*Data Analysis & Decision Making*, 4e

Albright, Winston, Zappe

**Table of Contents**

1. Introduction to Data Analysis and Decision Making
	1. Introduction
	2. An Overview of the Book
		1. The Methods
		2. The Software
	3. Modeling and Models
		1. Graphical Models
		2. Algebraic Models
		3. Spreadsheet Models
		4. The Seven-Step Modeling Process
	4. Conclusion

**Part I: Getting, Describing, and Summarizing Data**

1. Describing the Distribution of a Single Variable
	1. Introduction
	2. Basic Concepts
		1. Populations and Samples
		2. Data Sets, Variables, and Observations
		3. Types of Data
	3. Descriptive Measures for Categorical Variables
	4. Descriptive Measures for Numerical Variables
		1. Numerical Summary Measures
		2. Numerical Summary Measures with StatTools
		3. Charts for Numerical Variables
	5. Time Series Data
	6. Outliers and Missing Values
		1. Outliers
		2. Missing Values
	7. Excel Tables for Filtering, Sorting, and Summarizing
	8. Conclusion
2. Finding Relationships Among Variables
	1. Introduction
	2. Relationships Among Categorical Variables
	3. Relationships Among Categorical Variables and a Numerical Variable
		1. Stacked and Unstacked Formats
	4. Relationships Among Numerical Variables
		1. Scatterplots
		2. Covariance and Correlation
	5. Pivot Tables
	6. An Extended Example
	7. Conclusion

**Part II: Probability, Uncertainty, and Decision Making**

1. Probability and Probability Distributions
	1. Introduction
	2. Probability Essentials
		1. Rule of Complements
		2. Addition Rule
		3. Conditional Probability and the Multiplication Rule
		4. Probabilistic Independence
		5. Equally Likely Events
		6. Subjective Versus Objective Probabilities
	3. Distribution of a Single Random Variable
	4. An Introduction to Simulation
	5. Distribution of Two Random Variables: Scenario Approach
	6. Distribution of Two Random Variables: Joint Probability Approach
	7. Independent Random Variables
	8. Weighted Sums of Random Variables
	9. Conclusion
2. Normal, Binomial, Poisson, and Exponential Distributions
	1. Introduction
	2. The Normal Distribution
		1. Continuous Distributions and Density Functions
		2. The Normal Density
		3. Standardizing: Z-values
		4. Normal Tables and Z-values
		5. Normal Calculations in Excel
		6. Empirical Rules Revisited
	3. Applications of the Normal Distribution
	4. The Binomial Distribution
		1. Mean and Standard Deviation of the Binomial Distribution
		2. The Binomial Distribution in the Context of Sampling
		3. The Normal Approximation to the Binomial
	5. Applications of the Binomial Distribution
	6. The Poisson and Exponential Distributions
		1. The Poisson Distribution
		2. The Exponential Distribution
	7. Fitting a Probability Distribution to Data with @RISK
	8. Conclusion
3. Decision Making Under Uncertainty
	1. Introduction
	2. Elements of a Decision Analysis
		1. Payoff Tables
		2. Possible Decision Criteria
		3. Expected Monetary Value (EMV)
		4. Sensitivity Analysis
		5. Decision Trees
		6. Risk Profiles
	3. The PrecisionTree Add-In
	4. Bayes’ Rule
	5. Multistage Decision Problems
		1. The Value of Information
	6. Incorporating Attitudes Toward Risk
		1. Utility Functions
		2. Exponential Utility
		3. Certainty Equivalents
		4. Is Expected Utility Maximization Used?
	7. Conclusion

