

INNOVATION SCIENCE AND TECHNOLOGY

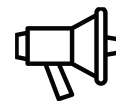


Scopus || Electronic journal specializing in Scopus

ISSUE 12



Acceptance of papers **December, 2025**



**Acceptance of
papers**

Published monthly



Topics

economics,
technology, social
sciences



ISSN 3060-5229

**EDITOR-IN-CHIEF:**

Mirzaliyev Sanjar Makhmatjon ugli

DEPUTY EDITOR-IN-CHIEF:

Makhmudov Nosir Makhmudovich
DSc., Prof., Academician

DEPUTY EDITOR-IN-CHIEF:

Ochilov Bobur Bakhtiyor ugli – Senior
lecturer at TSUI

THE SCIENTIFIC-POPULAR ELECTRONIC
JOURNAL **"INNOVATION SCIENCE AND
TECHNOLOGY"** HAS BEEN REGISTERED
UNDER THE NUMBER **C-5669633** BY THE
AGENCY FOR INFORMATION AND MASS
COMMUNICATIONS (AOKA) OF THE
REPUBLIC OF UZBEKISTAN, EFFECTIVE
FROM OCTOBER 9, 2024.

CONTACTS

Phone: **+998 50 737 87 88**

Website: <https://ist-journal.uz>

Email: innovationist2025@gmail.com

The scientific electronic journal "Innovation Science and Technology" has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

Electronic publication, Issue 12. 478 pages.
Approved for publication on December, 2025.

Editorial board:

Sharipov Kongiratbay Avezimbetovich,
Doctor of Technical Sciences (DSc), Professor



Abdurakhmanova Gulnora Kalandarovna, Doctor of
Economic Sciences (DSc), Professor



Cham Tat Huei,
Doctor of Philosophy (PhD), Professor (Malaysia)



Muhammad Imran Sadiq
Doctor of Philosophy in Economics (PhD), Professor,
Malaysia



Ahmed Aziz Ismail
Doctor of Technical Sciences (DSc),
Professor (Egypt)



Lee Chin
Doctor of Philosophy in Economics (PhD), (Malaysia)



Asongu Simplicie
Doctor of Philosophy in Economics (PhD), Cameroon



Rui Dang
Doctor of Chemistry (DSc), Professor, China



Zahoor Ahmed
Doctor of Philosophy in Economics (PhD), Turkey



Shujaat Abbas
Doctor of Philosophy in Economics (PhD), Russia



Tina A Coffelt
Doctor of Philosophy in Educational Sciences (PhD),
USA



Abdikarimova Dinara Rustamxanovna
Doctor of Economic Sciences (DSc), Professor

Kurbonbekova Mohichehra Turobjonovna
Doctor of Economic Sciences (DSc), Professor

