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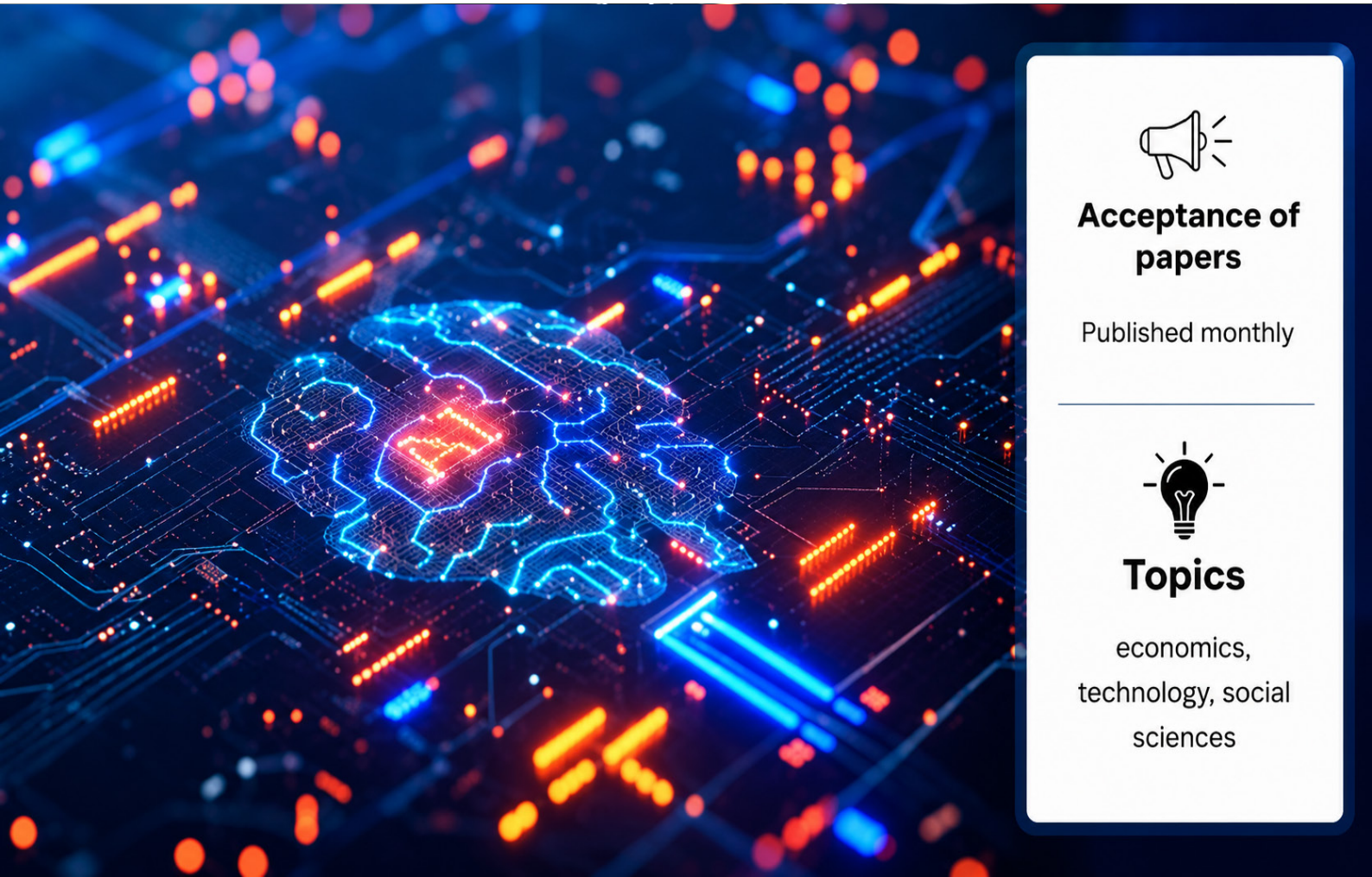

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CONTENTS

THEORETICAL FOUNDATIONS FOR USING ARTIFICIAL INTELLIGENCE IN ASSESSING CORPORATE FINANCIAL STABILITY

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Abstract: The increasing complexity of corporate financial activities requires advanced approaches to assessing financial stability. This study examines the theoretical foundations of using artificial intelligence (AI) to assess corporate financial stability as a multidimensional phenomenon encompassing liquidity, solvency, profitability, efficiency, cash-flow stability, capital structure, working capital, and financial risk. Particular attention is given to machine learning (ML) and explainable AI (XAI) for identifying complex patterns and enhancing assessment transparency. The study proposes an integrated conceptual framework combining financial indicators, AI-based assessment, XAI, and early-warning mechanisms, providing a theoretical basis for future empirical research and application in Uzbekistan.

