

Contents

Preface	xv
About the Authors	xvii
CHAPTER 1	
Introduction	1
Probability vs. Statistics	4
Overview of the Book	5
PART ONE	
<hr/>	
Descriptive Statistics	15
CHAPTER 2	
Basic Data Analysis	17
Data Types	17
Frequency Distributions	22
Empirical Cumulative Frequency Distribution	27
Data Classes	32
Cumulative Frequency Distributions	41
Concepts Explained in this Chapter	43
CHAPTER 3	
Measures of Location and Spread	45
Parameters vs. Statistics	45
Center and Location	46
Variation	59
Measures of the Linear Transformation	69
Summary of Measures	71
Concepts Explained in this Chapter	73

CHAPTER 4	
Graphical Representation of Data	75
Pie Charts	75
Bar Chart	78
Stem and Leaf Diagram	81
Frequency Histogram	82
Ogive Diagrams	89
Box Plot	91
QQ Plot	96
Concepts Explained in this Chapter	99
CHAPTER 5	
Multivariate Variables and Distributions	101
Data Tables and Frequencies	101
Class Data and Histograms	106
Marginal Distributions	107
Graphical Representation	110
Conditional Distribution	113
Conditional Parameters and Statistics	114
Independence	117
Covariance	120
Correlation	123
Contingency Coefficient	124
Concepts Explained in this Chapter	126
CHAPTER 6	
Introduction to Regression Analysis	129
The Role of Correlation	129
Regression Model: Linear Functional Relationship Between Two Variables	131
Distributional Assumptions of the Regression Model	133
Estimating the Regression Model	134
Goodness of Fit of the Model	138
Linear Regression of Some Nonlinear Relationship	140
Two Applications in Finance	142
Concepts Explained in this Chapter	149

CHAPTER 7	
Introduction to Time Series Analysis	153
What Is Time Series?	153
Decomposition of Time Series	154
Representation of Time Series with Difference Equations	159
Application: The Price Process	159
Concepts Explained in this Chapter	163
PART TWO	
Basic Probability Theory	165
CHAPTER 8	
Concepts of Probability Theory	167
Historical Development of Alternative Approaches to Probability	167
Set Operations and Preliminaries	170
Probability Measure	177
Random Variable	179
Concepts Explained in this Chapter	185
CHAPTER 9	
Discrete Probability Distributions	187
Discrete Law	187
Bernoulli Distribution	192
Binomial Distribution	195
Hypergeometric Distribution	204
Multinomial Distribution	211
Poisson Distribution	216
Discrete Uniform Distribution	219
Concepts Explained in this Chapter	221
CHAPTER 10	
Continuous Probability Distributions	229
Continuous Probability Distribution Described	229
Distribution Function	230
Density Function	232
Continuous Random Variable	237
Computing Probabilities from the Density Function	238
Location Parameters	239
Dispersion Parameters	239
Concepts Explained in this Chapter	245

CHAPTER 11**Continuous Probability Distributions with Appealing Statistical Properties 247**

Normal Distribution	247
Chi-Square Distribution	254
Student's t -Distribution	256
F -Distribution	260
Exponential Distribution	262
Rectangular Distribution	266
Gamma Distribution	268
Beta Distribution	269
Log-Normal Distribution	271
Concepts Explained in this Chapter	275

CHAPTER 12**Continuous Probability Distributions Dealing with Extreme Events 277**

Generalized Extreme Value Distribution	277
Generalized Pareto Distribution	281
Normal Inverse Gaussian Distribution	283
α -Stable Distribution	285
Concepts Explained in this Chapter	292

CHAPTER 13**Parameters of Location and Scale of Random Variables 295**

Parameters of Location	296
Parameters of Scale	306
Concepts Explained in this Chapter	321
Appendix: Parameters for Various Distribution Functions	322

CHAPTER 14**Joint Probability Distributions 325**

Higher Dimensional Random Variables	326
Joint Probability Distribution	328
Marginal Distributions	333
Dependence	338
Covariance and Correlation	341
Selection of Multivariate Distributions	347
Concepts Explained in this Chapter	358

CHAPTER 15	
Conditional Probability and Bayes' Rule	361
Conditional Probability	362
Independent Events	365
Multiplicative Rule of Probability	367
Bayes' Rule	372
Conditional Parameters	374
Concepts Explained in this Chapter	377
CHAPTER 16	
Copula and Dependence Measures	379
Copula	380
Alternative Dependence Measures	406
Concepts Explained in this Chapter	412
PART THREE	
Inductive Statistics	413
CHAPTER 17	
Point Estimators	415
Sample, Statistic, and Estimator	415
Quality Criteria of Estimators	428
Large Sample Criteria	435
Maximum Likelihood Estimator	446
Exponential Family and Sufficiency	457
Concepts Explained in this Chapter	461
CHAPTER 18	
Confidence Intervals	463
Confidence Level and Confidence Interval	463
Confidence Interval for the Mean of a Normal Random Variable	466
Confidence Interval for the Mean of a Normal Random Variable with Unknown Variance	469
Confidence Interval for the Variance of a Normal Random Variable	471
Confidence Interval for the Variance of a Normal Random Variable with Unknown Mean	474
Confidence Interval for the Parameter p of a Binomial Distribution	475

Confidence Interval for the Parameter λ of an Exponential Distribution	477
Concepts Explained in this Chapter	479
CHAPTER 19	
Hypothesis Testing	481
Hypotheses	482
Error Types	485
Quality Criteria of a Test	490
Examples	496
Concepts Explained in this Chapter	518
PART FOUR	
Multivariate Linear Regression Analysis	519
CHAPTER 20	
Estimates and Diagnostics for Multivariate Linear Regression Analysis	521
The Multivariate Linear Regression Model	522
Assumptions of the Multivariate Linear Regression Model	523
Estimation of the Model Parameters	523
Designing the Model	526
Diagnostic Check and Model Significance	526
Applications to Finance	531
Concepts Explained in this Chapter	543
CHAPTER 21	
Designing and Building a Multivariate Linear Regression Model	545
The Problem of Multicollinearity	545
Incorporating Dummy Variables as Independent Variables	548
Model Building Techniques	561
Concepts Explained in this Chapter	565
CHAPTER 22	
Testing the Assumptions of the Multivariate Linear Regression Model	567
Tests for Linearity	568
Assumed Statistical Properties about the Error Term	570
Tests for the Residuals Being Normally Distributed	570
Tests for Constant Variance of the Error Term (Homoskedasticity)	573

Absence of Autocorrelation of the Residuals	576
Concepts Explained in this Chapter	581
APPENDIX A	
Important Functions and Their Features	583
Continuous Function	583
Indicator Function	586
Derivatives	587
Monotonic Function	591
Integral	592
Some Functions	596
APPENDIX B	
Fundamentals of Matrix Operations and Concepts	601
The Notion of Vector and Matrix	601
Matrix Multiplication	602
Particular Matrices	603
Positive Semidefinite Matrices	614
APPENDIX C	
Binomial and Multinomial Coefficients	615
Binomial Coefficient	615
Multinomial Coefficient	622
APPENDIX D	
Application of the Log-Normal Distribution to the Pricing of Call Options	625
Call Options	625
Deriving the Price of a European Call Option	626
Illustration	631
REFERENCES	633
INDEX	635

<http://www.pbookshop.com>