Contents

1 Getting Ready for Data Analytics with R and Python 1
Introduction 1
Getting Ready for Programming Using R 2
Download and Install R and R Studio 2
Getting Started with R Studio and R Markdown File 2
An Example of an R Markdown File 6
Get Packages 10
Get Help 11
Getting Ready for Programming Using Python 11
Download and Install Python 12
An Example to Use Python Jupyter Notebook 15
Summary 16
Homework Questions 16

2 The Marketing Questions and Data Science Tools 17
Introduction to Marketing and Analytics 17
What Is Marketing? 18
What Is Data Science? 19
What Is Data Science and Marketing? 20
Two Types of Tasks for Analyzing Customers 21
The Cycles of Marketing Analytics 23
Review of Basic Statistics 24
Covariance and Correlation 26
Normal Distribution 27
Summary 30
Homework 30
Reference 30

3 Unlocking Marketing Insights with Free Data 31
Introduction 31
Building a Customer Data Infrastructure 32
External Free Data Sources for Marketing Research 33
Using APIs to Collect Data: An Example 35
Some Use Cases and Applications 38
Customer Data Protection and Regulations 39
Why Data Protection Matters 39
Key Regulatory Frameworks and Their Implications 40
Balancing Innovation and Privacy 41
Summary 42
Homework 42

4 Media Mix Modeling 43
Introduction 43
Comprehensive Overview of Marketing Channels 44
Integration and Standardization of Marketing Data Across Channels 44
Foundation for Data-Driven Marketing Decisions 45
Classification of Media Mix Models 45
Cost-Effective 46
Digital Ads Can Be Tracked 46
General Process in Building a Media Mix Model 47
Step 1: Understand the Problem and Gather the Necessary Data 47
Step 2: Develop and Test the Model 50
Step 3: Interpret the Results and Provide Suggestions 51
An Example of a Media Mix Model Using Aggregate-Level Data 52
First, Understand the Data 52
Second, Try Some Models 53
Finally, Results Interpretations 66
Summary 67
Homework 68

5 Market Segmentation and Clustering Analysis 69
Introduction 69
Common Ways to Segment the Market 70
Behavioral Segmentation and Targeting: The General Process 71
Step 1: Define the Goal 72
Step 2: Conduct the Analysis 72
Step 3: Interpret the Results 73
An Example of Behavioral Segmentation 73
Choose the Basis Variables 76

Clean the Data 77
Performing Clustering Analysis 79
K-Means Method for Clustering Analysis 80
Hierarchical Clustering 84
DBSCAN 88
Comparisons Between K-Means and DBSCAN 91
Summary 92
Homework 93
Reference 93

6 Targeting and Propensity Score Model (Part I) 95
Introduction 95
Different Types of Targeting 96
Types of Targeting Strategies 96
Dimension A: Segment- Versus Individual-Level Targeting 96
Dimension B: Targeting to Buy or Promote 98
Combine the Two Dimensions 100
Targeting with Propensity Scores 100
Step 1: Build a Logistic Regression Model 101
First, Load the Data 102
Step 2: Calculate the Propensity Scores for Potential Targets 106
Step 3: Find the Right Targets 106
Logistic Regression Model 107
Logistic Regression Versus Regression Model 107
Model Specifications 108
Interpretation of the Model Parameters 109
Summary 110
Homework 111

7 Targeting and Propensity Score Model (Part II) 113
Introduction 113
Initial Process of the Data 114
Recode the Variables to Be Numeric 115
Unbalanced Data 118
What Is Unbalanced Data? 119
Why Is This an Issue? 120
How to Deal with the Unbalanced Data? 120
Estimate the Logistic Regression Model 126
Model Fit Metrics 129
In-Sample Fit 129
Out-of-Sample Fit 132
Summary 138

Homework 139
Step 1: Read in the Data and Convert to Numerical Data 139
Step 2: Split the Data into Training and Testing Data 139
Step 3: Balance the Unbalanced Data 140
Step 4: Estimate Two Models with Different Sets of X Variables on Training Data 140
Step 5: Model Comparison Using ROC Curves and the AUC Values 140

8 Forecasting and Bass Model 141
Introduction 141
Forecasting Methods 142
Forecasting with No Data 142
Forecasting with Some Data 144
The Diffusion of Innovation Theory 145
Bass Model 146
A Brief History 147
Bass Model Setup 147
Bass Model Estimation 150
Assumptions and Limitations of the Bass Model 151
An Example of Applying the Bass Model: EV Predictions 152
Estimate the Bass Model Using Regression 153
Estimate a Regression Model, with t *as* X *Variables* 157
The Prophet Model 159
Understanding the Prophet Model 159
An Example of Applying the Prophet Model 160
Summary 163
Homework 164
References 165

9 Bayes' Theorem and Marketing Attribution 167
Introduction 167
Inverse Probability 168
Bayes' Theorem 170
Understanding Bayes' Theorem 171
Where to Find Prior Probability 173
A Numerical Example 174
Marketing Attribution 177
An Example of Marketing Attribution 177
Rule-Based Solutions 179
Model-Based Solutions 180
Summary 185
Homework 186
Reference 187

10 Bayesian Updating and Experimental Design 189
Introduction 189
What Is Probability? 189
Bayesian Updating 191
Experimental Design and Thompson Sampling 192
An Example 193
Thompson Sampling 194
Summary 202
Homework 203

11 Causal Analysis with Randomized Field Experiment 205
Introduction 205
Randomized Field Experiment 206
Running Randomized Field Experiment Using RCT 207
An Example 208
Formal Statistical Test 214
Heterogeneous Treatment Effects: Using a Regression Model 216
Summary 218
Homework 218

12 Artificial Intelligence in Marketing Analytics 219
What Is Artificial Intelligence? 219
The Birth of AI: A Historical Overview 220
The Turing Test 220
The Historical Evolution of AI: Four Key Waves 220
AI in Marketing Analytics 222
What are LLMs 222
Accessing LLMs for Marketing Applications 224
Using Gemini to Label Customer Reviews: An Example 225
Step 1: Set Up Free Access with Google AI Studio 225
Step 2: Analyze the Product Review 225
Summary 232
End of the Book 232
Homework 233
Reference 233