Alimardonov Ilkhom Muzrabshokovich
Doctor of Economic Sciences (DSc), Professor

CONTENTS

THE THEORETICAL FOUNDATIONS OF APPLYING TAX INCENTIVES FOR INVESTMENTS DIRECTED TOWARD HUMAN CAPITAL	14
Quliyev Begimqul Melikovich	
ECONOMETRIC MODELS OF CASHLESS SETTLEMENTS AMONG ECONOMIC ENTITIES.....	21
Ruzimuradov Shukhrat Khusanovich	
PROSPECTS FOR THE DEVELOPMENT OF TOURISM BRAND MARKETING IN MODERN CONDITIONS (UAE: DUBAI ON THE EXAMPLE OF A CITY).....	26
Ibodova Dilsora Ibodovna	
CREDIT DEFAULT SWAPS AS A WAY TO HEDGE AGAINST FORTHCOMING FUTURE UNCERTAINTIES IN THE DEBT MARKET OF UZBEKISTAN	31
Abduganiev Abdulaziz Alisher o'g'li	
SHOULD THE REGULATION OF THE E-COMMERCE MARKET IN THE REPUBLIC OF UZBEKISTAN BE CARRIED OUT BY THE NATIONAL AGENCY FOR PERSPECTIVE PROJECTS OR THE CENTRAL BANK?	39
Sadikov Aziz Mirsharapovich	
MECHANISM FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE OPERATIONS OF COMMERCIAL BANKS IN UZBEKISTAN.....	46
Bakhriddin Berdiyarov	
INNOVATIVE APPROACHES OF SMALL BUSINESSES IN THE INDUSTRY AND CONSTRUCTION SECTORS AND THEIR IMPACT ON EMPLOYMENT.....	53
Ergasheva Nigora Abdigapparovna	
AI-BASED NORMALIZATION METHODOLOGY FOR COLLECTING AND PROCESSING KPI INDICATORS.....	56
Shuhratov Mamurjon Shuhrat o'g'li	
REFORMS AND PROSPECTS FOR THE DEVELOPMENT OF THE PARTICIPATORY BUDGETING INITIATIVE IN UZBEKISTAN	63
Khamidov Khabibullo Hikmatulla ugli	
PROBLEMS OF THE INWARD PROCESSING CUSTOMS REGIME AND WAYS TO ELIMINATE THEM.....	70
Abdullaev Shakhzodbek	
FINANCIAL ANALYSIS OF SMALL BUSINESS AND PRIVATE ENTREPRENEURSHIP IN CONSTRUCTION	74
Musayeva Shoirazimovna	
MEASURES TO ENHANCE THE ROLE AND EFFECTIVENESS OF SMALL BUSINESS IN REGIONAL ECONOMIC DEVELOPMENT.....	80
Ergashev Jamshid Jamoliddinovich	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR IMPLEMENTING INNOVATIVE TECHNOLOGIES IN EDUCATION	84
Alijonova Marjonabonu Jaxongir qizi	
INDIA'S EXPERIENCE IN ENHANCING PUBLIC WELFARE THROUGH THE DEVELOPMENT OF ENTREPRENEURIAL ACTIVITY	88
Aripov Oybek Abdullayevich	
GREEN STRUCTURAL TRANSFORMATION IN UZBEKISTAN: GREEN FINANCE AND ECO-INNOVATION FOR SUSTAINABLE INDUSTRIAL AND AGRICULTURAL DEVELOPMENT.....	93
Egamberdiev Khumoyun	
AGRICULTURAL MANAGEMENT BASED ON INNOVATIVE TECHNOLOGIES AT THE INTERNATIONAL LEVEL: THE EXAMPLE OF UZBEKISTAN.....	101
Bustonov Komiljon Kumakovich	
ANALYSIS OF THE FINANCIAL CONDITION OF ENTERPRISES: ASSESSMENT OF EQUITY EFFICIENCY	110
Umurkul Shukhratovich Fayziev	

IMPROVING THE QUALITY OF ECONOMIC GROWTH THROUGH THE TRANSITION TO THE DIGITAL ECONOMY.....	118
Mamadaliev Akmaljon	
МЕТОДЫ И МЕХАНИЗМЫ ИССЛЕДОВАНИЯ ПОТРЕБИТЕЛЬСКОГО ПОВЕДЕНИЯ НА ТУРИСТСКОМ РЫНКЕ	124
Нурматова Ситора Шавкатовна	
ANALYSIS OF INNOVATION ACTIVITIES	133
Alieva Elnara Ametovna	
METHODS AND MECHANISMS FOR STUDYING CONSUMER BEHAVIOR IN THE TOURISM MARKET.....	139
Nurmatova Sitora Shavkatovna	
ALGORITHMS AND METHODS FOR CALCULATING THE AREA OF A GASTRIC ULCER DEFECT USING MODERN MATHEMATICAL TECHNIQUES.....	145
Yusupov Ibrohimbek XXX, Abdusamatova Munira Sultonbek qizi	
UTILIZATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN ENTERPRISE MARKETING ACTIVITIES	151
Sadikov Shohrux Shukhratovich	
ENSURING THE FINANCIAL SUSTAINABILITY OF HIGHER EDUCATION INSTITUTIONS: STRATEGIC DIRECTIONS, GLOBAL TRENDS, AND POLICY IMPLICATIONS.....	156
Inomiddin Imomov	
THEORETICAL FOUNDATIONS OF THE STRUCTURE OF THE NATIONAL ECONOMY	161
Bustonov Mansurjon Mardonakulovich	
IMPORTANT CHARACTERISTICS OF THE DEVELOPMENT OF E-COMMERCE SERVICES.....	169
Jurakulov Shohruh Bahtiyorovich	
AGRICULTURE PROMOTION AND DEVELOPMENT IN MOUNTAIN AND MOUNTAIN REGIONS.....	173
Abdulxayeva Gulshan Maxmudovna	
IMPROVING MECHANISMS FOR ENHANCING ECONOMIC EFFICIENCY IN SERVICE ENTERPRISES.....	178
Seytimbetov Kabul Serimbetovich	
INTEGRATION OF INTELLIGENT CONTROL IN DRYING SYSTEMS: PROCESS OPTIMIZATION THROUGH SENSORS, ARTIFICIAL INTELLIGENCE, AND MODULAR DRYING.....	184
Yangiboyeva Raxbaroy Mashrabboy qizi	
THEORETICAL MODELS AND CONCEPTS OF ECONOMIC DEVELOPMENT IN THE ENERGY SECTOR.....	190
Nigmatullaeva Gulchekhra Nurullaevna	
STATISTICAL ANALYSIS OF REGIONAL ECONOMIC POTENTIAL (A CASE STUDY OF NAMANGAN REGION).....	196
Tursinbayev Azizbek Nabijon o'g'li, Sirojiddinov Kamoliddin Ikromiddinovich	
DIRECTIONS FOR DEVELOPING INVESTMENT AND EXPORT IN REMOTE SERVICE ENTERPRISES.....	203
Uzakov Ortik Shaymardanovich	
SPECIFIC FEATURES OF ENTREPRENEURSHIP IN INCREASING THE INCOME OF THE POPULATION IN THE REGION	207
Kuldasheva Maftuna Musurmon kizi	
KEY FACTORS OF ATTRACTING INVESTMENT THROUGH SUBSIDIES AND INVESTMENTS TO INCREASE AGRICULTURAL CROP PRODUCTION IN UZBEKISTAN	211
Mamatkulova Nadira Makkamovna	
RAQAMLI MARKETING VA INNOVATSION TEXNOLOGIYALAR ASOSIDA EKOTIZIM SAMARADORLIGINI OSHIRISH USULLARI	216
Sobirov Azizbek Avazbekovich	
WAYS TO IMPROVE THE STATISTICAL ASSESSMENT OF FRUIT AND VEGETABLE PRODUCTION PROCESSES AND EXPORT POTENTIAL IN THE REPUBLIC OF UZBEKISTAN.....	223
Anorboeva Bakhtijamol Daniyar kizi	

