



ABSTRACTS

of scientific publications by Chief Assist. Prof. Yordan Petkov, PhD, Department of Statistics and Applied Mathematics, in a competition for “Associate Professor“ in the professional field 3.7. Administration and management, Scientific Field/Specialty: “Quantitative Methods in Management (Human Resource Management)”, published in Darzhaven Vestnik, issue 32/15.04.2025

A. Scientific Publication on the Dissertation

General number	Number in category	Title
1.	1.	Petkov, Y. (2013) Opportunities for managing human resource mobility in budget organizations - Modern methods and technologies in scientific research. Varna: Science and Economics, 325 - 331. ISBN 978-954-21-0630-2
<p>This report discusses some opportunities for managing the mobility of human resources in budget organizations. An advanced mathematical model for managing workers' admission and turnover in budget organizations, facing a restriction on the total wage bill, is proposed. The minimization of the total deviations of the real staff number from the required one is selected as optimality criterion.</p>		
2.	2.	Petkov, Y. (2011) Optimizing the allocation of human resources in implementation of construction operations - Building entrepreneurship and immovable property. Varna: Science and Economics, 366 - 374. ISSN 1313-2369 ; ISSN 2683-0280 - 2011
<p>The report offers an economic-mathematical model for optimizing the allocation of workers qualified to perform specific operations on construction sites to minimize overall costs. Unlike existing models for the general allocation of resources, the focus is directed in particular to human resources. Constructed model is supported by numerical examples and analysis of the results for its solution.</p>		
3.	3.	Petkov, Y. (2012) Markov model of human resource mobility - Trends and challenges in economic development. Varna: Science and Economics, v. 4, 415 - 423. ISBN 978-954-21-0603-6
<p>In the process of studying the socio-economic aspects of human behavior, the problems of developing specific models of the movement of human resources are of particular importance. In connection with the construction of mathematical models formalizing the movement process, the possibility of studying the socio-economic nature of the movement of human resources is significantly expanded, and on this basis for making appropriate management decisions. The report proposes a theoretical model of the movement of human resources between categories (territorial units, sectors of the economy) at a given level (region), based on Markov chains.</p>		

B. Scientific Publication on the Competition for Associate Professor

I. Monograph

General number	Number in	Title
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	category	
4.	1.	Petkov, Y. (2025) Quantitative methods and models in human resource management. Varna: Science and Economics, Monographic Library Prof. "Tsani Kalyandziev". ISBN 978-954-21-1191-7
<p>The issues of the effective management of human resources are of fundamental significance in management theory and in economic theory and are crucial for the productivity, hence for the competitiveness and the sustainable development of any organization. The need to make optimal decisions in the realization of the wide range of activities connected with human resource management, presumes scientific justification and objectivity of the approaches used. In that sense the use of quantitative methods and models gains an ever-increasing relevance, particularly under conditions of dynamic market environment.</p> <p>The monographic work defends the proposition that the design of new models as well as the modification and the adaptation of existing models of various activities in the management of human resources in the organization, can lead to an increase in their efficiency in their actual practical application.</p> <p>In this regard some possibilities for designing models for planning and forecasting the need for human resources are studied. Modifications and complements to existing models for the optimal use and allocation of human resources in the performance of various labour activities are proposed. The capabilities of the Data Envelopment Analysis method in appraising the performance of human resources are also presented. All the designed models are tested by means of numerical data, and are put forward analyses of the obtained results and guidelines for the use of the former in real situations.</p>		

II. Other monographs and extended scientific articles

General number	Number in category	Title
5.	1.	Slavov, Z., Dochev, D., Bruseva, M., Petkov, Y., Nikolaeva, V., Nenkov, S. (2016) Searching for the best solution. Varna: VFU "Chernorizets Hrabar". ISBN 978-954-715-651-7
<p>In his dynamic life, every individual modern person is constantly faced with the need to assess the situation in which they find themselves and, accordingly, make their decisions. Some of these decisions are important and have a decisive role in our lives and work, while others are primarily related to current daily activities and are not fateful in nature. Regardless of their importance, the decisions made must be workable, justified, logical and timely. Such decisions are called rational or optimal by some criterion, i.e. they must be the best in a certain sense. Decision-making theory deals with these issues. The publication of this collective monograph is part of a scientific project of the Varna Free University on the topic "Searching for the best solution". The project manager is Prof. Dr. Zdravko Slavov, and the coordinator is Assoc. Prof. Dr. Maria Bruseva. This book is the fourth collective monograph published by the University Press of VFU, all of which are related to decision-making theory. The goal is to examine decision-making problems from different perspectives. This is natural, because decision-making theory is an interdisciplinary science with applications in all human activities. The individual chapters have a certain relative independence and are written respectively by: - Prof. Dr. Zdravko Slavov - Chapters I, III and V; - Assoc. Prof. Dr. Eng. Math. Maria Bruseva - Chapter VII; - Prof. Dr. Docho Dochev, Prof. Dr. Zdravko Slavov, Senior Asst. Dr. Yordan Petkov - Chapter IV; - Assoc. Prof. Dr. Velislava Nikolaeva -</p>		



