

Contents

1	Elements of Parametric Control Theory of Market Economic Development.....	1
1.1	Components of Parametric Control Theory of Market Economic Development.....	1
1.2	Methods of Analysis of the Stability and Structural Stability of Mathematical Models of National Economic Systems.....	3
1.2.1	Development of the Methods for Evaluating Stability Indicators of Mathematical Models.....	3
1.2.2	Development of Methods for Evaluating Weak Structural Stability of a Discrete-Time Dynamical System (Semi-cascade) Based on the Robinson Approach.....	6
1.3	Approach to Synthesis and Choice (in the Environment of a Given Finite Set of Algorithms) of Optimal Laws of Parametric Control of a National Economic System's Development. Existence Conditions for a Solution to Respective Variational Calculus Problems. Conditions of Influence of Uncontrolled Parameters to These Problems.....	9
1.3.1	Analysis of the Existence Conditions for a Solution of the Variational Calculus Problem of Synthesis and Choice (in the Environment of a Given Finite Set of Algorithms) of Optimal Laws of Parametric Control of a Continuous-Time Deterministic Dynamical System.....	9
1.3.2	Analysis of the Existence Conditions for a Solution of the Variational Calculus Problem of Synthesis and Choice (in the Environment of a Given Finite Set of Algorithms) of Optimal Laws of Parametric Control of a Discrete-Time Deterministic Dynamical System.....	13

1.3.3	Analysis of the Existence Conditions for a Solution of the Variational Calculus Problem of Synthesis and Choice (in the Environment of a Given Finite Set of Algorithms) of Optimal Laws of Parametric Control of a Discrete-Time Stochastic Dynamical System	16
1.3.4	Analysis of the Influence of Uncontrolled Parameter Variations (Parametric Disturbances) on the Solution of the Variational Calculus Problem of Synthesis and Choice of Optimal Parametric Control Laws.....	19
1.4	Algorithm of Application of Parametric Control Theory and Rules of Interaction Between Persons Making Decisions on Elaboration and Realization of the Effective State Economic Policy on the Basis of an Information System for Decision-Making Support	23
1.4.1	Algorithm of the Application of Parametric Control Theory.....	23
1.4.2	Rules of Interaction for Decision Makers on the Formulation and Implementation of an Effective Public Economic Policy Based on the Information Decision Support System	24
1.5	Examples for Application of Parametric Control Theory	36
1.5.1	Mathematical Model of the Neoclassical Theory of Optimal Growth.....	36
1.5.2	One-Sector Solow Model of Economic Growth.....	42
1.5.3	Richardson Model for the Estimation of Defense Costs	46
1.5.4	Mathematical Model of a National Economic System Subject to the Influence of the Share of Public Expense and the Interest Rate of Government Loans on Economic Growth	50
1.5.5	Mathematical Model of the National Economic System Subject to the Influence of International Trade and Currency Exchange on Economic Growth.....	70
1.5.6	Forrester's Mathematical Model of Global Economy.....	83
1.5.7	Turnovsky's Monetary Model	91
1.5.8	Endogenous Jones's Model	98

2	Methods of Macroeconomic Analysis and Parametric Control of Equilibrium States in a National Economy	117
2.1	Macroeconomic Analysis of a National Economic State Based on IS, LM, and IS-LM Models, Keynesian All-Economy Equilibrium. Analysis of the Influence of Instruments on Equilibrium Solution	118
2.1.1	Construction of the IS Model and Analysis of the Influence of Economic Instruments.....	118
2.1.2	Macroeconomics of Equilibrium Conditions in the Money Market.....	121
2.1.3	Macroestimation of the Mutual Equilibrium State in Wealth and Money Markets. Analysis of the Influence of Economic Instruments.....	124
2.1.4	Macroestimation of the Equilibrium State on the Basis of the Keynesian Model of Common Economic Equilibrium. Analysis of the Influence of Economic Instruments.....	125
2.1.5	Parametric Control of an Open Economic State Based on the Keynesian Model.....	127
2.2	Macroeconomic Analysis and Parametric Control of the National Economic State Based on the Model of a Small Open Country.....	129
2.2.1	Construction of the Model of an Open Economy of a Small Country and Estimation of Its Equilibrium Conditions.....	129
2.2.2	Influence of Economic Instruments on Equilibrium Solutions and Payment Balance States	136
2.2.3	Parametric Control of an Open Economy State Based on a Small Country Model	139
3	Parametric Control of Cyclic Dynamics of Economic Systems	141
3.1	Mathematical Model of the Kondratiev Cycle.....	141
3.1.1	Model Description	141
3.1.2	Estimating the Robustness of the Kondratiev Cycle Model Without Parametric Control.....	143
3.1.3	Parametric Control of the Evolution of Economic Systems Based on the Kondratiev Cycle Model	144
3.1.4	Estimating the Structural Stability of the Kondratiev Cycle Mathematical Model with Parametric Control	147
3.1.5	Analysis of the Dependence of the Optimal Value of Criterion K on the Parameter for the Variational Calculus Problem Based on the Kondratiev Cycle Mathematical Model	147

3.2	Goodwin Mathematical Model of Market Fluctuations of a Growing Economy	147
3.2.1	Model Description	147
3.2.2	Analysis of the Structural Stability of the Goodwin Mathematical Model Without Parametric Control	149
3.2.3	Problem of Choosing Optimal Parametric Control Laws on the Basis of the Goodwin Mathematical Model	150
3.2.4	Analysis of the Structural Stability of the Goodwin Mathematical Model with Parametric Control	153
3.2.5	Analysis of the Dependence of the Optimal Parametric Control Law on Values of the Uncontrolled Parameter of the Goodwin Mathematical Model	156
4	Macroeconomic Analysis and Parametric Control of Economic Growth of a National Economy Based on Computable Models of General Equilibrium	157
4.1	National Economic Evolution Control Based on a Computable Model of General Equilibrium of Economic Branches	158
4.1.1	Model Description, Parametric Identification, and Retrospective Prediction	158
4.1.2	Macroeconomic Analysis on the Basis of the Computable Model of General Equilibrium of Economic Branches	175
4.1.3	Finding Optimal Parametric Control Laws on the Basis of the CGE Model of Economic Branches	205
4.2	National Economic Evolution Control Based on the Computable Model of General Equilibrium with the Knowledge Sector.....	211
4.2.1	Model Description, Parametric Identification, and Retrospective Prediction	211
4.2.2	Estimation of the Macroeconomic Theory Provisions on the Basis of the Computable Model of General Equilibrium with the Knowledge Sector	236
4.2.3	Finding Optimal Parametric Control Laws Based on the CGE Model with the Knowledge Sector.....	238

4.3	National Economic Evolution Control Based on the Computable Model of General Equilibrium with the Shady Sector.....	242
4.3.1	Model Description, Parametric Identification, and Retrospective Prediction	242
4.3.2	Finding the Optimal Values of the Adjusted Parameters on the Basis of the CGE Model in the Shady Sector	268
5	Conclusion	273
	References	275
	About The Authors	279
	Index	281

Macroeconomic Analysis and Parametric Control of a
National Economy

Ashimov, A.A.; Sultanov, B.T.; Adilov, Z.M.; Borovskiy,
Y.V.; Novikov, D.A.; Alshanov, R.A.; Ashimov, A.A.

2013, X, 290 p., Hardcover

ISBN: 978-1-4614-4459-6