Long-Answer Questions 254

Chapter 16: Structural Equation Modeling (SEM) 255

16.1 Constructs and Items 256
16.1.1 Types of Constructs 258
16.1.2 Identification Problem 260
16.1.3 Analyzing an Individual Construct 262
16.2 Confirmatory Factor Analysis (CFA) 265
16.2.1 Difference between Exploratory Factor Analyses (EFA) and Confirmatory Factor Analysis (CFA) 266
16.2.2 Differences between Confirmatory Factor Analysis (CFA) and Structured Equation Modeling (SEM) 266
16.2.3 Common Method Bias 267
16.3 Structural Equation Modelling (SEM) 268
16.3.1 Differences between SEM and Multiple Regression Models 270
16.3.2 Statistical Fitness Indices in SEM 271
16.3.3 Multivariate Assumptions in SEM 271
16.3.4 Path Analysis 274
16.3.5 Mediation Effects in Structural Models 276
16.4 Introduction to the AMOS Interface 282
16.4.1 Icons in the Amos Package 283
16.5 Summary 285
16.6 Exercises 285
Multiple-Choice Questions 285
Long-Answer Questions 287

Chapter 17: Time Series Analytics 289

17.1 Time Series Data 291
17.1.1 Features of Time Series 291
17.1.2 Trend Analysis and CAGR Calculation 293
17.1.3 Analyzing Seasonality in a Time Series 293
17.1.4 Stationary vs. Non-Stationary Time Series 294
17.1.5 Transformation of a Non-Stationary Time Series 294
17.2 Forecasting with ARIMA Modeling 295
17.2.1 Forecasting Process with an ARIMA Method 295
17.2.2 Process of forecasting using the ARIMA method 297
17.3 Example: Forecasting of WPI Series using the ARIMA Method in R 299
17.4 Summary 307
17.5 Exercises 307
Multiple-Choice Questions 307
Long-Answer Questions 308

Chapter 18: Exploratory Factor Analysis (EFA) 309

18.1 Concept and Applications of EFA 309
18.2 Applying EFA — A Case Study 310
18.3 Summary 320
18.4 Exercises 320
Multiple-Choice Questions 320
Long-Answer Questions 322

Answers to Multiple-Choice Questions 323

Index 327