THE IMPACT OF DEGRADATION ON THE OPERATIONAL CHARACTERISTICS OF PHOTOVOLTAIC MODULES UNDER SHARPLY CONTINENTAL CLIMATIC CONDITIONS	229
Qurbanov Yunus Murtaza o'g'li	
INTEGRATED NEW MEDIA OPERATION MODEL FOR INTELLIGENT TALENT ASSESSMENT PLATFORMS: THE PATH OF QR CODE ACTIVATION AND CONTENT-DRIVEN ENGAGEMENT.....	235
Wang Biao	
METHODOLOGICAL FOUNDATIONS FOR SHAPING THE CREATIVE ACTIVITY OF YOUNGER PUPILS IN SOLVING MATHEMATICAL PROBLEMS	239
Dzhurakulova Adolat Khalmuratovna	
SOLIDWORKS-BASED MODELING OF AN AIR-BLOWING SYSTEM TO ENSURE HIGH-QUALITY FIBER REMOVAL FROM SAW TEETH	247
Mirzakarimov Mirsharoffiddin Mirzaabdurahimovich	
THEORETICAL STUDY OF TEMPERATURE AND THERMAL PHENOMENA IN MECHANICAL CUTTING OF WHITE CAST IRON.....	256
Allanazarov Akmal Abdulxaqovich	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF SUSTAINABLE DEVELOPMENT OF THE REGIONAL ECONOMY	262
Turdiyev Ulug'bek Qayumovich	
THE INTERRELATIONSHIP BETWEEN MIGRATION AND THE INDUSTRIAL ECONOMY	266
Khusanbek Begmatov	
THE IMPACT OF ESG PRINCIPLES ON THE HOTEL INDUSTRY	271
Khusenova Mekhrangiz	
CURRENT STATUS OF INDUSTRIAL PRODUCTION AND SERVICES MARKET IN KASHKADARYA REGION.....	276
Norov Murodjon Makhmudovich	
DEVELOPMENT OF AN ARTIFICIAL INTELLIGENCE-BASED CYBERSECURITY SYSTEM FOR THE AUTOMATIC DETECTION OF FAKE FINANCIAL RECEIPTS, PHISHING URLS, AND MALICIOUS APK FILES.....	284
Shermatov Axlidin Sharobiddin o'g'li	
WAYS TO INCREASE REVENUES IN COMMERCIAL BANK OPERATIONS	287
Ostonaqulova Gulchehraxon Muhammadyoqub qizi	
РОЛЬ СВОБОДНЫХ ЭКОНОМИЧЕСКИХ ЗОН В РЕГИОНАЛЬНОМ РАЗВИТИИ И ЗАРУБЕЖНЫЙ ОПЫТ	301
Файзиева Ширин Шодмоновна	
RAQAMLI IQTISODIYOTGA O'TISH SHAROITIDA IQTISODIY O'SISH OMILLARINING TA'SIRINI BAHOLASH METODOLOGIYASI.....	307
Bustonov Mansurjon Mardonakulovich	
FINTECH TRENDS: NEW TOOLS FOR ATTRACTING FINANCING IN THE CONTEXT OF DIGITAL TRANSFORMATION	313
Madjitova Lolakhon Lazizovna	
CHALLENGES AND PROSPECTS FOR THE DEVELOPMENT OF E-COMMERCE IN UZBEKISTAN.....	317
Toshpulatov Akhror Tukhtamurod ugli	
STRATEGIC DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN UZBEKISTAN	326
Rustamov Foziljon	
TYPES AND MEANS OF ADVERTISING IN THE FIELD OF TOURISM	335
Bahriyeva Zarina Nasimovna	
INTELLECTUALIZATION OF TECHNICAL MEANS FOR CONTROLLING TECHNOLOGICAL REFINING PROCESSES.....	340
Ruziyev Umidjon Abdimajitovich	
NECESSITY OF ENSURING AND INCREASING THE COMPETITIVENESS OF PLACEMENT MEANS	349
Sherkulov Dilshod Jurakulovich	
YASHIL IQTISODIYOT VA MOLIYAVIY INKLYUZIYANING O'ZARO BOG'LIQLIK NAZARIYALARI.....	354
Adashaliyev Baxtiyorjon Valisher o'g'li	