**Part III: Statistical Inference**

1. Sampling and Sampling Distributions
	1. Introduction
	2. Sampling Terminology
	3. Methods for Selecting Random Samples
		1. Simple Random Sampling
		2. Systematic Sampling
		3. Stratified Sampling
		4. Cluster Sampling
		5. Multistage Sampling Schemes
	4. An Introduction to Estimation
		1. Sources of Estimation Error
		2. Key Terms in Sampling
		3. Sampling Distribution of the Sample Mean
		4. The Central Limit Theorem
		5. Sample Size Determination
		6. Summary of Key Ideas for Simple Random Sampling
	5. Conclusion
2. Confidence Interval Estimation
	1. Introduction
	2. Sampling Distributions
		1. The t Distribution
		2. Other Sampling Distributions
	3. Confidence Interval for a Mean
	4. Confidence Interval for a Total
	5. Confidence Interval for a Proportion
	6. Confidence Interval for a Standard Deviation
	7. Confidence Interval for the Difference Between Means
		1. Independent Samples
		2. Paired Samples
	8. Confidence Interval for the Difference Between Proportions
	9. Controlling Confidence Interval Length
		1. Sample Size for Estimation of the Mean
		2. Sample Size for Estimation of Other Parameters
	10. Conclusion
3. Hypothesis Testing
	1. Introduction
	2. Concepts in Hypothesis Testing
		1. Null and Alternative Hypotheses
		2. One-Tailed Versus Two-Tailed Tests
		3. Types of Errors
		4. Significance Level and Rejection Region
		5. Significance from p-values
		6. Type II Errors and Power
		7. Hypothesis Tests and Confidence Intervals
		8. Practical Versus Statistical Significance
	3. Hypothesis Tests for a Population Mean
	4. Hypothesis Tests for Other Parameters
		1. Hypothesis Tests for a Population Proportion
		2. Hypothesis Tests for Differences Between Population Means
		3. Hypothesis Test for Equal Population Variances
		4. Hypothesis Tests for Differences Between Population Proportions
	5. Tests for Normality
	6. Chi-Square Test for Independence
	7. One-Way ANOVA
	8. Conclusion

**Part IV: Regression, Forecasting, and Time Series**

1. Regression Analysis: Estimating Relationships
	1. Introduction
	2. Scatterplots: Graphing Relationships
		1. Linear Versus Nonlinear Relationships
		2. Outliers
		3. Unequal Variance
		4. No Relationship
	3. Correlations: Indicators of Linear Relationships
	4. Simple Linear Regression
		1. Least Squares Estimation
		2. Standard Error of Estimate
		3. The Percentage of Variation Explained: *R*2
	5. Multiple Regression
		1. Interpretation of Regression Coefficients
		2. Interpretation of Standard Error of Estimate and *R*2
	6. Modeling Possibilities
		1. Dummy Variables
		2. Interaction Variables
		3. Nonlinear Transformations
	7. Validation of the Fit
	8. Conclusion
2. Regression Analysis: Statistical Inference
	1. Introduction
	2. The Statistical Model
	3. Inferences About the Regression Coefficients
		1. Sampling Distribution of the Regression Coefficients
		2. Hypothesis Tests for the Regression Coefficients
		3. A Test for the Overall Fit: The ANOVA Table
	4. Multicollinearity
	5. Include/Exclude Decisions
	6. Stepwise Regression
	7. The Partial F Test
	8. Outliers
	9. Violations of Regression Assumptions
		1. Nonconstant Error Variance
		2. Nonnormality of Residuals
		3. Autocorrelated Residuals
	10. Prediction
	11. Conclusion
3. Time Series Analysis and Forecasting
	1. Introduction
	2. Forecasting Methods: An Overview
		1. Extrapolation Methods
		2. Econometric Methods
		3. Combining Forecasts
		4. Components of Time Series Data
		5. Measures of Accuracy
	3. Testing for Randomness
		1. The Runs Test
		2. Autocorrelation
	4. Regression-Based Trend Models
		1. Linear Trend
		2. Exponential Trend
	5. The Random Walk Model
	6. Autoregression Models
	7. Moving Averages
	8. Exponential Smoothing
		1. Simple Exponential Smoothing
		2. Holt’s Model for Trend
	9. Seasonal Models
		1. Winters’ Exponential Smoothing Model
		2. Deseasonalizing: The Ratio-to-Moving-Averages Method
		3. Estimating Seasonality with Regression
	10. Conclusion