Chapter I; - Assoc. Prof. Stoyan Nenkov - Chapter VI.		
6.	2.	Nikolaev, R., Petkov, Y., Gospodinova, N. (2016) Mathematical Competitions for University students. Varna: "MOOREA". ISBN 978-954-8576-42-0
<p>Book "Student Mathematical Competitions" is intended for the preparation of students from economic and technical higher schools for the National Student Mathematical Olympiad (NSOM), but can also be successfully used for other mathematical competitions. The content of the book covers seven main topics: 1. Equations of lines and planes. Equations of curves of the second degree. 2. Matrices, determinants, systems of linear equations. 3. Polynomials with integers and real coefficients. 4. Number sequences. Method of mathematical induction. 5. Function of one real variable: limit, continuity, differentiability. Basic theorems of differential calculus. 6. Study of a function. Function of two and more variables. 7. Indefinite, definite integrals and applications. Sequences.</p> <p>Each of the topics includes basic theoretical statements, a large number of solved and unsolved problems with answers and instructions. Many of the presented examples are complex in nature, i.e. cover more than one of the above-mentioned sections. A large part of the proposed tasks are the author's, but there are also those that represent generalizations of already known mathematical problems or tasks given to the NSOM. The authors' aspiration in preparing the book is related to offering tasks that allow more than one way of solving, in order to develop non-standard thinking in students and their ability to deal with a variety of problems. The difficulty and the way of presenting the examples are consistent with the difficulty of the tasks given to the NSOM in recent years.</p> <p>The participation of the authors in writing the book is as follows: Assoc. Prof. Dr. Rosen Nikolaev – topic 1 and topic 5; Senior Asst. Prof. Dr. Yordan Petkov – topic 6 and topic 7; Assistant Prof. Nevena Gospodinova – topic 2, topic 3 and topic 4.</p>		
7.	3.	Grozdev, S., Sharkova, I., Todorova, P., Petrova, R., Kostadinova, M., Matakieva, S., Petleshkov, K., Georgieva, M., Georgiev, S., Stefanova, D., Marasheva, I., Alashka, R., Stefanov, S., Petkov, Y., Staribratov, I., Pavlov, V., Nikolaev, R., Nenkov, V., Milkova, T. (2022). Mathematical Olympiad in Financial Literacy: Problems and Methodological Solutions, 2019, 2020. Sofia: Mathematical Library European Kangaroo Association. ISBN 978-619-91721-3-1
<p>The main goals of the authors are related to increasing the interest of students in building modern skills and acquiring financial literacy. The main tools are the knowledge and skills in mathematics for the respective age groups, traditionally used in the formation of competencies in most general education and specialized subjects. The Financial Literacy Competition provides an opportunity to: develop computational abilities, including using a calculator; motivating students to choose the right mathematical approach and its argumentation in solving practical problems, including problems from economics, finance, insurance, banking and entrepreneurship. This book – a collective monograph, contains the topics from 2019 and 2020 (original author's mathematical problems), and their methodological solutions are also proposed. Increasing functional literacy and computational abilities, including using a calculator, as well as getting acquainted with ideas for solving the problems from the proposed collective monograph, increase the reader's chances of success in the competitions and competitions that are ahead.</p>		
8.	4.	Grozdev, S., Sharkova, I., Todorova, P., Petrova, R., Kostadinova, M., Matakieva, S., Petleshkov, K., Georgieva, M., Georgiev, S., Stefanova,



		D., Marasheva, I., Alashka, R., Stefanov, S., Petkov, Y., Staribratov, I., Pavlov, V., Nikolaev, R., Nenkov, V., Milkova, T. (2022). Mathematical Olympiad in Financial Literacy: Problems and Methodological Solutions, 2021, 2022. Sofia: Mathematical Library European Kangaroo Association. ISBN 978-619-91721-4-8
<p>The main goals of the authors are related to increasing students' interest in building modern skills, creating social responsibility for managing personal finances and investing, motivating students and teachers to increase their success in the teaching process and acquiring financial literacy as part of functional literacy. The main tools are the knowledge and skills in mathematics for the respective age groups, traditionally used in the formation of competencies in most general education and specialized subjects. This book is a collective monograph that contains the topics of 2021 and 2022 (original author's mathematical problems), and their methodological solutions are also proposed. Increasing functional literacy and computational abilities, including using a calculator, as well as getting acquainted with ideas for solving the problems from the proposed collective monograph, increase the reader's chances of success in the competitions and competitions that are ahead.</p>		
9.	5.	Grozdev, S., Lilkova, M., Stoeva, T., Ivanova, P., Petrova, R., Pencheva, G., Matakieva, S., Stefanova, D., Petrova, E., Chalakova, K., Marinova, E., Nikolova, G., Dankov, D., Bobeva, G., Kostadinova, M., Isufov, R., Sharkova, I., Todorova, P., Raykov, N., Nakov, S., Petkov, Y., Raeva, I., Rahnev, A., Nikolaev, R., Nenkov, V., Madzharova, T., Milkova, T. (2022). European Kangaroo 2022: Problems and Methodological Solutions. Sofia: Mathematical Library European Kangaroo Association. ISBN 978-619-91721-2-4
<p>The interest in the International Mathematical Competition "European Kangaroo" is constantly growing. Students from over 80 countries take part in it. The reason for this considerable interest is primarily in the nature of the tasks. Many of them are models of real practical situations that are presented in an entertaining way. That doesn't make them any easier. On the contrary, very often students face serious difficulties. But the pleasure of being able to solve such a problem is indescribable. Here are the problems and solutions for all classes of Bulgarian Kangaroo, held on 05.02.2022, European Kangaroo, held on 17.03.2022 and Kangaroo Plus, held on 16.04.2022. We hope that the proposed methodological solutions, which are the work of an impressive team of teachers, lecturers and specialists, will contribute to their implementation.</p>		
10.	6.	Petkov, Y. (2012) Continuous model of the movement of human resources (after the example of the district of Varna). UE-Varna, An Annual book, 84, p. 300 - 334. ISSN 0861-6752
<p>In the study there are considered some capabilities of the continuous trend models for the formalization and forecasting of the movement of human resources, accounting for the impact of various factors. There is developed an economic and mathematical model, which permits the assessment and forecasting of major characteristics of the labour movement of human resources for a particular level, such as: number of "potential human resources", number of entrants, leavers and employed by sector of the economy, size of the outgoing from the standard flow of human resources. There is illustrated the possibility for practical realization of the model after the example of the movement of human resources in the district of Varna. There is proposed a suitable methodology for binding some of the parameters of the developed model to the factors determining them.</p>		