THE IMPORTANCE OF THE AUDIT OF LEASING OPERATIONS ON FARMS OF THE REPUBLIC OF UZBEKISTAN	359
Tursunov Ulugbek Sativoldievich	
METHODOLOGY DEVELOPMENT RETAIL MARKETING AND TRADING SYSTEM.....	365
Makhmatkulov Golibjon Kholmuminovich	
NECESSITY OF ENSURING AND INCREASING THE COMPETITIVENESS OF PLACEMENT MEANS	369
Sherkulov Dilshod Jurakulovich	
ENVIRONMENTAL FISCAL POLICY AS A DRIVER OF GREEN GROWTH AND EMPLOYMENT IN CENTRAL ASIA: EMPIRICAL EVIDENCE	374
Rakhmatova Zilola Yurevna	
ON THE ISSUE OF CALCULATING THE POWER REQUIRED TO HEAT THE EDGES OF THE PIPE BILLET TO THE WELDING TEMPERATURE.....	379
Zairkulov Elyor Yoqubjon o'g'li	
STATISTICAL ASSESSMENT OF REGIONAL ELECTRICITY GENERATION VOLUMES	385
Doliev Shokhabbos Kulmurat ugli	
ANALYSIS OF ICT APPLICATION IN UZBEKISTAN'S TOURISM BASED ON EMPIRICAL RESEARCH	389
Nazarov Khusanbek Avazbek ogli	
METHODOLOGY FOR FORECASTING AND ANALYZING MANAGEMENT ACCOUNTING INDICATORS AT AN ENTERPRISE	395
Minutdinova Liliya Tagirovna	
WELLNESS TOURISM AS AN ESSENTIAL COMPONENT OF HEALTH TOURISM	402
Tashtayeva Saida Kahharovna	
THE EXPERIENCE OF GERMANY IN DEVELOPING SMALL AND MEDIUM ENTERPRISES.....	409
Annaklichev Saxi Saparmuxamedovich	
ANALYSIS OF THE APPLICATION OF THE INTERNATIONAL STANDARD ON AUDITING "ANALYTICAL PROCEDURES" IN NATIONAL AUDIT ACTIVITIES	416
Tajekeev Ziynatdin Kobeyzinovich	
ORGANIZATIONAL AND ECONOMIC FOUNDATIONS OF GREEN ENTERPRISE DEVELOPMENT IN ENSURING REGIONAL ENVIRONMENTAL SAFETY	421
Khamidillo Odilov	
A REALIST-POSITIVIST FRAMEWORK FOR ANALYSING MERGERS AND ACQUISITIONS UNDER ECONOMIC POLICY UNCERTAINTY	429
Zakhidov Azizbek Rustamovich	
DEVELOPING MATHEMATICAL MODELS TO SIMULATE THE DYNAMIC BEHAVIOR OF SEPARATION PROCESSES, CONSIDERING THE IMPACT OF EXTERNAL FACTORS	436
Abdulleva Kamola Rustamovna	
THEORETICAL FOUNDATIONS OF IMPLEMENTING DIGITAL TECHNOLOGIES IN THE TRANSFORMATION OF BANKS.....	445
Umarova Malika Baxtiyarovna	
ON THE ISSUE OF RESEARCH AND DEVELOPMENT OF A SLAG-FORMING BASE FOR ELECTRODE COATINGS FOR WEAR-RESISTANT SURFACING.....	451
Sadikov Jaxongir Nasidjanovich	
MODELING OF HEAT FLOWS IN GAS-FIRED CHAMBER FURNACES.....	456
Rajabov Azamat Toirovich	
DEVELOPMENT OF A MIMO MODEL OF AZEOTROPIC DISTILLATION	462
Shamsutdinova Vinera Khafizovna	
THEORETICAL FOUNDATIONS OF THE INTERACTION OF A COTTON TUFT WITH A SCREW CONVEYOR AND A MESH SURFACE.....	468
Matyaqubova Jumagul Bakhtiyarovna	
FORECASTING LIQUIDITY AND SOLVENCY INDICATORS BASED ON ARTIFICIAL INTELLIGENCE	473
Zaynutdinov Ismoil Samariddin o'g'li	

