

Phoebus J. Dhrymes

Mathematics for Econometrics

Second Edition



Springer-Verlag

New York Berlin Heidelberg Tokyo

Contents

Chapter 1

Vectors and Vector Spaces 1

1.1 Complex Numbers	1
1.2 Vectors	4
1.3 Vector Spaces	6

Chapter 2

Matrix Algebra 8

2.1 Basic Definitions	8
2.2 Basic Operations	10
2.3 Rank and Inverse of a Matrix	12
2.4 Hermite Forms and Rank Factorization	18
2.5 Trace and Determinants	23
2.6 Computation of the Inverse	32
2.7 Partitioned Matrices	34
2.8 Kronecker Products of Matrices	40
2.9 Characteristic Roots and Vectors	43
2.10 Orthogonal Matrices	55
2.11 Symmetric Matrices	58
2.12 Indempotent Matrices	65
2.13 Semidefinite and Definite Matrices	66

Chapter 3

Linear Systems of Equations and Generalized Inverses of Matrices 81

- 3.1 Introduction 81
- 3.2 Conditional, Least Squares, and Generalized Inverses of Matrices 82
- 3.3 Properties of the Generalized Inverse 85
- 3.4 Solutions of Linear Systems of Equations and Pseudoinverses 92
- 3.5 Approximate Solutions of Systems of Linear Equations 96

Chapter 4

Vectorization of Matrices and Matrix Functions: Matrix Differentiation 102

- 4.1 Introduction 102
- 4.2 Vectorization of Matrices 102
- 4.3 Vector and Matrix Differentiation 107

Chapter 5

Systems of Difference Equations with Constant Coefficients 126

- 5.1 The Scalar Second-order Equation 126
- 5.2 Vector Difference Equations 133
- 5.3 An Application to the General Linear Structural Econometric Model (GLSEM) 136

Addendum 142

Bibliography 146

Index 148