

Table of Contents

FOUNDATIONS

Philosophical and Historical Foundations

Introduction

Nature of Science

Scientific Principles

Scientific Method

Scientific Hypotheses

Logic

Variability and Uncertainty in Investigations

Science and Statistics

Statistics and Biology

Introduction to Probability

Introduction: Models for Random Variables

Classical Probability

Conditional Probability

Odds

Combinatorial Analysis

Bayes Rule

Probability Density Functions

Introduction

Introductory Examples of pdfs

Other Important Distributions

Which pdf to Use?

Reference Tables

Parameters and Statistics

Introduction

Parameters

Statistics

OLS and ML Estimators

Linear Transformations

Bayesian Applications

Interval Estimation: Sampling Distributions, Resampling Distributions, and Simulation Distributions

Introduction

Sampling Distributions

Confidence Intervals

Resampling Distributions

Bayesian Applications: Simulation Distributions

Hypothesis Testing

Introduction

Parametric Frequentist Null Hypothesis Testing

Type I and Type II Errors

Power

Criticisms of Frequentist Null Hypothesis Testing

Alternatives to Parametric Null Hypothesis Testing

Alternatives to Null Hypothesis Testing

Sampling Design and Experimental Design

Introduction

Some Terminology

The Question Is: What Is the Question?

Two Important Tenets: Randomization and Replication

Sampling Design

Experimental Design

APPLICATIONS

Correlation

Introduction

Pearson's Correlation

Robust Correlation

Comparisons of Correlation Procedures

Regression

Introduction

Linear Regression Model

General Linear Models

Simple Linear Regression

Multiple Regression

Fitted and Predicted Values

Confidence and Prediction Intervals

Coefficient of Determination and Important Variants

Power, Sample Size, and Effect Size

Assumptions and Diagnostics for Linear Regression

Transformation in the Context of Linear Models

Fixing the Y -Intercept

Weighted Least Squares

Polynomial Regression

Comparing Model Slopes

Likelihood and General Linear Models

Model Selection

Robust Regression

Model II Regression (X Not Fixed)

Generalized Linear Models
Nonlinear Models
Smoother Approaches to Association and Regression
Bayesian Approaches to Regression

ANOVA

Introduction
One-Way ANOVA
Inferences for Factor Levels
ANOVA as a General Linear Model
Random Effects
Power, Sample Size, and Effect Size
ANOVA Diagnostics and Assumptions
Two-Way Factorial Design
Randomized Block Design
Nested Design
Split-Plot Design
Repeated Measures Design
ANCOVA
Unbalanced Designs
Robust ANOVA
Bayesian Approaches to ANOVA

Tabular Analyses

Introduction
Probability Distributions for Tabular Analyses
One-Way Formats
Confidence Intervals for p
Contingency Tables
Two-Way Tables
Ordinal Variables
Power, Sample Size, and Effect Size
Three-Way Tables
Generalized Linear Models

Appendix

References

Index

A Summary and Exercises appear at the end of each chapter.