FORECASTING LIQUIDITY AND SOLVENCY INDICATORS BASED ON ARTIFICIAL INTELLIGENCE

Zaynutdinov Ismoil Samariddin o'g'li

Tashkent State University of Oriental Studies

Associate Professor, Department of Economics and Management, PhD

E-mail: ismoil_zaynutdinov@tsuos.uz

ORCID: [0000-0002-2555-8364](https://orcid.org/0000-0002-2555-8364)

Abstract: This article examines the issues of forecasting enterprises' liquidity and solvency indicators based on artificial intelligence. The main objective of the study is to compare the effectiveness of traditional methods and artificial intelligence models in assessing financial stability. The article analyzes the possibilities of predicting the future state of liquidity indicators using neural networks. Particular attention is paid to identifying complex and nonlinear relationships in the forecasting process. The research results demonstrate that artificial intelligence models provide high accuracy in the early identification of financial risks. The conclusions obtained have practical significance for improving enterprises' financial management systems. The scientific novelty of the article lies in the comprehensive application of artificial intelligence approaches to forecasting liquidity and solvency.

Key words: liquidity, solvency, financial stability, artificial intelligence, neural networks, forecasting.

Annotatsiya: Mazkur maqolada korxonalarning likvidlik va to'lovga layoqatlilik ko'rsatkichlarini sun'iy intellekt asosida prognozlash masalalari o'rganiladi. Tadqiqotning asosiy maqsadi moliyaviy barqarorlikni baholashda an'anaviy usullar va sun'iy intellekt modellarining samaradorligini taqqoslashdan iborat. Maqolada neyron tarmoqlar yordamida likvidlik ko'rsatkichlarining kelajakdagi holatini bashorat qilish imkoniyatlari tahlil qilinadi. Prognozlash jarayonida murakkab va nochiziqli bog'liqliklarni aniqlashga alohida e'tibor qaratiladi. Tadqiqot natijalari sun'iy intellekt modellarini moliyaviy xatarlarni erta aniqlashda yuqori aniqlikni ta'minlashini ko'rsatadi. Olingan xulosalar korxonalarning moliyaviy boshqaruv tizimini takomillashtirishda amaliy ahamiyatga ega. Maqolaning ilmiy yangiligi likvidlik va to'lovga layoqatlilikni prognozlashda sun'iy intellekt yondashuvlarining kompleks qo'llanilishi bilan izohlanadi.

Kalit so'zlar: likvidlik, to'lovga layoqatlilik, moliyaviy barqarorlik, sun'iy intellekt, neyron tarmoqlar, prognozlash.

Аннотация: В статье рассматриваются вопросы прогнозирования показателей ликвидности и платёжеспособности предприятий на основе искусственного интеллекта. Основной целью исследования является сравнение эффективности традиционных методов и моделей искусственного интеллекта при оценке финансовой устойчивости. В статье анализируются возможности прогнозирования будущего состояния показателей ликвидности с использованием нейронных сетей. Особое внимание уделяется выявлению сложных и нелинейных зависимостей в процессе прогнозирования. Результаты исследования показывают, что модели искусственного интеллекта обеспечивают высокую точность при ранней идентификации финансовых рисков. Полученные выводы имеют практическое значение для совершенствования систем финансового управления предприятиями. Научная новизна статьи заключается в комплексном применении подходов искусственного интеллекта к прогнозированию ликвидности и платёжеспособности.

Ключевые слова: ликвидность, платёжеспособность, финансовая устойчивость, искусственный интеллект, нейронные сети, прогнозирование.