III. Scientific articles

General number	Number in category	Title
11.	1.	Dochev, D., Milkova, T., Petkov, Y. (2006) Geometric plotting of the optimal guaranteed solutions of a linear two-criteria problem in conditions of uncertainty. <i>Izvestia, Varna: Science and Economics</i> , 3, 23 – 34. ISSN 1310-0343
<p>The present paper discusses a linear two-criteria problem in conditions of uncertainty. There is given a method of geometric plotting of the optimal guaranteed solutions after Slater and Pareto. There is also a full classification of the maxmin and minmax populations after Slater and Pareto.</p>		
12.	2.	Atanasov, B., Petkov, Y. (2006) Opportunities for setting effective parameters of the optimum criterion. <i>Izvestia, Varna: Science and Economics</i> , 3, 11 - 22. ISSN 1310-0343
<p>One of the important characteristics of the optimum criterion in every economic-mathematical model is related to its reliability. The issue of quantitative assessment, of the optimum criterion reliability measurement, is largely solved through the rational setting of target function parameters. With regard to this, the present study is an attempt to offer opportunities for setting effective parameters of the optimum criterion. That possibility is theoretically substantiated and there are suggested specific approaches to binding parameters to the optimum solutions found. The deduced theoretical results can be viewed as a natural complement to the post-optimum analysis of every economic-mathematical model. The opportunities for the practical realization of the deduced results are also justified.</p>		
13.	3.	Dochev, D., Slavov, Z., Petkov, Y. (2009) A single criterion problem of indefiniteness. <i>Izvestia, Varna: Science and Economics</i> , 6, 31 - 41. ISSN 1310-0343
<p>The article examines the single criterion problem of indefiniteness given: the set of solutions (alternatives); the set of the states of nature (the economy), i.e. of indefinitenesses; a scalar function, setting the criterion (the outputs). There are suggested two approaches to solution-making. The first is the classical approach, based on the the maximin principle (the guaranteed result or the maximin utility after Wald). Guaranteed solutions are sought among „the worst”, therefore they are not applied in practice. The second approach is based on the principle of the minimax risk or the minimax „regret” after Savage. By way of an example it is shown that the second approach has a number of advantages.</p>		
14.	4.	Dochev, D., Slavov, Z., Petkov, Y. (2012) Mathematical methods for the allocation of mandates in proportional electoral systems. <i>e-Journal VFU, Varna: VFU "Chernorizets Hrabar"</i> , 2, 1-12. ISSN 1313-7514
<p>The article presents the main mathematical methods by which mandates can be distributed in proportional electoral systems of the two main types - with full and with limited proportional representation. A comparative analysis is made between them, outlining the advantages and disadvantages of each of them. The proposed theoretical statements are illustrated with numerical examples.</p>		



15.	5.	Dochev, D., Slavov, Z., Petkov, Y. (2012) Business decision making criteria under uncertainty and risk. e-Journal VFU, Varna: VFU "Chernorizets Hrabar", 2, 1-23. ISSN 1313-7514
<p>The article is devoted to the most frequently used mathematical methods for decision-making under uncertainty and risk. The nature and the differences between the situations of “uncertainty” and “risk” are analyzed, and an attempt is made to classify the decision-making tasks in each of them. The main criteria for choosing an optimal alternative depending on the degree of uncertainty of the environment are presented. The theoretical statements are supported by numerical examples.</p>		
16.	6.	Dochev, D., Slavov, Z., Petkov, Y., Genchev, A. (2014) Metagames. e-Journal VFU, Varna: VFU "Chernorizets Hrabar", 7, 1-7. ISSN 1313-7514
<p>Metagame theory was created with the aim of transforming classical game theory into a tool for analyzing and solving real-world conflicts. A model example has been constructed to show that a higher-level metagame recognizes rational decisions of a non-individualistic nature.</p>		
17.	7.	Dochev, D., Slavov, Z., Petkov, Y., Genchev, A. (2014) From Game Theory to Drama Theory. e-Journal VFU, Varna: VFU "Chernorizets Hrabar", 7, 1-15. ISSN 1313-7514
<p>The article traces the development of the main concepts for modeling, solving and analyzing conflict problems - from the creation of classical Game theory in the first half of the 20th century to the emergence of Drama theory in the last decade of the 20th century. Despite the enormous interest in Game theory at the beginning of its existence, the hopes of its creators to develop a universal normative theory of rational behavior turned out to be just a dream. In this regard, the limitations of classical Game theory in its application to the analysis and solution of real conflicts are analyzed. The search for opportunities to overcome these limitations, in view of the need to model and solve conflict problems in economics, political science, sociology, psychology and other fields of science and practice, is a prerequisite for the creation of Metagame theory, Conflict analysis and Drama theory.</p>		
18.	8.	Nikolaev, R., Petkov, Y. (2015) Analysis of the problems and performance of the students from 12th grade on the regional mathematics tournament in Kardzhali – 2014. Mathematics and informatics, 1, 86 - 94. ISSN 1310-2230 (Print), ISSN 1314-8532 (Online).
<p>The present paper discusses the tasks for the 12th grade in the Regional Mathematics Tournament in Kardzhali, held on 11.29.2014. Different approaches to their solutions are proposed. On the basis of the obtained results the authors analyze the level of preparation of participants in events of a similar type and make some suggestions for the improvement of the future work with outstanding students in mathematics.</p>		
19.	9.	Nenkov, V., Petkov, Y. (2015) Analysis of the paper for the regional round of the international mathematical competition for university students "European Kangaroo". Mathematics and informatics, 58, 4, 403 - 414. ISSN 1310-2230 (Print), ISSN 1314-8532 (Online).
<p>The paper proposes the competition paper for university students from the regional round of the International mathematical competition "European Kangaroo" in 2015. Methodological solutions of the problems are considered and an analysis of the results is proposed.</p>		



