

# Contents

## 1

### INTRODUCTION

1

## 2

### AXIOMS AND THEOREMS

10

Covariance Statements 12

A Resolution 17

A More Complex Example with Feedback 21

## 3

### RECASTING VERBAL THEORIES AS CAUSAL MODELS

27

Typologies 30

Inventories of Causes 35

Inventories of Effects 41

Simple Chains and Loops 43

## 4

### *STATIC FORMULATIONS AND IDENTIFICATION PROBLEMS* 48

- Identification of Supply and Demand Equations 50
- A General Linear Model 59
- Additional Examples 66
- Block-Recursive Systems 71
- Concluding Remarks 74

## 5

### *SINGLE-EQUATION DYNAMIC MODELS* 76

- The Nature of Dynamic Models 77
- Lagged Endogenous Variables and Difference Equations 78
- Differential Equations 88
- Estimation with Least Squares 97

## 6

### *SIMULTANEOUS-EQUATION DYNAMIC MODELS* 100

- Theoretical Specification of Feedback Relationships 102
- Stability Conditions 106
- Illustrations 126
- Concluding Remarks 139

## 7

### *GENERALIZATIONS AND LEVELS OF ABSTRACTION* 141

- The Element-Class Perspective 142
- The Class-Subclass Perspective 144
- The Indicator Perspective 151

## APPENDIX:

**A****THEORY BUILDING AND THE STATISTICAL CONCEPT  
OF INTERACTION** 155

First-order Interactions: Multiplicative Models	156
Higher-order Interactions: Atkinson's Motivation Model	162
Concluding Remarks	164

## APPENDIX:

**B****SOME ELEMENTARY CALCULUS** 166**INDEX** 178