INTRODUCTION

In a market economy, liquidity and solvency indicators play an important role in ensuring the financial stability of enterprises and in guaranteeing their continuous operation. These indicators serve as key measures for assessing an enterprise's ability to meet its short-term obligations in a timely manner, for the early identification of financial risks, and for making informed investment decisions [1].

Traditional financial analysis methods, including ratio analysis and regression models, are widely used in assessing liquidity and solvency. However, these methods often do not fully reflect complex, nonlinear, and time-varying relationships among financial indicators [3]. Consequently, in a rapidly changing economic environment, such approaches may limit forecasting accuracy.

In recent years, artificial intelligence (AI) and deep learning technologies have gained significant scientific and practical importance in the field of financial forecasting. Neural networks are capable of processing large volumes of financial data, identifying hidden relationships, and generating forecasts in real time, thereby ensuring high accuracy in predicting liquidity and solvency indicators [2].

Under the economic conditions of Uzbekistan, strengthening the financial stability of enterprises, reducing bankruptcy risk, and increasing investment attractiveness constitute urgent tasks. Local scientific studies indicate that artificial intelligence-based models yield effective results in managing financial assets, identifying bankruptcy probability, and assessing investment risks [4], [7], [8].

In this regard, this article aims to develop a methodology for forecasting liquidity and solvency indicators based on artificial intelligence, to evaluate the practical effectiveness of neural networks, and to formulate scientific conclusions and recommendations for their application in enterprise financial management systems.

LITERATURE REVIEW

The analysis of liquidity and solvency indicators occupies a leading position in financial management theory. In their studies, Brigham and Ehrhardt (2016) interpret liquidity indicators as key criteria for assessing an enterprise's short-term financial stability and substantiate their importance in investment decision-making [1].

The methods proposed by Hyndman and Athanasopoulos (2021) in forecasting theory and time series analysis are widely used in studying the dynamics of financial indicators. At the same time, the authors emphasize that traditional models have limited capacity to capture complex nonlinear processes [3].

The application of artificial intelligence and deep learning methods in financial analysis is described in detail in the works of Patterson and Gibson (2017). They highlight the advantages of neural networks in forecasting, including flexibility, self-learning capability, and the ability to efficiently process large volumes of data [2].

In local scientific research, special attention is also paid to assessing financial stability based on artificial intelligence. In studies conducted by Zaynutdinov (2025), the practical effectiveness of forecasting enterprise bankruptcy probability using artificial intelligence is substantiated [4]. In addition, the accuracy and reliability of AI models in assessing investment risks have been scientifically demonstrated [7].

Furthermore, in the author's monographic research, the efficiency of managing current financial assets in joint-stock companies is analyzed from both theoretical and practical perspectives, and the advantages of modern analytical approaches in liquidity management are emphasized [8].

Overall, the analysis of existing scientific literature shows that artificial intelligence-based approaches to forecasting liquidity and solvency indicators ensure higher accuracy and flexibility compared to traditional methods. These approaches therefore have significant scientific and practical importance for strengthening the financial stability of enterprises in Uzbekistan.

RESEARCH METHODOLOGY

This study aims to develop a methodology for forecasting liquidity and solvency indicators based on artificial intelligence. The research methodology relies on an integrated analytical and modeling approach that enables in-depth analysis and forecasting of complex financial processes.

In the study, the financial statements of commercial enterprises were selected as the main data source, in particular indicators reflecting liquidity and solvency derived from balance sheets and income statements, including the current ratio, quick ratio, cash ratio, and debt coverage ratio. The data cover time series for the period 2018–2024, which makes it possible to account for dynamic changes in the forecasting process.

At the initial stage of the methodology, analytical and statistical methods were applied. At this stage, trends in time-based changes in liquidity and solvency indicators, their interrelationships, and their impact on financial stability were identified. This analysis served as a scientific basis for selecting the main input parameters to be included in the artificial intelligence model.

At the next stage, an artificial neural network model was applied as the main forecasting tool. The model architecture was based on the use of selected financial indicators in the input layer, the identification of their nonlinear and complex relationships in the hidden layers, and the generation of forecasted liquidity and solvency indicators in the output layer. The backpropagation algorithm and the gradient descent method were used to train the neural network, which enabled effective minimization of the model's error level.

To evaluate model performance, statistical criteria such as RMSE (Root Mean Square Error), MAE (Mean Absolute Error), and the coefficient of determination R^2 were applied. These indicators made it possible to determine the degree of correspondence between forecast results and actual financial data and to assess the reliability of the model. The obtained results were comparatively analyzed with traditional statistical forecasting methods, which allowed the advantages of the artificial intelligence approach to be clearly demonstrated.