20.	10.	Nikolaev, R., Petkov, Y. (2016) Analysis of the problems and performance of the students from 11th and 12th grades in the regional mathematics tournament Kardzhali' 2015. Mathematics and informatics, 59, 3, 243-255. ISSN 1310-2230 (Print), ISSN 1314-8532 (Online)
This article discusses the tasks for the 11th and 12th grades in the Regional Mathematics Tournament in Kardzhali, held on 14.11.2015. Methodical approaches to the solutions are proposed. Accounting for the results the authors analyze the level of preparation of participants in events of a similar type.		
21.	11.	Nikolaev, R., Trifonova, E., Petkov, Y. (2016) Methodology for optimal selection of alternative solutions in coastal engineering. Mathematics plus, 24, 4, pp. 48 - 62. ISSN(Print) 0861-8321.
Coastal zones are constantly subjected to the destructive influence of various storm events. Coastal protection measures in such cases are traditionally limited to engineering solutions. The existing variety of engineering measures for mitigating storm impacts differ both in the manner and degree of impact, and in the financial resources required for their implementation. The article proposes a methodology for selecting a mitigation measure, ensuring an optimal ratio between the effect of implementation and the costs of implementation. The mathematical apparatus used in it is based on the classical theory of decision-making under uncertainty and risk.		
22.	12.	Nikolaev, R., Milkova, T., Petkov, Y. (2017) Some Numerical Sequences Concerning Square Roots (Part One). Mathematics and informatics, 60, 5, c. 474 – 480. ISSN 1310-2230 (Print), ISSN 1314-8532 (Online).
The article is dedicated to one type of problems with an infinite number of nested square radicals proposed in mathematical competitions. A generalization is considered and the deduced theoretical relation is proved by the method of the complete mathematical induction.		
23.	13.	Petkov, Y. (2021) Portfolio Optimization in Microsoft Excel. Mathematics plus, 29, 4, 83-95. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964
The article presents some possibilities for constructing optimal investment portfolios by solving nonlinear optimization models. These models are treated by the specialized tool Solver in Microsoft Excel.		
24.	14.	Yordanov, I., Gushev, V., Petkov, Y., Nikolaev, R., Grozdev, S. (2022) National mathematical olympiad for university students'2022 methodological solutions of the problems for group „V”. Mathematics plus, 30, 2, 40-47. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
The present paper proposes methodological solutions of the problems for group „V“ of the National mathematical Olympiad for university students, held in Ravda in May 2022.		
25.	15.	Petkov, Y. (2022) Interest and discount calculations with MS EXCEL. Mathematics plus, 30, 2, 66-79. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
Some possibilities of MS Excel are presented in the paper for interest, discount calculations and evaluation of investment effectiveness using built-in financial functions. Solutions of various problems are considered, some of which are included in Olympiads in Financial and Actuarial mathematics.		



