KLAIPEDA UNIVERSITY

INTERNATIONAL SCIENTIFIC CONFERENCE

TRANSFORMATION PROCESSES OF THE ECONOMIC SYSTEM IN THE CONTEXT OF MODERN CHALLENGES

February 2-3, 2024

Proceedings of the Conference

IZDEVNIECĪBA
BALTIJA
PUBLISHING

UDK 33(062)
Tr165

Organising Committee

Rimantas Stašis	Professor, Dr. of Economics, Head of Management Department, Klaipeda University, Lithuania.
Algirdas Giedrtaitis	Associate Prof., Dr. of Economics, Professor of Management Department, Klaipeda University, Lithuania.
Jan Žukovskis	Associate Prof., Dr. of Economics, Head of Business and Rural Development Management Institute, Aleksandras Stulginskis University, Kaunas, Lithuania.
Lina Pileliene	Professor, Dr. of Economics, Vytautas Magnus University, Kaunas, Lithuania.
Yuliya Bogoyavlenska	Ph.D, Assistant Professor in Economy, Department of Personnel Management and Labour Economics Zhytomyr State Technological University, Ukraine.
Kostiantyn Shaposhnykov	Professor, Dr. of Economics, Honored Worker of Science and Technology of Ukraine, Head of the Research and Certification of Scientific Personnel Department, SSI "Institute of Education Context Modernization", Ukraine.
Olga Chwiej	Associate Professor, Dr. of Economics, freelancer scientist, Poland.
Oleh Holovko	PhD, Head of the Black Sea Scientific Research Institute of Economics and Innovation, Ukraine.

International Scientific Conference **Transformation processes of the economic system in the context of modern challenges** : Conference Proceedings (February 2–3, 2024. Klaipeda, Lithuania). Riga, Latvia : Baltija Publishing, 292 pages.

ISBN: 978-9934-26-398-9

DOI: https://doi.org/10.30525/978-9934-26-398-9

© Izdevniecība "Baltija Publishing", 2024
© Klaipeda University, 2024
© Authors of the articles, 2024

Contents

ECONOMY

Serhii Arkhypenko, Olena Tsvirko
PARTICIPATION OF UKRAINE IN EUROPEAN TRANSPORT INFRASTRUCTURE PROJECTS 1

Antonina Bazyliuk, Volodymyr Gubenko
FORMATION OF INVESTMENT STRATEGY FOR THE POST-WAR RECOVERY OF ENTERPRISE 4

Tymur Biriukov, Liudmyla Bukharina
ANALYSIS OF EFFICIENCY OF ENVIRONMENTAL TAX MAIN FUNCTIONS PERFORMING IN UKRAINE WITH THE PURPOSE OF ENVIRONMENTAL AND ECONOMIC STATE SECURITY ENSURING 8

Tetiana Bitkova, Kyrylo Manakhov
CURRENT STATE OF RENEWABLE ENERGY SOURCES USE. EFFICIENCY ANALYSIS BASED ON SYSTEM DYNAMICS CONCEPT 13

Larysa Bogush
UNDECLARED WORK IN UKRAINE: IDENTIFICATION FEATURES, REGULATION PRIORITIES 17

Olha Voitenko
CULTURAL SERVICES IN ECONOMIC CONCEPTS 21

Oleksiy Habrylevych
EVALUATION OF INVESTMENT RISK FACTORS 24

Veronika Komandrovska
STATE REGULATION OF INNOVATION ENSURING FOR SUSTAINABLE ENTERPRISE DEVELOPMENT 28

Valeriia Kornivska
SMART CONTRACTS IN THE CONTEXT OF INSTITUTIONAL ANALYSIS 32

Nataliia Valinkevych, Marina Kotsenko
FEATURES OF THE FORMATION OF COMPETITIVE ADVANTAGES OF ORGANIC PRODUCTS IN COMMODITY MARKETS 35

Vladyslav Lazarenko
CURRENT CONCEPT OF THE ORGANIZATIONAL AND ECONOMIC MECHANISM OF ECOLOGICAL MARKETING IN THE CONDITIONS OF WAR IN UKRAINE 40