Key words: artificial intelligence; machine learning; corporate financial stability; explainable artificial intelligence; early-warning system.

Annotatsiya: Korporativ moliyaviy faoliyatning tobora murakkablashib borishi moliyaviy barqarorlikni baholashda ilg‘or yondashuvlardan foydalanishni talab etmoqda. Ushbu tadqiqot likvidlik, to‘lovga qobiliyatlilik, rentabellik, samaradorlik, pul oqimlari barqarorligi, kapital tuzilmasi, aylanma kapital va moliyaviy risklarni qamrab oluvchi ko‘p o‘lchovli hodisa sifatida korporativ moliyaviy barqarorlikni baholashda sun’iy intellektdan (SI) foydalanishning nazariy asoslarini o‘rganadi. Murakkab qonuniyatlarni aniqlash hamda baholash jarayonining shaffofligini oshirishda mashinaviy o‘qitish (MO‘) va tushuntiriladigan sun’iy intellektga (XAI) alohida e’tibor qaratilgan. Tadqiqotda moliyaviy ko‘rsatkichlar, sun’iy intellekt asosidagi baholash, XAI va erta ogohlantirish mexanizmlarini birlashtiruvchi integratsiyalashgan konseptual asos taklif etiladi. Mazkur yondashuv O‘zbekiston sharoitida kelgusidagi empirik tadqiqotlar va amaliy qo‘llash uchun nazariy asos yaratadi.

Kalit so‘zlar: sun’iy intellekt; mashinaviy o‘qitish; korporativ moliyaviy barqarorlik; tushuntiriladigan sun’iy intellekt; erta ogohlantirish tizimi.

Аннотация: Возрастающая сложность корпоративной финансовой деятельности требует применения передовых подходов к оценке финансовой устойчивости. В данном исследовании рассматриваются теоретические основы использования искусственного интеллекта (ИИ) для оценки корпоративной финансовой устойчивости как многомерного явления, охватывающего ликвидность, платежеспособность, рентабельность, эффективность, устойчивость денежных потоков, структуру капитала, оборотный капитал и финансовые риски. Особое внимание уделяется машинному обучению (МО) и объяснимому искусственному интеллекту (XAI) для выявления сложных закономерностей и повышения прозрачности процесса оценки. В исследовании предлагается интегрированная концептуальная модель, объединяющая финансовые показатели, оценку на основе искусственного интеллекта, XAI и механизмы раннего предупреждения, что формирует теоретическую основу для дальнейших эмпирических исследований и практического применения в условиях Узбекистана.

Ключевые слова: искусственный интеллект; машинное обучение; корпоративная финансовая устойчивость; объяснимый искусственный интеллект; система раннего предупреждения.

INTRODUCTION

Corporate financial stability is essential for long-term business sustainability. It reflects a firm’s ability to maintain liquidity, meet financial obligations, generate profits, manage capital, and withstand financial shocks. Traditionally, stability has been assessed using financial ratios and statistical models covering liquidity, solvency, profitability, leverage, efficiency, and working capital. However, these approaches may have limited ability to capture complex and nonlinear relationships among financial variables. The growing availability of corporate financial data has created opportunities for advanced analytical methods. Artificial intelligence, particularly ML, can process multidimensional data and identify complex patterns beyond conventional methods. ML techniques are increasingly used in financial distress and bankruptcy prediction, although issues of data quality, robustness, transparency, and interpretability remain important.

Corporate financial stability is a multidimensional concept encompassing liquidity, solvency, profitability, efficiency, cash-flow stability, capital structure, working capital, and financial risk. However, existing AI research

largely focuses on bankruptcy and financial distress. Therefore, an integrated framework combining financial indicators, AI, explainable AI (XAI), and early-warning mechanisms is needed to provide a broader assessment of financial stability.