26.	16.	Nikolaev, R., Milkova, T., Petkov, Y. (2022) Olympiad in Financial mathematics for university students. Mathematics plus, 30, 4, 78-85. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
The competition theme, solutions of the problems and the results of the Olympiad in Financial mathematics for university students held in November 2022 are presented. The Olympiad is organized as a youth initiative by the Municipality of Varna and the Department of Statistics and Applied Mathematics at the University of Economics, Varna.		
27.	17.	Yordanova, V., Petkov, Y., Karadimova, D. (2023) Accuracy in the calculations in financial literacy tasks. Mathematics plus, 31, 2, 74-83. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
It is proved in the present paper, that the accuracy in computational procedures in financial transactions is extremely important, since this affects the final results. Specific examples (tasks) are proposed to illustrate the need of correct rounding and according to the authors it should be done only at the end of the calculations.		
28.	18.	Grozdev, S., Nikolaev, R., Nenkov, V., Petkov, Y. (2023) Olympiad for university students - Group "V". Mathematics plus, 31, 4, 56-64. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
The article proposes methodological solutions to the problems from the topic for group "V" of the National Student Mathematics Olympiad, held in the city of Montana in May 2023.		
29.	19.	Nikolaev, R., Milkova, T., Petkov, Y., Yordanova, V. (2023) Olympiad in Financial mathematics for university students'2023. Mathematics plus, 31, 4, 65-71. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
Some details are presented about the organization of the Olympiad in Financial Mathematics for University Students' 2023. Methodological solutions of the problems from the Olympiad paper are proposed.		
30.	20.	Stoilova, S., Raeva, I., Madzharova, T., Petkov, Y., Nenkov, V. (2023) Olympiad for university students - Group "B". Mathematics plus, 31, 4, 48-55. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
The article proposes methodological solutions to the problems from the topic for group "B" of the National Student Mathematics Olympiad, held in the city of Montana in May 2023.		
31.	21.	Grozdev, S., Nikolaev, R., Gushev, V., Petkov, Y. (2024) National olympiad in mathematics for university students'2024 – group „V“. Mathematics plus, 32, 2, 52-57. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
Methodological solutions are proposed of the problems from the paper of the National Olympiad of Mathematics for University Students' 2024 – Group „V“, held in the city of Burgas in May 2024.		
32.	22.	Petkov, Y. (2024) An Opportunity to Assess the Effectiveness of Human Resources in the Performance of Construction Operations. Construction Entrepreneurship and Real Property, Varna : UE-Varna, 1, 1, 80-91. ISSN(Online) 2683-0280.
In the modern conditions of economic development, the tendency to find optimal options for the implementation of economic processes related to the rational use of resources is increasingly confirmed. One of the most developed sectors in Bulgaria is construction. The intensifying competition in it, the rising prices of raw materials and materials, as well as the growing demands of the customers for the final product, pose more and more distinctly the		



question of the execution of construction activities in a high quality and on time. One of the key conditions for achieving such high productivity is the high efficiency of the employees in the enterprise. Therefore, efforts to develop an objective and accurate system by which to evaluate their performance are of particular importance. In recent years, the so-called Data Envelopment Analysis (DEA). It overcomes some of the weaknesses of traditional appraisal systems and provides a comprehensive performance indicator for both individual workers and entire teams, units, departments, etc. In this regard, in the present work, an attempt has been made to present both the essence of DEA and some possibilities for its application in the evaluation of human resources in the construction enterprise. The theoretical statements are supported by numerical examples and analyzes of the obtained results.

33.	23.	Nikolaev, R., Milkova, T., Petkov, Y., Yordanova, V. (2025) Financial mathematics olympiad for university students – 2024. Mathematics plus, 33, 1, 52-59. ISSN(Print) 0861-8321, ISSN(Online) 2603-4964.
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The Olympiad in Financial Mathematics for University Students took place on 30.11.2024. The youth initiative was organized by Varna Municipality and the department “Statistics and Applied Mathematics” at the University of Economics, Varna. This article presents the results of the Olympiad, the problems and their solutions.

IV. Research papers

General number	Number in category	Title
34.	1.	Petkov, Y. (2008) Possibilities for applying fractional-linear optimization in the localization of small and medium-sized enterprises. // Firmite i pazarite v Bulgaria v usloviyata na evrointegratsia - prodalzhavashkata adaptatsia - Intern. Sci. Conf. Varna: Science and Economics, 2, pp. 109 - 113. ISBN 978-954-21-0369-1.
The report proposes a non-standard approach in optimizing the localization and size of small and medium-sized enterprises, using relative indicators to form the optimality criterion. The developed economic and mathematical model takes into account both the costs of extraction, transportation and processing of raw materials, as well as the profit from the sale of manufactured products.		
35.	2.	Petkov, Y. (2010) Possibilities for transformation of nonlinear models to optimize warehouse dislocation and capacities. // Svetovnata kriza i iкономическото развитие - Intern. Sci. Conf. Varna: Science and Economics, 3, pp. 673 - 679. ISBN 978-954-21-0491-9.
The report proposes a new approach for adapting nonlinear economic-mathematical models for optimizing production and transport activities, as well as for determining effective capacities, to linear ones. A nonlinear model has been developed for optimizing the dislocation and capacities of warehouses in a logistics system, and a possible transformation into a linear one is proposed, assuming that the unknown capacities of the warehouses are discrete quantities.		
36.	3.	Petkov, Y. (2013) Stochastic formalization of the Assignment problem. // Statistics as a Science, Education, Profession and Activity : Intern. Sci. Conf. : Dedicated to 2013 - Intern. Year of Statistics, Oct. c. 24 - 25, Varna, Bulgaria. Varna: Science and Economics, pp. 200 - 204. ISBN 978-954-21-0670-8.