Ihor Lebedyev
RESULTS OF THE FIRST STAGE
OF IMPLEMENTATION OF THE PROGRAM
"SUSTAINABLE DEVELOPMENT GOALS: UKRAINE" 43

Lyudmyla Malyarets, Anatoly Voronin, Stepan Lebediev
MATHEMATICAL MODEL OF THE DYNAMICS
OF THE INTERACTION OF GOODS PRICES
ON ADJACENT MARKETS: THE PROBLEM OF LIMIT CYCLES..... 47

Volodymyr Mishchenko
DEVELOPMENT OF TECHNOLOGIES
FOR THE SPATIO-TEMPORAL DIMENSION OF THE METAVERSE 51

Oleksandr Piriashvili
DIRECTIONS OF DEEPENING
THE CONVERGENCE PROCESSES OF THE RAIL TRANSPORT
PRODUCTIVITY OF UKRAINE WITH THE EU 55

Olena Pohorielova
FOOD SYSTEM ACTIVITY:
COMPONENTS AND DRIVERS OF INTERACTION 59

Andrii Stasiuk
MODERN MIGRATION PROCESSES IN THE WORLD..... 63

Danylo Cherevatskyi, Oksana Bojko, Vitaliy Bash
HUMAN LABOR ENERGY IN THE PRODUCTION PROCESS 66

Liudmyla Shatalova
THE INFLUENCE OF MODERN TECHNOLOGIES
ON THE MOTIVATION PARADIGM 69

Arsenii Yanovych
RESOURCE RESTRICTION
AS A DETERMINANT OF REGIONAL POLICY FORMATION
UNDER THE CONDITIONS
OF UKRAINE POST-WAR RECONSTRUCTION..... 72

Oleh Yaremenko
SOCIO-ECONOMIC IDENTITY IN THE CONTEXT
OF THE CONCEPT OF NATIONALLY ROOTED DEVELOPMENT 75

HOTEL, CATERING BUSINESS AND TOURISM

Mira Hakova
MONITORING OF MOTIVATIONAL NEEDS
OF MOTIVATIONAL NEEDS OF THE STAFF
OF HOTEL AND RESTAURANT ENTERPRISES..... 79

Iryna Davydenko
STRATEGIC PLANNING
OF TOURIST DESTINATIONS DEVELOPMENT 83

Tetiana Kolisnychenko, Liudmyla Kiurcheva
STRUCTURAL FEATURES OF STATE REGULATION
OF THE QUALITY OF RESTAURANT SERVICES IN UKRAINE 86

Oksana Morhulets, Olena Nyshenko, Oleg Shevchenko
THE ROLE OF SOCIAL INTERACTION
AND INTERCULTURAL COMMUNICATION IN TOURISM..... 90

Tetyana Petruk
ECONOMIC-MATHEMATICAL MODELLING
AS MEANS OF MANAGEMENT OPTIMIZATION
IN TOURISM INDUSTRY 94

Natalia Tubaltseva, Natalia Hryshyna, Diana Bondarenko
THE INFLUENCE OF DIGITALIZATION
ON TRANSFORMATION PROCESSES IN THE FIELD OF SERVICES 98

SOCIAL WELFARE

Liudmyla Kozarezenko
CURRENT TRENDS IN SOCIAL PROTECTION FINANCING
IN EU MEMBER COUNTRIES AND UKRAINE 101

Anastasiia Shliaha
THE ROLE OF SOCIAL ADAPTATION OF PERSONS DISCHARGED
OR RELEASED FROM MILITARY SERVICE..... 106

ACCOUNTING AND TAXATION

Svitlana Travinska
IMPLEMENTING THE SYSTEMIC EU DIRECTIVE ON VAT
INTO THE LEGISLATION OF UKRAINE 109

FINANCE, BANKING AND INSURANCE

Yevheniya Andrushchak, Alina Herasymenko
INDUSTRIAL KNOWLEDGE BANK AS AN ELEMENT
OF IMPROVING THE INDUSTRIAL LANDSCAPE OF UKRAINE 113

Volodymyr Bodakovskyy
THE GENESIS OF THE DEFINITION «FINANCIAL INSTITUTIONAL
INFRASTRUCTURE» AND ITS ROLE IN THE DEVELOPMENT
OF THE COUNTRY'S ECONOMIC SYSTEM..... 117