This issue is particularly relevant to Uzbekistan, where AI and digital transformation have become national development priorities. The country's Strategy for the Development of Artificial Intelligence Technologies until 2030[1] emphasizes the expansion of AI applications, technological infrastructure, and human capital. Recent government initiatives have also highlighted the growing application of AI in banking and finance. These developments create favorable conditions for the development of AI-based approaches to corporate financial analysis.

Accordingly, this study aims to examine the theoretical foundations of AI-based corporate financial stability assessment and propose an integrated conceptual framework. The study contributes by defining financial stability as a multidimensional construct, integrating conventional financial analysis with AI and XAI, and establishing a conceptual basis for developing data-driven early-warning systems applicable to enterprises in Uzbekistan.

REVIEW OF LITERATURE ON THE SUBJECT

Corporate financial assessment has traditionally relied on financial statements, financial ratios, and statistical models such as the Altman Z-score, which combines multiple indicators to identify financial distress.[2] Although these methods are interpretable, they may have limited ability to capture nonlinear relationships and complex interactions among financial variables.

The growing availability of financial data has encouraged the use of AI and ML methods, including neural networks, decision trees, random forests, support vector machines, and gradient boosting. Recent studies emphasize the importance of data preprocessing, feature selection, outlier detection, and class imbalance in developing reliable models.[3] However, complex AI models may operate as "black boxes," limiting their usefulness in financial decision-making. Explainable AI (XAI) addresses this issue by improving model transparency through techniques such as feature importance and SHAP.[4][5]

Despite these advances, research largely focuses on bankruptcy and financial distress prediction. This study therefore proposes an integrated theoretical framework combining financial indicators, AI, XAI, and early-warning mechanisms to assess corporate financial stability as a multidimensional phenomenon. The framework also provides a basis for future application to enterprises in Uzbekistan.

RESEARCH METHODOLOGY

The study employs theoretical, analytical, and comparative methods to examine the use of artificial intelligence in assessing corporate financial stability. The research analyzes traditional financial assessment approaches, recent developments in artificial intelligence, machine learning, and explainable AI, and their potential application to multidimensional financial stability assessment. Based on this analysis, a conceptual framework for AI-based corporate financial stability assessment is developed.

ANALYSIS AND RESULTS

Multidimensional assessment of financial stability. Corporate financial stability should be assessed as a multidimensional phenomenon rather than through a single financial indicator. Corporate-sector financial health is commonly evaluated through indicators related to leverage, profitability, liquidity, and debt-servicing capacity, which provide information about an enterprise's ability to withstand financial shocks and meet its obligations.[6] Based on the literature and theoretical analysis, the proposed framework incorporates liquidity, solvency, profitability, financial efficiency, cash-flow stability, capital structure, working capital management, and financial risk. These dimensions provide a comprehensive basis for evaluating an enterprise's financial

1 *National Legislation Database,* 25.07.2026-y., 06/26/141/0776*) //* Resolution of the President of the Republic of Uzbekistan No. RP-358 "On the approval of the Strategy for the Development of Artificial Intelligence Technologies until 2030" (14.10.2024).

2 Altman, E.I. (1968), 'Financial ratios, discriminant analysis and the prediction of corporate bankruptcy', The Journal of Finance, 23(4), pp. 589–609.

3 El Madou, K., Marso, S., El Kharrim, M. and El Merouani, M. (2024), 'Evolutions in machine learning technology for financial distress prediction: a comprehensive review and comparative analysis', Expert Systems, 41(2), e13485.

4 Černevičienė, J. and Kabašinskas, A. (2024), 'Explainable artificial intelligence (XAI) in finance: a systematic literature review', Artificial Intelligence Review, 57, 216.

5 Weber, P., Carl, K.V. and Hinz, O. (2024), 'Applications of Explainable Artificial Intelligence in Finance—a systematic review of Finance, Information Systems, and Computer Science literature', Management Review Quarterly, 74, pp. 867–907.

6 International Monetary Fund (2006), *Financial Soundness Indicators: Compilation Guide*, Washington, DC: International Monetary Fund.

condition and resilience.