<p>This paper presents a new formalization of the famous „Assignment problem " in the context of uncertainty about labor productivity by offering a stochastic approach in defining its input parameters. At the same time, a different approach to its solution is made, which provides prerequisites for its practical implementation.</p>		
37.	4.	<p>Petkov, Y., Stancheva, V. (2013) "Beyond budgeting" - alternative approach to traditional budgeting process for industrial business in Bulgaria. // „Perspektivi pred industrialnia biznes” - Intern. Sci. Conf. Varna : Ikoconsult, pp. 152-157. ISBN 978-954-8235-09-9.</p>
<p>The paper presents "Beyond budgeting" as an alternative to traditional budgeting for corporate management and aims to outline the opportunities that this innovative model offers to the industrial business in Bulgaria. The "Beyond budgeting" practice is getting more and more popular because of the need of adaptation of the corporations to the new economic reality.</p>		
38.	5.	<p>Petkov, Y., Stancheva, V. (2014) Prognosing corporate bankruptcy for companies in the construction and infrastructure sector. // Construction entrepreneurship and real property - Intern. Sci. and Pract. Conf, Varna: Science and Economics, pp. 271-283. ISSN 1313 – 2369.</p>
<p>The global economic crisis brings new reality for the business. Therefore the economists have to test whether the available theory is adequate to the current situation. The paper aims to analyze different models for prognosing corporate bankruptcy for companies from the construction and infrastructure sector in Bulgaria. The authors present various approaches for predicting corporate failure and test them for several public companies in Bulgaria.</p>		
39.	6.	<p>Petkov, Y. (2015) A modification of a model for optimal inventory management under random demand. // Ikonmikata v promenyashitia se svyat: natsionalni, regionalni i globalni izmerenia - Intern. Sci. Conf, v. 2. – Varna: Science and Economics, pp. 487 - 494. ISBN 978-954-21-0834-4.</p>
<p>Uncertainty is one of the important characteristics of the conditions in which economic processes occur. As a reaction of science to this undoubtedly important fact, the theory of decision-making under uncertainty has emerged. In this context, a number of economic and mathematical models related to the formation of optimal strategies for inventory management under uncertainty are found in the scientific literature. This report proposes a modification of one of the widely known models for optimal inventory management under random search, taking into account the possibility of using trade discounts when purchasing larger quantities of inventory.</p>		
40.	7.	<p>Nikolaev, R., Petkov, Y. (2015) Place and role of the University of Economics - Varna in the National Student Olympiad in Mathematics. // Matematikata kato fundamentalna i prilozhna nauka - Int. Sci. and Pract. Conf. - Varna : Science and Economics, pp. 343 - 366. ISBN 978-954-21-0860-3.</p>
<p>The report outlines the place and role of the University of Economics - Varna in the most significant student mathematics competition in Bulgaria - the National Student Mathematics Olympiad. In this regard, the performance of students in the last 10 editions of the competition is monitored. The role of university lecturers in the Olympiad is demonstrated through selected problems that have found a place in the competition themes. Methodological solutions to these tasks are also presented.</p>		
41.	8.	<p>Petkov, Y. and Stancheva, V. (2015) Study of the practical-applied mathematical skills of students from University of Economics - Varna.</p>



		// Matematikata kato fundamentalna i prilozhna nauka - Int. Sci. and Pract. Conf. Varna: Science and Economics, pp. 400 - 408. ISBN 978-954-21-0860-3.
<p>One of the important requirements in the training of specialists in the field of economics is the improvement of their mathematical knowledge and skills. The report aims to analyze the results obtained from a survey on the level of mastery of practical and applied mathematical methods among students of the Bachelor's Degree Program at the University of Economics - Varna. In this regard, appropriate applied tasks have been constructed; a sample has been selected among students of the University of Economics - Varna, with whom a survey will be conducted to assess their competence in terms of mastery of mathematical apparatus; the results obtained have been analyzed and measures have been outlined to increase the effectiveness of training personnel in the field of economics.</p>		
42.	9.	Petkov, Y., Yordanova, V. (2017) A particular case of decision-making in conflict situations using matrix games. // Ikonmikata v promenyashitia se svyat - natsionalni, regionalni i globalni izmerenia – Int. Sci. Conf. Varna: Science and Economics, 1, pp. 316 - 321. ISBN 978-954-21-0927-3.
<p>Many conflict situations in economics, management and politics find their scientifically based decision thanks to Game Theory. It represents the study of mathematical models of the processes of decision making in terms of strategic uncertainty or cooperation and their properties. The biggest success Game Theory achieves in the field of finite two-person constant-sum games (or so called “matrix games”), for the solution of which effective methods are developed. These are characterized by the presence of two participants – “players” with completely opposite interests, having a finite number of pure strategies (courses of action in the conflict situation). Resolution of the game aims to identify the optimal strategies of the players - pure or mixed, by means of which they achieve maximal possible outcome. This paper examines one particular case of $2 \times n$ and $m \times 2$ matrix games, where one of the players has exactly two pure strategies and the other player has three or more non-dominated (active) pure strategies. An approach to directly identifying the appropriate 2×2 subgames and obtaining the corresponding optimal strategies is proposed, representing an addition to the well-known graphical method. The methodology is demonstrated using numerical example.</p>		
43.	10.	Yordanova, V., Petkov, Y. (2017) Features of the economic-mathematical models for optimizing the production program of a construction company. // Construction entrepreneurship and real property - Int. Sci. and Pract. Conf. Varna: Science and Economics, pp. 342 - 349. ISSN 1313-2369.
<p>In the modern economic reality, every enterprise, including the construction enterprise, is forced to look for various tools that contribute to the optimization of its business activities in order to achieve high competitiveness. In this regard, the authors of this report consider one such tool, namely economic and mathematical models. The report attempts to indicate some features related to the construction of economic and mathematical models for optimizing the production program of the construction enterprise. The authors consider two main types of economic and mathematical models. The issue related to the probabilistic nature of the parameters is treated, and two approaches are proposed for reducing the probabilistic model to a deterministic one. The main problem of determining the criterion for optimality of the model is considered.</p>		



