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**ARTIFICIAL INTELLIGENCE FOR ASSESSING CORPORATE FINANCIAL
DISTRESS: A REVIEW AND FUTURE RESEARCH DIRECTIONS**

Jokhongir Hasanovich Dagarov

Tashkent State University of Economics

Abstract. Corporate financial distress threatens business continuity and financial stability. Traditional assessment methods may have difficulties capturing nonlinear relationships among financial indicators. This study reviews the application of artificial intelligence (AI) in corporate financial distress assessment, focusing on machine learning (ML), deep learning, ensemble, hybrid, and explainable AI approaches. The review identifies key advantages and challenges of AI-based models and highlights future directions for developing accurate, interpretable, and effective early-warning systems.

Keywords: financial distress, bankruptcy, explainable AI, machine learning.

Introduction.

Corporate financial distress is a significant threat to business continuity, solvency, and financial stability. Early identification of distress is therefore important for managers, investors, creditors, and other stakeholders. Traditional approaches based on financial ratios and statistical models have provided important foundations for predicting corporate failure.^{4 5} However, these methods may have limitations in capturing nonlinear relationships and complex interactions among financial indicators. The growing availability of corporate, market, and macroeconomic data increases the potential of AI for financial distress assessment. ML algorithms can process large datasets and identify complex patterns that conventional methods may overlook.

The relevance of this research is also supported by Uzbekistan's national AI policy. The Strategy for Developing Artificial Intelligence Technologies until 2030, approved by Presidential Resolution PQ-358 on October 14, 2024,⁶ promotes the wider application of AI across economic sectors. This creates opportunities for applying AI to corporate financial analysis and risk management. Therefore, this study aims to review AI-based approaches to corporate financial distress assessment, identify their main advantages and limitations, and outline future research directions.

Literature Review

Research on corporate financial distress assessment has evolved from traditional financial-ratio analysis to statistical and artificial intelligence methods. Beaver established the predictive value of financial ratios,⁷ while Altman developed the Z-score model using

⁴ Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research*, 4, 71–111.

⁵ Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, 23(4), 589–609.

⁶ President of the Republic of Uzbekistan. (2024). Resolution PQ-358 of October 14, 2024, on approval of the strategy for the development of artificial intelligence technologies until 2030. Republic of Uzbekistan.

⁷ Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research*, 4, 71–111.



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discriminant analysis.⁸ Ohlson later applied logistic regression to estimate bankruptcy probability.⁹

With the development of AI, ML methods such as neural networks, support vector machines, random forests, and boosting algorithms have been increasingly applied to financial distress assessment. Studies have shown that ML and ensemble models can improve predictive performance compared with conventional statistical approaches.¹⁰ Recent research has increasingly focused on advanced models such as XGBoost, hybrid approaches, and explainable AI, which can improve both prediction and interpretation.¹¹ However, class imbalance, data quality, model interpretability, and generalization remain important challenges.¹²

Methodology.

This study applies a structured narrative literature review to examine AI-based approaches to corporate financial distress assessment. Previous studies are analyzed according to AI methods, data sources, predictive performance, and major methodological challenges. The review focuses on ML, ensemble methods, deep learning, hybrid models, and explainable AI.

Analysis and Discussion

The reviewed literature demonstrates a clear shift from traditional statistical approaches toward artificial intelligence in corporate financial distress assessment. AI-based methods can capture nonlinear relationships, process multidimensional information, and support the identification of early signs of financial deterioration.¹³

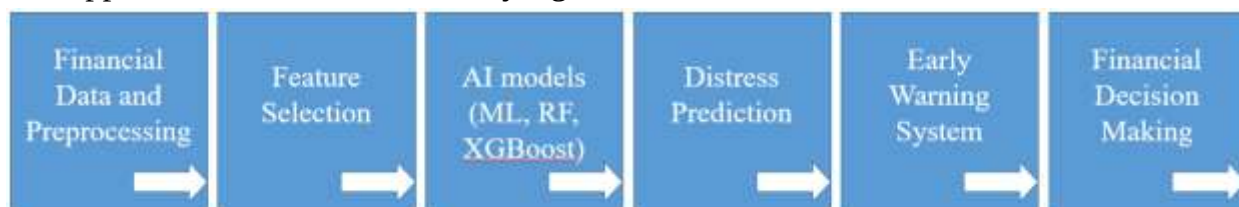


Figure 1. Conceptual framework of AI-based financial distress assessment.