**Part V: Decision Modeling**

1. Introduction to Optimization Modeling
	1. Introduction
	2. Introduction to Optimization
	3. A Two-Variable Product Mix Model
	4. Sensitivity Analysis
		1. Solver’s Sensitivity Report
		2. SolverTable Add-In
		3. Comparison of Solver’s Sensitivity Report and SolverTable
	5. Properties of Linear Models
		1. Proportionality
		2. Additivity
		3. Divisibility
		4. Discussion of the Linear Properties
		5. Linear Models and Scaling
	6. Infeasibility and Unboundedness
		1. Infeasibility
		2. Unboundedness
		3. Comparison of Infeasibility and Unboundedness
	7. A Larger Product Mix Model
	8. A Multiperiod Production Model
	9. A Comparison of Algebraic and Spreadsheet Models
	10. A Decision Support System
	11. Conclusion
2. Optimization Modeling: Applications
	1. Introduction
	2. Worker Scheduling Models
	3. Blending Models
	4. Logistics Models
		1. Transportation Models
		2. Minimum Cost Network Flow Models
	5. Aggregate Planning Models
	6. Financial Models
	7. Integer Programming Models
		1. Capital Budgeting Models
		2. Fixed-Cost Models
		3. Set-Covering Models
	8. Nonlinear Models
		1. Basic Ideas of Nonlinear Optimization
		2. Managerial Economics Models
		3. Portfolio Optimization Models
	9. Conclusion
3. Introduction to Simulation Modeling
	1. Introduction
	2. Probability Distributions for Input Variables
		1. Types of Probability Distributions
		2. Common Probability Distributions
		3. Using @RISK to Explore Probability Distributions
	3. Simulation and the Flaw of Averages
	4. Simulation with Built-In Excel Tools
	5. Introduction to @RISK
		1. @RISK Features
		2. Loading @RISK
		3. @RISK Models with a Single Random Input Variable
		4. Some Limitations of @RISK
		5. @RISK Models with Several Random Input Variables
	6. The Effects of Input Distributions on Results
		1. Effect of the Shape of the Input Distribution(s)
		2. Effect of Correlated Input Variables
	7. Conclusion
4. Simulation Models
	1. Introduction
	2. Operations Models
		1. Bidding for Contracts
		2. Warranty Costs
		3. Drug Production with an Uncertain Yield
	3. Financial Models
		1. Financial Planning Models
		2. Cash Balance Models
		3. Investment Models
	4. Marketing Models
		1. Models of Customer Loyalty
		2. Marketing and Sales Models
	5. Simulating Games of Chance
		1. Simulating the Game of Craps
		2. Simulating the NCAA Basketball Tournament
	6. An Automated Template for @RISK Models
	7. Conclusion

**Extra Chapter Available on the Web**

1. Importing Data into Excel
	1. Introduction
	2. Rearranging Excel Data
	3. Importing Text Data
	4. Importing Relational Database Data
		1. A Brief Introduction to Relational Databases
		2. Using Microsoft Query
		3. SQL Statements
	5. Web Queries
	6. Cleansing the Data
	7. Conclusion

Visit the [Cengage](http://www.cengage.com/decisionsciences/albright) site for our books.

Send e-mail to albright@indiana.edu

Albright is retired from the [Kelley School of Business, Indiana University, Bloomington](http://www.kelley.indiana.edu/) and now works as a consultant for [Palisade Corp](http://www.palisade.com/).

Back to [home page](file:///C%3A%5CUsers%5Cchris%5CDropbox%5CMy%20Books%5CWeb%20Site%5Cdefault.htm)

Updated: 1/13/2015