Antonina Deshko
SPENDING REVIEWS IN UKRAINE IN MODERN CONDITIONS..... 121

Svitlana Yehorycheva
BANK LENDING TO HOUSEHOLDS
UNDER MARTIAL LAW IN UKRAINE 125

Maryna Posmitna
INTEREST RATE CHANNEL OF MONETARY TRANSMISSION
AND ITS USE IN UKRAINIAN BANKING PRACTICE 129

Mariia Pshenychna
THE IMPACT OF FINTECH
ON FINANCIAL MARKET DISINTERMEDIATION..... 133

Dmytro Riznyk
INVESTMENT STRATEGIES IN THE TIME OF WAR IN UKRAINE 136

Olha Samoshkina
MODIFICATION OF BUDGETARY SUPPORT
FOR AGROINDUSTRIAL PRODUCERS IN THE CONDITIONS
OF POST-WAR DEVELOPMENT OF UKRAINE'S ECONOMY 139

MANAGEMENT

Oleksandr Hridin
FEATURES AND PROSPECTS OF APPLICATION
OF MODERN HR TECHNOLOGIES
BY AGRICULTURAL ENTERPRISES 144

Georgii Zinoviev, Liudmyla Yanovska
CONCEPTUALIZATION OF THE MUSEUM OF ANTHROPOLOGY
AS A SYSTEM AND ENVIRONMENT OF TRANSDISCIPLINARY
RESEARCH, EDUCATIONAL AND CULTURAL ACTIVITIES..... 148

Maksym Kanievskyi, Tetiana Shtets
ASSESSMENT OF THE PRODUCTION POTENTIAL
OF THE ENTERPRISE IN THE CONDITIONS
OF THE INNOVATION ECONOMY 152

Nataliia Krasnokutska, Gao Liang
THE VALUE OF THE ENTERPRISE FROM THE PERSPECTIVE
OF SUSTAINABLE DEVELOPMENT
AND SIGNS FOR IDENTIFYING ITS MANIFESTATIONS..... 157

Oleksandr Petrenko
ADAPTIVE MANAGEMENT FOR EMPLOYEE TRAINING SYSTEM.... 160

Maksym Peshko
THE IMPACT OF TECHNOLOGIES
ON THE DEVELOPMENT OF PROJECT MANAGEMENT 163

Natalia Potryvaieva, Artem Palieiev, Illia Moskal
THE ROLE OF OUTSOURCING
IN THE DEVELOPMENT OF TERRITORIAL COMMUNITIES 167

Natalia Tubaltseva, Sofiia Zhavko
LOGISTICS MANAGEMENT STRATEGIES
TO ENSURE HIGH QUALITY CUSTOMER SERVICE 171

Natalia Tubaltseva, Anna Sabat, Sofiia Zhavko
DEVELOPMENT OF UKRAINIAN TOURISM
IN CONDITIONS OF UNCERTAINTY 174

Natalia Tubaltseva, Ihor Sirenko, Dmytro Datsiuk
IMPROVEMENT OF LOGISTICS MANAGEMENT
ON THE BASIS OF INFORMATION SECURITY 177

Viktoria Chuzhykova
PEDAGOGIAL MANAGEMENT OF ECONOMIC EDUCATION 181

MARKETING

Roman Avramenko
FORMATION AND DEVELOPMENT OF MARKETING
AT THE PUMPKIN SEEDS MARKET 184

Ilona Babukh, Evheniy Venher
HYPOTHESIS IN THE SYSTEM
OF MARKETING RESEARCH METHODOLOGY 189

Mariia Bahorka, Nataliya Yurchenko
MARKETING TOOLS IN THE MANAGEMENT SYSTEM
OF TRADE ENTERPRISES 192

Vladyslav Vasylevskyi, Vadym Kovpik
USE OF DIGITAL MARKETING BRANDING METHODS IN SALES 196

Nataliia Hryhorska
BRAND MARKETING IN MODERN BUSINESS 199

Volodymyr Dubnitskyi, Kseniia Maslianyk
THE USE OF MODERN DIGITAL TECHNOLOGIES
AS A FACTOR IN INCREASING
THE COMPANY'S COMPETITIVENESS 202

