COMPUTER-ASSISTED ANALYSIS
AND MODEL SIMPLIFICATION

Edited by
HARVEY J. GREENBERG
Energy Information Administration
Washington, D.C.
JOHN S. MAYBEE
Department of Mathematics
University of Colorado
Boulder, Colorado

ACADEMIC PRESS 1981
A Subsidiary of Harcourt Brace Jovanovich, Publishers
New York London Toronto Sydney San Francisco
CONTENTS

Contributors ix
Preface xi

On Organizing Analysis 1
George M. Lady

The Scope of Computer-Assisted Analysis and Model Simplification 17
Harvey J. Greenberg

Technical Summary 27

SESSION 1 STRUCTURAL MODELING 31
Frank Harary, Chairman

Structural Models and Graph Theory
Frank Harary 59

Structural Models and Graph Theory
Fred S. Roberts 59

Learning through Model Building
John N. Warfield 69

Notes on Networks and Mini-Models
David Nissen 79

Discussion 103

SESSION II QUALITATIVE STABILITY ANALYSIS 113
James Quirk, Chairman

Qualitative Stability of Matrices and Economic Theory: A Survey Article
James Quirk 113

Some Structural Aspects of Economic Models
Richard W. Ruppert 165

Comments on James Quirk’s Article
W. M. Gorman 175
Comments on "Qualitative Stability of Matrices and Economic Theory: A Survey Article" by James Quirk
Eli Hellerman
Discussion

SESSION III QUALITATIVE DETERMINACY AND EXTENSION
John Maybee, Chairman

Sign Solvability
John S. Maybee

Maybee's "Sign Solvability"
Kelvin Lancaster

Particularizing the Generality of Economic Analysis
Stedman B. Noble

Qualitative Matrices: Strong Sign-Solvability and Weak Satisfiability
Victor Klee and Richard Ladner
Discussion

SESSION IV EMBEDDED STRUCTURES
Robert Bixby, Chairman

Hidden Structure in Linear Programs
Robert E. Bixby

Creating Network Structure in LPs
Fred Glover

Automatic Identification of Embedded Structure in Large-Scale Optimization Models
Gerald G. Brown and William G. Wright

Some Comments on Hidden Structure in Linear Programs
Linus Schrage
Discussion

SESSION V QUERY SYSTEMS
Jack Minker, Chairman

Logical Inference as an Aid to Analysis in Large Databases
Jack Minker
# CONTENTS

Query Systems for Linear Programming Models  
*James E. Kalan*  
431  
How Query Systems Can Simplify Models and Aid Analysis  
*Richard P. O'Neill*  
437  
Comments on "Logical Inference as an Aid to Analysis in Large Databases" by Jack Minker  
*J. A. Tomlin*  
443  
Discussion  
447

**APPENDIX 1** IMPLEMENTATION ASPECTS OF MODEL MANAGEMENT: A FOCUS ON COMPUTER-ASSISTED ANALYSIS  
Harvey J. Greenberg  
455

**APPENDIX 2** GRAPH-THEORETIC FOUNDATIONS OF COMPUTER-ASSISTED ANALYSIS  
Harvey J. Greenberg, J. Richard Lundgren, and John S. Maybee  
481

**APPENDIX 3** MEASURING COMPLEMENTARITY AND QUALITATIVE DETERMINACY IN MATRICIAL FORMS  
Harvey J. Greenberg  
497