44.	11.	Petkov, Y., Gospodinova, N. (2017) One approach for finding an optimal portfolio of two risky assets. // Novite realnosti v upravlenieto – Int. Sci. Conf. Varna: Science and Economics, pp. 367 - 375. ISBN 978-954-21-0947-1.
The task of choosing optimal investment decisions is central to portfolio managers. This report proposes an approach for identifying an optimal portfolio of two risky assets that maximizes the Sharpe ratio. The methodology is demonstrated using numerical example.		
45.	12.	Петков, Й. (2020) One approach for finding an optimal portfolio of multiple risky assets. // Economic science, education and the real economy: development and interactions in the digital age – Int. Sci. Conf., v 3, Varna: Science and Economics, 3, pp. 590 - 598. ISBN 978-954-21-1039-2.
The problem of making optimal investment decisions is central to portfolio managers. This report proposes an approach for identifying an optimal portfolio of multiple risky assets that maximizes the Sharpe ratio. The methodology is demonstrated using numerical example.		
46.	13.	Петков, Й. (2021) Possibilities for application of the data envelopment analysis in human resources management. // Human resource management – Int. Sci.-Pract. Conf. Varna: Science and Economics, pp. 215-221. ISBN 978-954-21-1092-7.
This report presents the essence and features of the Data envelopment analysis as a management tool. Emphasis is placed on the possibilities for its application in the field of human resources management. Theoretical statements are supported by numerical examples.		
47.	14.	Nikolaev, R., Petkov, Y. (2022) Participation of the University of Economics – Varna in the National Mathematics Olympiad for University Students (2016-2022). // The role of fundamental programs in higher education - Int. Sci.-Pract. Conf. Varna: Science and Economics, pp. 46-54. ISSN(Online) 2815-3863.
In this paper, an attempt has been made to outline the place and role of the University of Economics - Varna in the most significant student math competition in Bulgaria – the National Mathematics Olympiad for University Students. Therefore, the performance of the students in the last six editions of the competition was tracked. The role of university teachers in the Olympiad is demonstrated through a selection of problems that have been proposed and found a place in the competition themes over the years. Methodological solutions to these problems are also presented.		
48.	15.	Nikolaev, R., T. Milkova, Y. Petkov, V. Yordanova (2023) The Accuracy of calculations in financial mathematical problems. // The post-Soviet space is a territory of innovations. Collection of the 7th International Scientific and Practical Conference, Moscow: Moscow Regional Socio-Economic Institute, pp. 223-232. ISBN(Print) 978-5-91422-091-1.
In the last two or three decades, special attention has been paid to the financial literacy of teenagers - schoolchildren and students. A special impression when considering and evaluating the solutions to the tasks of the participants is that the calculations show insufficient accuracy, which leads to inaccuracy of the results, both in numerical values and as conclusions that need to be drawn. The goal set by the authors in this report is to demonstrate the effect of inaccurate rounding in calculations based on some examples from the main topics included in the material on the Olympiads in financial mathematics.		



49.	16.	Petkov, Y. (2024) Forecasting the number of human resources in the organization using Markov chains. // Human Resource Management - Int. Sci.-Pract. Conf. Varna: Science and Economics, pp. 80-88. ISSN(Online) 2815-5084.
<p>In modern reality, the human factor and its adequate formation and management is extremely important for the effective functioning of organizations. Along with a number of other factors, rational planning, forecasting and maintaining optimal staff numbers play an essential role. In this regard, the purpose of the report is to present the possibilities of the stochastic model, known in the literature as Markov chains, for predicting the number of employees in different job positions in the organization. The theoretical formulations are supported by numerical example.</p>		
50.	17.	Petkov, Y., Miryanov, R. (2024) A Practical Problem in Analytic Geometry. // The role of fundamental programs in higher education - Int. Sci.-Pract. Conf. Varna: Science and Economics, pp. 97-105. ISSN(Online) 2815-3863.
<p>The report presents a possible application of the knowledge provided by the fundamental mathematical discipline “Linear Algebra and Analytic Geometry” in solving an informatics problem, more precisely, a Computer Graphics problem. In addition, the given task provides a good opportunity to exercise the theoretical statements related to vectors and an equation of a line in the plane.</p>		
51.	18.	Петков, Й. (2025) A possibility to optimize the number of employees in the organization when working directly with clients. // Digital Transformation, Entrepreneurship, Business Innovations : International Conference on Economics, Business & Management (ICEBM). Varna: Science and Economics, pp. 218-222. ISSN(Online) 3033-1706.
<p>The analysis of the number of human resources required in quantitative and qualitative aspects gives an answer to the question "how many and what kind of people are needed by the organization as a whole and by individual structural units for a certain period of time". For this purpose, management science offers three main approaches - method of expert assessment, method of direct calculations and method of mathematical modeling. Often underestimated and defined as difficult to implement in practice, the latter approach has an indisputable advantage, namely that with correct input information, it guarantees accurate results. In this paper, we will try to support this statement by constructing a model through which the minimum number of employees needed for customer service can be determined. The proposed model has been tested with numerical data.</p>		