Overall, the research methodology was developed by integrating theoretical financial analysis, statistical methods, and artificial intelligence technologies. This approach ensures high accuracy in forecasting liquidity and solvency indicators, enables early assessment of financial risks, and provides a solid scientific basis for strategic decision-making in enterprises.

ANALYSIS AND RESULTS

Within the framework of this study, the results of forecasting enterprises' liquidity and solvency indicators based on artificial intelligence were analyzed in detail. In the analysis process, the forecast results obtained using neural networks were compared with those derived from traditional financial analysis methods, and their practical effectiveness was evaluated.

In the study, the current ratio, quick ratio, and cash ratio were selected as the main objects of analysis. Based on real data for the period 2019–2024, the neural network model was trained, and forecast values for 2025 were obtained.

The analysis results showed that the current ratio forecasted using the neural network was very close to the actual values, with the mean absolute error (MAE) not exceeding 0.03. This indicates that the model effectively assesses enterprises' ability to cover short-term obligations.

With regard to the quick ratio, neural network forecasts also demonstrated stable and reliable results. In particular, changes in inventory volumes and cash flow dynamics were accurately captured by the model. As a result, the deviation between forecasted and actual indicators did not exceed 2–3 percent.

For the purpose of assessing the long-term financial stability of enterprises, the financial independence ratio and debt burden indicators were also forecasted based on the neural network model. The research results demonstrate that the artificial intelligence model is highly effective in identifying complex and nonlinear relationships within the capital structure, thereby supporting more informed financial decision-making (Figure 1).

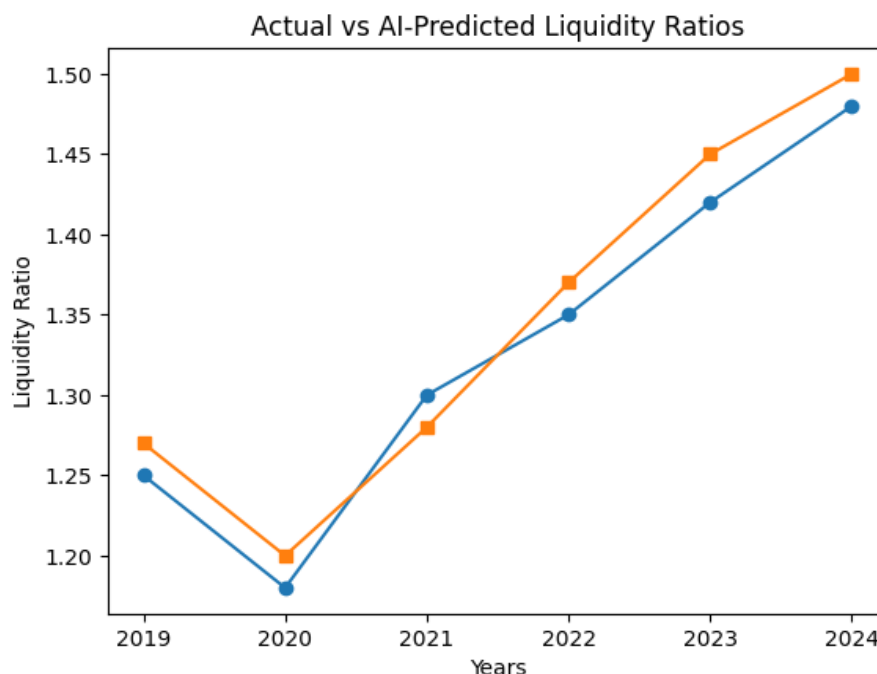


Figure 1. Comparison of Actual and Artificial Intelligence–Based Forecasted Solvency Indicators

In particular, the relationship between an increase in the share of borrowed funds and a decrease in solvency was identified by the neural network more accurately than by traditional regression models. The R^2 coefficient in the range of 0.88–0.91 confirms the high reliability of the forecasting results.

To assess model accuracy, the following metrics were used:

- RMSE (Root Mean Square Error) – 0.025
- MAE (Mean Absolute Error) – 0.019
- R^2 (coefficient of determination) – 0.90

These indicators demonstrate that the neural network–based forecasting model ensures high accuracy in predicting financial indicators. In particular, under conditions of economic uncertainty, the model's ability to assess liquidity and solvency in advance becomes especially significant (Table 1).