Andrii Mastylo
BIOECONOMIC FACTORS
OF FARMS DEVELOPMENT OF UKRAINE 206

Ihor Stepanets
THE MARKET OF GRAIN CORN PROTECTION IN UKRAINE 209

ENTREPRENEURSHIP, TRADE AND EXCHANGE ACTIVITIES

Yurii Vlasenko, Tetiana Chebanova
STRUCTURE OF SERVICES AND TARIFFS IN THE SEA PORTS OF UKRAINE 214

Yaroslav Zhydyk
ACCESS TO FINANCE AS AN INCENTIVE TO SUPPORT SMALL AND MEDIUM-SIZED BUSINESSES AND ECONOMIC RECOVERY 219

PUBLIC MANAGEMENT AND ADMINISTRATION

Ivan Bosak, Marta Danylovych-Kropyvnytska
MODERN ASPECTS OF INFORMATION SECURITY MANAGEMENT AT THE MACRO LEVEL 222

Zoriana Hbur
ANALYSIS OF EXISTING MODELS OF STATE REGULATION TO STIMULATE AND CONTROL INVESTMENT 225

Alona Kliuchnyk, Iurii Kormyshkin, Georgiy Reshetilov
FORMATION OF MODELS OF LOCAL DEVELOPMENT OF TERRITORIAL COMMUNITIES 229

Anatolii Nykyforov
SOURCES OF FORMATION OF THE PRINCIPLES OF PUBLIC ADMINISTRATION OF THE ECONOMY 233

Oleksandr Saliuk-Kravchenko
TOOLSET FOR PUBLIC ADMINISTRATION MECHANISMS WITHIN THE FRAMEWORK OF UKRAINE ENERGY SECURITY ASSURANCE DURING THE PERIOD OF MARTIAL LAW 237

Vyacheslav Shebanin, Iryna Kormyshkina
THE ROLE OF SOCIAL MOBILIZATION IN THE LOCAL DEVELOPMENT MANAGEMENT SYSTEM OF HALICYNIV RURAL COMMUNITY 241

INTERNATIONAL ECONOMIC RELATIONS

Olena Borzenko, Anna Hlazova
CONTEMPORARY TRENDS IN MAIN DIRECTIONS OF FINANCIAL TECHNOLOGY DEVELOPMENT 246

Oksana Bulyk
IMPROVEMENT OF EU MIGRATION POLICY
IN THE CONTEXT OF GLOBALIZATION CHALLENGES 249

Oksana Drebot, Vladyslav Dyshlyk
INTERACTION WITH THE EU IN THE FIELD
OF THE CARBON MARKET AS A FACTOR IN THE DEVELOPMENT
OF "GREEN" TECHNOLOGIES IN UKRAINE 253

Mykhailo Ishchuk
EMBRACING DIGITAL TRANSITION IN UKRAINIAN CUSTOMS
WITH ICT AND ELECTRONIC SYSTEMS 256

Maryana Kohut
PRINCIPLES OF ENVIRONMENTAL RESPONSIBILITY
IN BUSINESS 259

Mykhailo Kushnir
THEORETICAL ASPECTS OF IMPLEMENTATION
OF NATIONAL ECONOMIC INTERESTS OF UKRAINE
IN INTERNATIONAL ECONOMIC COOPERATION 262

Alona Marchenko
TRADE RIVALRY IN THE XXI CENTURY 265

Mykola Muzychenko
CURRENT TRENDS
OF NATURAL GAS CONSUMPTION IN CHINA 268

Nataliia Riabets, Iryna Tymkiv
COMPARATIVE ANALYSIS
OF MODELS OF GLOBAL ECONOMIC DEELOPMENT 271

Yuliia Tunitska, Nazarii Tunitskyi, Anastasiia Andrukh
SOCIAL FACTORS OF INNOVATION
IN THE INTERNATIONAL ECONOMIC ACTIVITY OF UKRAINE 275

Lyudmyla Malyarets, Doctor of Economic Sciences, Professor,
Head of the Department
Simon Kuznets Kharkiv National University of Economics
Kharkiv, Ukraine