V. Textbooks and Practical Textbooks

General number	Number in category	Title
52.	1.	Atanasov, B., Petrov, P., Milkova, T., Petkov, Y. Optimization Methods – 2 nd part Mathematics, a practical textbook for solving problems. Varna: Science and Economics, 2006. - <i>chapter I „Elements of linear algebra“</i> .
<p>The practical textbook “Optimization methods (2nd part Mathematics)” is written in accordance with the curriculum of the current curricula. It presents in detail the main tasks of linear algebra and linear optimization. From the tasks in the textbook, those interested can</p>		



<p>study various optimization methods and get ideas for some of their applications in economic research. At the beginning of each paragraph, brief theoretical results are presented, and on the basis of specific problems, the main methods of linear optimization are clarified and applied. The exposition, notations and problems included in the textbook are consistent with the textbook on the subject "Optimization methods (2nd part Mathematics)". Examples are proposed for compiling mathematical models of economic problems for mastering optimization methods, tasks for independent work and tasks with economic content.</p>		
53.	2.	<p>Dochev, D., Nikolaev, R., Petkov, Y., Milkova, T., Risk theory: a practical textbook. Varna: Science and Economics, 2007. - <i>chapter 1 „Risk“, chapter 2 “Utility and Risk”, chapter 3 “Entrepreneurial risk”.</i></p>
<p>The Risk Theory handbook is a natural complement to the textbook of the same title. It offers a large amount of solved and unsolved problems related to the measurement and assessment of entrepreneurial and investment risk, as well as the main quantitative methods for its reduction - diversification and hedging. In connection with the latter, a due place is given to portfolio theory and classical derivative financial instruments - forwards, futures, swaps, options. Each of the topics contains a short theoretical part, which allows the reader to get a clearer and more accurate idea of the problems under consideration. For this purpose, there are many solved examples with interpretation of the results obtained. In addition, the manual contains a sufficient number of unsolved problems for independent work, which the authors have tried to link to real situations arising in practice. The participation of the authors in writing the textbook is equal.</p>		
54.	3.	<p>Atanasov, B., Nikolaev, R., Boshnakov, V., Milkova, T., Petkov, Y. Optimization methods. Varna: Science and Economics, 2009. - <i>chapter I „Analytical geometry“ u p. 3.2.4 „Possibilities for solving the linear optimization problem using Microsoft Excel“.</i></p>
<p>The textbook "Optimization Methods" is intended for students of the specialty "Tourism" at the University of Economics - Varna. It is consistent with the curriculum for this discipline and can be used by both students studying in the specialty "Tourism" and those who are interested in applying mathematical methods in economic research. The authors have strived to make the textbook as accessible as possible to a wide range of readers. Therefore, a number of mathematical statements are given without proofs, and those of the proofs that are presented are significantly simplified. The textbook offers a number of examples of economic problems and their mathematical models, as well as a detailed analysis and synthesis of the optimal solutions of linear models. The possibilities for applying ready-made software products are demonstrated.</p>		
55.	4.	<p>Dochev, D., T., Suruzhon, D., Nikolaev, R., Stoyanov T., Zapryanova, T., Petkov, Y. Mathematics with applications in economics. Varna: Science and Economics, 2011. - <i>chapter 3 “Financial Mathematics”, p.5.5 “Applications of Analytical Geometry in Economics”, p.7.3 “Applications of the Derivative in Economics”, p.10.8 “Applications of the Definite Integral in Economics” and Chapter Eleven “Differential Equations”.</i></p>
<p>The textbook covers issues of combinatorics, financial mathematics, linear algebra, analytic geometry, limit theory, differential calculus of one and more variables, indefinite, definite and improper integrals, first-order differential equations and probability theory. It is intended for students of the University of Economics - Varna. The authors have strived to accompany all</p>		



the most important mathematical concepts, statements and methods with examples demonstrating their economic content and their wide application possibilities. This will allow readers to independently connect specific economic problems with abstract mathematical concepts and methods, while at the same time mastering the universal possibilities of mathematics.

56.	5.	Dochev, D., Yordanova, V., Petkov, Y., Karakulakov, M., Milkova, T., Miryanov, R., Boshnakov, V. Mathematics (problems with applications in Economics). Varna: Science and Economics,, 2012. - <i>chapter Three "Financial Mathematics", chapter Eleven "Differential Equations" and p. 7.3 "Applications of the Derivative in Economics"</i> .
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The practical textbook clarifies basic concepts from various areas of mathematics through well-selected solved examples, many of which illustrate the use of mathematical methods and models in various economic disciplines. A large number of problems are also proposed for independent work by students.

57.	6.	Nikolaev, R., Y. Petkov, D. Mihaylov, Mathematics with Application in Economics. Electronic Textbook. Varna: Science and Economics, 2014, 222 p. - <i>topic five "Curves of second degree. Applications of analytical geometry in economics", topic eight "Properties of differentiable functions. Application of the derivative in economics", topic ten "Function of two or more variables" and item 13.7 "Applications of a definite integral"</i> .
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The textbook is intended for students of the University of Economics - Varna, studying in bachelor's programs in distance learning. Its main goal is to master the basic methods used for numerical (quantitative) analysis in economics. The educational content is structured in fifteen topics - one for each academic week of the semester, with purely mathematical theoretical conclusions being minimized. Attention is paid to the application of mathematics in modeling economic processes.

**Varna,
05.06.2025**

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/Yordan Petkov/**