

Contents

1	Introduction	11
2	Model and Modeling	17
2.1	System	17
2.2	Model	18
2.3	Modelling	19
2.4	Simulation	20
2.5	General Procedure for Creating a Model	21
2.6	Various Forms of Models	22
2.7	Classification of Mathematical Models	23
2.8	Dynamic Systems and Dynamic Models	28
3	Economics Modelling	33
3.1	Nature of Economic Models	33
3.2	The Need for Economic Modelling	34
3.3	Models and Modelling in Economics	34
3.4	Limitations of Mathematical Models in Economics	37
3.5	Role of Mathematics in Economics	37
4	History of Mathematical Models in Economics	41
4.1	Early History	41
4.2	Growth of Mathematical Models in Economics	42
4.3	Role of Nobel Foundation and Nobel Institutions in the Promotion of Mathematical Treatment of Economics	45
5	Mathematical Instruments	47
5.1	Linear Case I	52
5.2	Linear Case II	58
5.3	Nonlinear Case	63
5.4	Examples of Numerical Solutions of Selected Economic Problems	69
6	Models	71
6.1	Dynamic Model of New Product Launch Impact on Stock Market Par- ticipants	71
6.2	Hysteretic Model of Phillips Curve	74
6.3	Microeconomic Nonlinear Dynamical Model of the Production, Ware- housing and Sale	77
6.4	Shipbuilding Cycle	79

6.5	The Dynamic Model of E-government System Development	81
6.6	Walras Dynamic Model with the Influence of History	83
6.7	Inventory Balance Model	86
6.8	The Dynamic Financial System	88
6.9	Model of E-commerce Behaviour	90
6.10	Economic Growth Model with Endogenous Carrying Capacity	92
6.11	Economic Growth Model with Endogenous Labor Shift under Dual Economy	95
6.12	Delay Differential Neoclassical Growth Model	97
6.13	Note on Goodwin's 1951 Nonlinear Accelerator Model With an Invest- ment Delay	100
6.14	Kaldor – Kalecki Business Cycle Model	103
6.15	Open AK Economy	106
6.16	Time-to-build and Cycles	109
6.17	Market Equilibrium Model	112
6.18	Kalecki's Business Cycle Model	113
6.19	Solow Vintage Capital Growth Model with Variable Delay	115
6.20	Goodwin Model with Investment Lag	117
6.21	Delay Nonlinear Cournot Model	119
6.22	Time Delay System in a Polluted Environment	120
6.23	Delayed-Energy-Based model of capital accumulation	122
6.24	Class of Delayed Economic Model	124
6.25	Hybrid Bioeconomic System with Delay	126
6.26	Modified Ramsey Model with Delay and Random Perturbations	128