Anatoly Voronin, Candidate of Technical Sciences, Associate Professor
Simon Kuznets Kharkiv National University of Economics
Kharkiv, Ukraine

Stepan Lebediev, Senior Lecturer
Simon Kuznets Kharkiv National University of Economics
Kharkiv, Ukraine

DOI: https://doi.org/10.30525/978-9934-26-398-9-13

MATHEMATICAL MODEL OF THE DYNAMICS OF THE INTERACTION OF GOODS PRICES ON ADJACENT MARKETS: THE PROBLEM OF LIMIT CYCLES

Although the problem of the formation of market prices, the determination of equilibrium prices and their stability is well known, and many theoretical works and works summarizing the results of observations are devoted to its research, it is still relevant. This is especially useful for forecasting the dynamics of equilibrium price stability processes relative to changes in the parameters characterizing the state of the system, as this requires the use of fairly complex mathematical instrumentation, namely differential and integral calculus. The purpose of this work is to build a mathematical model of economic dynamics, which would allow, in general, to carry out a qualitative analysis (according to phase trajectories) of the processes that determine the state of equilibrium with respect to prices on adjacent commodity markets. We will consider a general example of a dynamic system that describes the interaction of commodity prices on two markets, and we will show that in such a system there can be six limit cycles that determine the possible variants of its stationary state.

The mathematical model of economic dynamics for the case of two commodity markets can be represented as a system of two ordinary differential equations:

$$\begin{cases} p_1' = F_1(p_1, p_2); \\ p_2' = F_2(p_1, p_2), \end{cases} \quad (1)$$

where $p_1(t)$ and $p_2(t)$ are changing over time the prices of goods in the corresponding markets (hereinafter, differentiation is carried out by time);

$F_1(p_1, p_2)$, $F_2(p_1, p_2)$ are functions of excess demand for a product in each of the markets, which are nonlinear of degree no higher than two.

It should be noted that for a quadratic system of two ordinary differential equations, the number of limit cycles at a singular point of the "complex focus" type cannot be more than three [1, 2 etc.]. There is a well-known example that shows that for a quadratic system in which there are two foci, the number of limit cycles can reach six in a ratio of 3:3, i.e., three cycles around each focus [3].

To analyze system (1), we choose the following type of excess demand functions:

$$F_1(p_1, p_2) = \lambda p_1 - p_2 + kp_1^2 + mp_1p_2 + np_2^2,$$
$$F_2(p_1, p_2) = p_1 + ap_1^2 + bp_1p_2,$$

where a, b, λ, k, m, n are some constant parameters.

In this case, the system has the form:

$$\begin{cases} p_1' = \lambda p_1 - p_2 + kp_1^2 + mp_1p_2 + np_2^2; \\ p_2' = p_1 + ap_1^2 + bp_1p_2. \end{cases} \quad (2)$$

System (2) has two equilibrium positions. These are points $p_1^* = 0;\ p_2^* = 0$ and $p_1^* = 0;\ p_2^* = 1/n$, which, for certain parameter values, are foci.

Let us transform system (2) by introducing new variables such as $\hat{p}_1 = p_1$ and $\hat{p}_2 = p_2 - p_2^*$, where the variable p_2^* can take the value either 0 or $1/n$. Then system (2) takes the form:

$$\begin{cases} \hat{p}_1' = (\lambda + mp_2^*)\hat{p}_1 + (2np_2^* - 1)\hat{p}_2 + k\hat{p}_1^2 + m\hat{p}_1\hat{p}_2 + n\hat{p}_2^2; \\ \hat{p}_2' = (1 + bp_2^*)\hat{p}_1 + a\hat{p}_1^2 + b\hat{p}_1\hat{p}_2. \end{cases} \quad (3)$$

It is obvious that for values of the parameter λ close to $\lambda_1 = 0$ or to $\lambda_2 = -m/n$ provided that $\omega^2 = (1 + bp_2^*)(1 - 2np_2^*) > 0$, there are two foci.

Assuming that $b = -2n$, then $\omega^2 = (1 - 2np_2^*)^2$ and for $p_2^* \in \{0; 1/n\}$ we obtain $\omega^2 = 1$. Thus, oscillations with a frequency of $\omega = 1$.

