

table of contents

preface xi

CHAPTER 1

model building: the tie between theory and data 1

What a Mathematical Model Is 2

Models in Sociological Theory 2, Models in Data Analysis 3,
Models in Mathematical Form 4

The Theory-Model-Data Triangle 9

Mapping 11, Two Approaches to Mathematical Form 12,
Four Types of Models 14

Some Comments on the Uses of Mathematics in Sociology 15

Benefits of Mathematical Sociology, or Why Bother? 15,
Costs of Mathematical Sociology: Is It Really Worth It? 17

CHAPTER 2

a power-function model of status 20

| | |
|---|----|
| Translation into Mathematics | 22 |
| Questions About the Choice of the Model | 22 |
| Development and Tests of the Model | 24 |
| Extensions of the Model | 29 |
| Evaluating the Model | 32 |
| Conclusions: Benefits and Costs of Mathematics | 35 |
| Problems | 36 |

CHAPTER 3

the distribution of acts in small groups 38

| | | | |
|------------------------------------|-----|----------------------|-----|
| Translation into Mathematics | 40, | Developing the Model | 42, |
| Evaluating and Extending the Model | 44 | | |
| Problems | 51 | | |

CHAPTER 4

graphs, matrices, and structural balance 53

| | | | |
|--|-----|--------------------------------|-----|
| Translation into Mathematics | 55 | | |
| Formalization of the Theory | 55, | Basic Concepts of Graph Theory | 56, |
| Translating from Theory to Model | 58, | Development of the Model | 58 |
| Other Mathematical Representations of | | | |
| Balanced Structures | 61 | | |
| Matrix Representation | 61, | | |
| Set-Theory Representation of Balanced Structures | 64 | | |

Tests and Extensions of the Model 65

Application to Sociometric Data 65, Modifications of the Model 66

Evaluating the Model 72**Problems 74**

CHAPTER 5

kinship and clique structures 75**Kinship Structure Models 76**The Substantive Problem 76, Translating from Data to Model 78,
Development of the Model 81, Testing the Model 84,
Evaluation of the Model 84**Analyzing Cliques and Status Structures 85**The Substantive Problem 86, Translation into Mathematics 86,
Developing the Model 89, Evaluating the Model 92**Summary 93****Problems 94**

CHAPTER 6

identifying causes in structures 98**Marginal Analysis Using Partial Differential
Equations 99**Translation into Mathematics 99, Moving from Theory to Model 101,
Translation into Mathematics 101,
Substantive Extensions of the Model 105, Evaluating the Model 107**Some Final Notes on Structure Models 110****Problems 116**

CHAPTER 7

time series data and diffusion 117

Curve Fitting with Time Series Data 118

Translation into Mathematics 122, Estimation of Parameters 125,
Interpreting the Model 126

Process Models: Diffusion 128

Translation into Mathematics 129,
Further Development of the Model 135

Problems 138

CHAPTER 8

computer simulation and renewal processes 140

A Computer Simulation of Interpersonal Choice 140

Translation into Mathematics 144,
Testing and Extending the Model 149,
Incorporating the Idea of Social Pressure 151,
A "No-Host" Model 153, A Final Attempt 154,
Other Implications and Other Models 156

A Model of Birth Control Processes 158

The Substantive Problem 158, Translation into Mathematics 158,
Efficiency of Abortion as Birth Control 161,
General Use of the Model 162

Problems 163

CHAPTER 9

markov processes and occupational mobility 165

A Brief Introduction to Markov Processes 165

Ways of Representing Markov Processes 166,
Aggregation and Equilibrium 169

Markov Models of Mobility 171

Developing the Model 172, Estimating the Parameters 173,
 Revising the Model 176, Development of the Revised Model 177,
 Estimating Parameters 178, Testing the Model 180,
 McFarland's Mobility Model 182

Problems 185

CHAPTER 10

value conflict in two-person interaction 187

Theory and Data 188

Experimental Procedure 188, Results 190,
 Translation into Mathematics 192, Estimating the Parameters 193,
 Test of the Model 194

Revised Model 195

Estimating the Parameters 198, Testing the Model 201,
 Interpreting the Values of the Parameters 201,
 Evaluating the Model 203

Problems 204**Appendix to Chapter 10 205**

CHAPTER 11

discrete-state continuous time models 208

Translation into Mathematics 210

Estimating Parameters 215

Panel Data 215, Cross-sectional Data 220

Comments on the Model 224**Problems 224**

CHAPTER 12

working with mathematical models 225

Questions about Variables 227

Order 227, Continuity 228, Level 229, Randomness 230,
Treatment of Time 231

Questions about Relationships 232

Causality 232, Form 233

Key Questions for Model Building 235

General Philosophical Considerations 236

Inspiration for the Model Builder 238

index 239