AI-based assessment framework. The proposed framework consists of several interconnected stages: data collection, data preprocessing, indicator selection, AI model development, financial stability assessment, and interpretation. This structure is informed by established methodological practices in financial distress prediction research, where data preprocessing, feature selection, model implementation, and model evaluation constitute important stages of the analytical process.[7] Financial information may include balance sheet, income statement, cash-flow, market, and selected non-financial data. After preprocessing, relevant financial indicators can be supplied to machine learning models such as logistic regression, decision trees, random forests, support vector machines, gradient boosting, and artificial neural networks.[8]

The general relationship can be expressed as:

$$FS_i = f(X_{\{1\}}, X_{\{2\}}, \ldots, X_{\{n\}})$$

where () represents the financial stability of enterprise (i), and () represent the selected financial indicators.

The proposed framework could support the development of an AI model capable of generating a financial stability score or classifying enterprises into several categories, such as high stability, moderate stability, vulnerable condition, and critical condition. The classification thresholds should be determined empirically using historical data.

Explainable AI and early warning. Explainable Artificial Intelligence (XAI) is an important component of the proposed framework because financial decision-makers need to understand the factors underlying AI-generated assessments. Techniques such as SHAP and feature importance can identify the contribution of individual financial indicators to model predictions and improve the transparency of AI-based financial decision-making.[9]

The integrated framework can therefore be represented as (Figure 1):

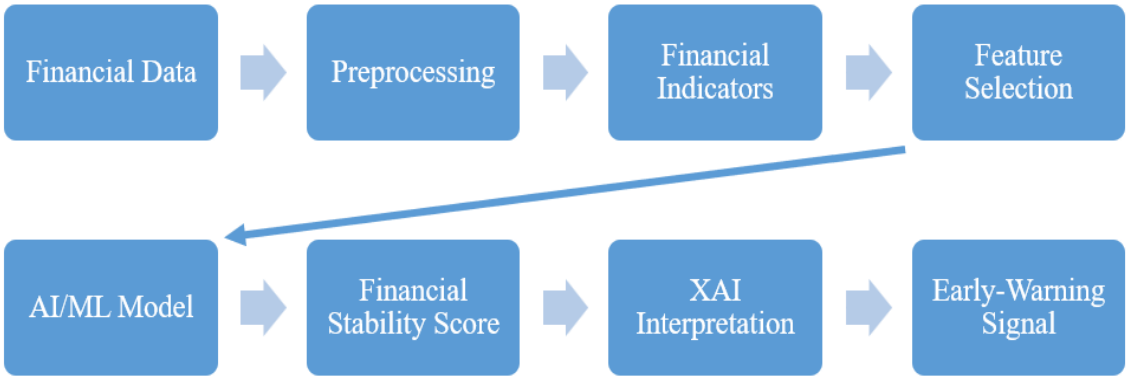

Figure 1. AI-based framework for corporate financial stability assessment[10]

This framework combines the economic interpretability of traditional financial analysis with the analytical capabilities of AI. Its adaptation to enterprises in Uzbekistan can support more comprehensive financial assessment and the early identification of potential financial deterioration.

CONCLUSIONS AND SUGGESTIONS

The study establishes the theoretical foundations for using artificial intelligence in assessing corporate financial stability. It conceptualizes financial stability as a multidimensional phenomenon encompassing liquidity, solvency, profitability, financial efficiency, cash-flow stability, capital structure, working capital management, and financial risk. The proposed conceptual framework integrates traditional financial indicators with machine learning, explainable AI, and early-warning mechanisms, extending assessment beyond the traditional focus on bankruptcy and financial distress. The framework provides a theoretical basis for developing AI-based financial assessment systems and can be adapted to enterprises operating in Uzbekistan. Future research

7 Zhao, J., Ouenniche, J. and De Smedt, J. (2024), 'Survey, classification and critical analysis of the literature on corporate bankruptcy and financial distress prediction', *Machine Learning with Applications*, 15, 100527.

8 El Madou, K., Marso, S., El Kharrim, M. and El Merouani, M. (2024), 'Evolutions in machine learning technology for financial distress prediction: a comprehensive review and comparative analysis', *Expert Systems*, 41(2), e13485.

9 **Černevičienė**, J. and Kabašinskas, A. (2024), 'Explainable artificial intelligence (XAI) in finance: a systematic literature review', *Artificial Intelligence Review*, 57, 216.

10 Developed by author.

should empirically test the framework using real data and compare the performance of different AI models.

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