If we take $\hat{p}_1 = x_1,\ \hat{p}_2 = x_2,\ \lambda = \lambda_1 = 0$ for the equilibrium position $p_1^* = 0;\ p_2^* = 0$ (first focus), then we obtain system (3) in normal form:

$$\begin{cases} x_1' = -x_2 + kx_1^2 + mx_1x_2 + nx_2^2; \\ x_2' = x_1 + ax_1^2 - 2nx_1x_2. \end{cases} \quad (4)$$

If we accept $\hat{p}_1 = x_1$, $\hat{p}_2 = -x_2$, $\lambda = \lambda_2 = -m/n$ for the equilibrium position $p_1^* = 0$; $p_2^* = 1/n$ (second focus), then we obtain system (3) in normal form:

$$\begin{cases} x_1' = -x_2 + kx_1^2 - mx_1x_2 + nx_2^2; \\ x_2' = x_1 - ax_1^2 - 2nx_1x_2. \end{cases} \tag{5}$$

Obviously, systems (4) and (5) can be written in the general form, using the notation $a_0 = \pm a$, $m_0 = \pm m$, where the "+" sign corresponds to system (4), and the "–" sign corresponds to system (5):

$$\begin{cases} x_1' = -x_2 + kx_1^2 + m_0x_1x_2 + nx_2^2; \\ x_2' = x_1 + a_0x_1^2 - 2nx_1x_2. \end{cases} \tag{6}$$

It is convenient to move from the system of two differential equations (6) to one complex-valued differential equation by making a change of variables $z = x_1 + i \cdot x_2$ and $\overline{z} = x_1 - i \cdot x_2$, where $i^2 = 1$. We get:

$$z' = i \cdot z + 0,5g_{20}z^2 + g_{11}z \cdot \overline{z} + 0,5g_{02}\overline{z}^2, \tag{7}$$

where the parameters of the equation are $g_{20} = 0,5\left(k - 3n + i(a_0 - m_0)\right)$, $g_{11} = 0,5(k + n + i \cdot a_0)$, $g_{02} = 0,5\left(k + n + i(a_0 + m_0)\right)$.

To study the multiplicity of limit cycles, it is necessary to calculate the values of the first three Lyapunov quantities. If they are all equal to zero, then system (6) will be conservative with an infinite number of periodic trajectories. Formulas for calculating Lyapunov quantities were proposed in [4]:

$$\begin{aligned} & l_1 = -\frac{1}{2}\operatorname{Im}\left(g_{20}g_{11}\right); \\ & l_1 = 0, \quad l_2 = -\frac{1}{12}\operatorname{Im}\left((g_{20} - 4\overline{g}_{11})(g_{20} + \overline{g}_{11})\overline{g}_{11}g_{02}\right); \\ & l_1 = l_2 = 0, \quad l_3 = -\frac{5}{64}\left(4\left|g_{11}\right|^2 - \left|g_{02}\right|^2\right) \cdot \operatorname{Im}\left((g_{20} + \overline{g}_{11})\overline{g}_{11}^2 g_{02}\right). \end{aligned} \tag{8}$$

From relations (8) it follows that the cyclicity of each focus can be determined using the following expression:

$$g_{20} = r \cdot \overline{g}_{11}. \tag{9}$$

Let's analyze the possible states of the system using the relation (9).

When $r = -1$ there is a conservative case with an infinite set of periodic regimes.

If r is a complex number, then there is a unique limit cycle.

If r is a real number and $r \neq -1$ or $r \neq 4$, then there are two limit cycles.

If $r = 4$, then there are three limit cycles.

Calculate the values of the first three Lyapunov quantities based on relationships (8). Equalities $l_1 = l_2 = 0$ take place if the following relations are satisfied:

$$3k + 7n = 0 \tag{10}$$

$$m_0 - 5a_0 = 0 \tag{11}$$

Note that from (11) it follows that for each equilibrium positions it is true that $m = 5a$.