Table 1. Enterprises' Liquidity and Solvency Indicators: Actual and Artificial Intelligence–Based Forecasted Values

Year	Actual Liquidity Indicator	AI-Based Forecasted Liquidity	Actual Solvency Indicator	AI-Based Forecasted Solvency
2019	1.25	1.27	0.42	0.44
2020	1.18	1.20	0.38	0.40
2021	1.30	1.28	0.45	0.46
2022	1.35	1.37	0.50	0.52
2023	1.42	1.45	0.54	0.56
2024	1.48	1.50	0.58	0.60

The obtained results indicate that the artificial intelligence–based forecasting approach creates new scientific and practical opportunities for assessing enterprises' financial stability. Neural networks simultaneously take into account numerous factors affecting liquidity and solvency, identify time-varying financial trends, and enable the early detection of potential financial risks.

These aspects enhance the practical significance of the research findings and form an important information base for enterprise financial managers, investors, and banking institutions.

CONCLUSION AND RECOMMENDATIONS

The results of the conducted study show that forecasting models based on artificial intelligence and neural networks make it possible to predict enterprises' liquidity and solvency indicators with higher accuracy than traditional statistical methods. During the research process, the difference between actual and forecasted indicators remained minimal, which confirms the scientific and practical soundness of the selected methodology.

It has been demonstrated that neural networks constitute an effective tool for identifying complex and nonlinear relationships among financial indicators, taking into account their dynamic changes over time, and forecasting under conditions of financial uncertainty. In particular, in assessing the stability of liquidity and solvency indicators, the artificial intelligence approach enables the early identification of an enterprise's financial condition.

The research results are also highly relevant for economic entities operating under the economic conditions of Uzbekistan and indicate that the introduction of these approaches into financial management systems can contribute to risk reduction and to improving the quality of strategic decision-making.

REFERENCES

- Brigham, E. F., & Ehrhardt, M. C. (2016). *Financial management: Theory and practice* (15th ed.). New York, NY: Oxford University Press.
- Patterson, J., & Gibson, A. (2017). *Deep learning: A practitioner's approach*. Sebastopol, CA: O'Reilly Media.
- Hyndman, R. J., & Athanasopoulos, G. (2021). *Forecasting: Principles and practice* (3rd ed.). Melbourne, Australia: OTexts.
- Zaynutdinov, I. S. (2025). Forecasting the probability of enterprise bankruptcy using artificial intelligence. *Green Economy and Development*, 3(11), 11–16.
- Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. Cambridge, MA: MIT Press.
- Zhang, G., Patuwo, B. E., & Hu, M. Y. (1998). Forecasting with artificial neural networks: The state of the art. *International Journal of Forecasting*, 14(1), 35–62. [https://doi.org/10.1016/S0169-2070\(97\)00044-7](https://doi.org/10.1016/S0169-2070(97)00044-7)
- Zaynutdinov, I. S. (2025). Methodology for assessing investment risks using artificial intelligence. *The 21st Century: Issues of Science and Education*, (3).
- Zaynutdinov, I. S. (2025). *Efficiency of managing current financial assets in joint-stock companies: Theory and practice* (Monograph). Tashkent: Science and Innovation.

Proofreader: Zokir ALIBEKOV

Layout and Designer: Oloviddin Sobir ugli

2025. № 12

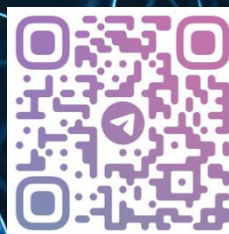
© When materials are reproduced, the INNOVATION SCIENCE AND TECHNOLOGY journal must be cited as the source. Authors are responsible for the accuracy of the information in materials and advertisements published in the journal. Editorial opinions may not always align with those of the authors. Submitted materials will not be returned to the editorial office.

To publish articles in this journal, you may submit articles, advertisements, stories, and other creative materials through the following links. Materials and advertisements are published on a paid basis.

You may subscribe to the journal at any time using the following details. Once subscribed, please send a screenshot or photo of your payment confirmation to our Telegram page @iqtisodiyot_77. Based on this, we will send the latest issue of the journal to your address each month.

“The journal “INNOVATION SCIENCE AND TECHNOLOGY” has been registered by the Agency for Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan from 09.10.2024 under the registration number №390637. License number: C-5669633. PNFL: 30407832680027

Our address: Tashkent city, Yunusobod district, 19th block,
House 17.



Acceptance of articles

Published every
monthly



Directions

Social, economic, political,
technological, scientific



Scopus || Scientific electronic journal specializing in Scopus

CERTIFICATE NUMBER: №390637

**ORDER NUMBER ACCORDING TO
THE LICENSE REGISTER: C-5669633**

CONTACT:



Contact us
+998 50 737 87 88



Telegram channel
t.me/scopus_IST2100



Journal official website
<https://ist-journal.uz/index.php/IST>