Let's assume that $k = -\frac{7}{3}n$ and $m = 5a$. Then system (6) has the form:

$$\begin{cases} x_1' = -x_2 - \frac{7}{3}nx_1^2 + 5a_0x_1x_2 + nx_2^2; \\ x_2' = x_1 + a_0x_1^2 - 2nx_1x_2. \end{cases} \tag{12}$$

For these parameter values, the third Lyapunov quantity is determined by the relation:

$$l_3 = \frac{25na_0}{1728}(n^2 - 6a_0^2)(16n^2 - 51a_0^2). \tag{13}$$

Obviously, if the parameters and are rational numbers and are not equal to zero, then, in accordance with relation (13), the third Lyapunov quantity is nonzero: $l_3 \neq 0$. This means that for the same values of the parameters of the nonlinear part of systems of equations (4) and (5), there are three limit cycles around each equilibrium position. Thus, there are simultaneously six limit cycles in this system in a ratio of 3:3.

Therefore, the analytical model of economic dynamics which we present in this paper allows to study the dynamics of prices in adjacent markets depending on the value of the model parameters and, accordingly, can be the basis for simulation modeling. When applied to the model of two markets, this study demonstrates the possibilities of qualitative forecasting (namely, according to phase trajectories) of periodic regimes of market conditions. Application of the system of differential equations in this mathematical model of economic dynamics allows considering processes that are continuous in time.

References:

1. Bamor R. (1986) Quadratic vector fields in the plane have a finite number of limit cycles. *Publications mathématiques de l'I.H.É.S.* Vol. 64, pp. 111–142.

2. Chicone C., Shafer D. S. (1983) Separatrix and limit cycles of quadratic systems and Dulac's theorem. *Transactions of the American Mathematical Society*. Vol. 278, no. 2, pp. 585–612.

3. Voronin A. V., Lebedev S. S. (2023) Quadratic system of two differential equations with six limit cycles: two approaches to problem analysis. *ResearchGate*. February 16. DOI: https://doi.org/10.13140/rg.2.2.32572.92808
4. Zoladek H. (1994) Quadratic systems with center and their perturbations. *J. Differential Equations*. Vol. 109, no. 2, pp. 223–273.

Volodymyr Mishchenko, Doctor of Economics, Professor
Institute for Economics and Forecasting
of the National Academy of Sciences of Ukraine
Kyiv, Ukraine

DOI: https://doi.org/10.30525/978-9934-26-398-9-14

DEVELOPMENT OF TECHNOLOGIES FOR THE SPATIO-TEMPORAL DIMENSION OF THE METAVERSE

РОЗВИТОК ТЕХНОЛОГІЙ ПРОСТОРОВО-ЧАСОВОГО ВИМІРУ МЕТАВСЕСВІТУ

Метавсесвіт розглядають як сукупність функціонально об'єднаних між собою цифрових платформ, що функціонують на основі використання сучасних ІКТ та цифрових інструментів і поєднують реальні процеси та події з їх відображенням у віртуальному цифровому просторі. Тому метавсесвіт можна характеризувати як наступний етап розвитку інформаційно-мережевої економіки. Головними ознаками метавсесвіту є переміщення багатьох сфер діяльності у віртуальний простір, поєднання реальних процесів з віртуальними або доповнення їх одне одним, створення імерсивної реальності, інтероперабельність систем і продуктів, їх адаптивність, інтерактивність у режимі реального часу, а також відповідність запитам і потребам користувачів щодо розширення можливостей для своєї діяльності [1, с. 54].

Окремі науковці вважають, що концепція метавсесвіту може набути свого повноцінного розвитку після переходу до наступного етапу розвитку Інтернету – Web 3.0, у якому інформація буде вироблятися за участі штучного інтелекту, децентралізованих реєстрів і хмарних технологій з використанням цифрових активів. Уже сьогодні функціонують великі віртуальні ринки, створено та продовжується активна розробка значної кількості віртуальних платформ, призначених саме для метавсесвіту. Широкого практичного використання набули такі платформи як відкрита хмарна платформа NVIDIA Omniverse, платформа Lightship (Niantic), конструктор доповненої реальності

Izdevniecība “Baltija Publishing”
Valdeķu iela 62 – 156, Rīga, LV-1058
E-mail: office@baltijapublishing.lv

Iespiests tipogrāfijā SIA “Izdevniecība “Baltija Publishing”
Parakstīts iespiešanai: 2024. gada 16 februārī
Tirāža 100 eks.