Source: Developed by author.

The literature suggests that ensemble methods, particularly Random Forest and XGBoost, demonstrate strong predictive capabilities, while neural networks and deep-learning methods provide greater flexibility for complex and high-dimensional data.¹⁴

⁸ Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, 23(4), 589–609.

⁹ Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*, 18(1), 109–131.

¹⁰ Barboza, F., Kimura, H., & Altman, E. I. (2017). Machine learning models and bankruptcy prediction. *Expert Systems with Applications*, 83, 405–417.

¹¹ Carmona, P., Dwekat, A., & Mardawi, Z. (2022). No more black boxes! Explaining the predictions of a ML XGBoost classifier algorithm in business failure. *Research in International Business and Finance*, 61, 101649

¹² Zhao, J., Ouenniche, J., & 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.

¹³ Barboza, F., Kimura, H., & Altman, E. I. (2017). Machine learning models and bankruptcy prediction. *Expert Systems with Applications*, 83, 405–417.

¹⁴ Chen, Y., Ribeiro, B., & Chen, A. (2019). A new perspective of performance comparison among machine learning algorithms for financial distress prediction. *Applied Soft Computing*, 83, 105663.

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However, model performance depends strongly on data quality, feature selection, and appropriate evaluation procedures.

An important finding is that predictive accuracy should not be considered the only criterion. Financial distress models should also be interpretable, since managers, investors, and creditors need to understand the factors underlying a prediction. Explainable AI can improve transparency and support the practical use of AI-based financial risk assessment.¹⁵

Another major challenge is class imbalance, as distressed firms usually represent a smaller proportion of observations than financially healthy firms. Therefore, future studies should consider precision, recall, F1-score, ROC-AUC, and cost-sensitive measures rather than relying only on accuracy.¹⁶

The analysis also identifies several promising research directions: integration of financial and non-financial data, hybrid AI models, explainable AI, dynamic prediction using time-series data, and industry-specific models. These approaches may contribute to more reliable and adaptable corporate financial distress early-warning systems.



Figure 2. Future research directions.

Source: Developed by author.

The framework highlights five key directions for future research. Explainable AI can improve model transparency by showing the factors that influence distress predictions.¹⁷ Hybrid AI can combine the strengths of different statistical and machine-learning techniques. Big-data models can integrate financial, market, macroeconomic, and non-financial information. Dynamic models can incorporate time-series data to detect changes in financial condition earlier. Finally, industry-specific models can account for differences in financial structures and risk characteristics across sectors.

Conclusion

Artificial intelligence offers significant potential for improving corporate financial distress assessment by capturing complex and nonlinear relationships and generating timely early-warning signals. The reviewed literature shows that machine learning, ensemble methods, deep learning, and explainable AI can complement traditional financial analysis and enhance predictive capabilities. However, data quality, class imbalance, interpretability, and model generalization remain important challenges. Future research should focus on hybrid, explainable, dynamic, and industry-specific AI models that combine predictive accuracy with practical interpretability. Integrating financial, market,

¹⁵ Carmona, P., Dwekat, A., & Mardawi, Z. (2022). No more black boxes! Explaining the predictions of a ML XGBoost classifier algorithm in business failure. *Research in International Business and Finance*, 61, 101649.

¹⁶ Gnip, P., Kanász, R., Zoričák, M., & Drotár, P. (2025). An experimental survey of imbalanced learning algorithms for bankruptcy prediction. *Artificial Intelligence Review*, 58, 104.

¹⁷ Carmona, P., Dwekat, A., & Mardawi, Z. (2022). No more black boxes! Explaining the predictions of a ML XGBoost classifier algorithm in business failure. *Research in International Business and Finance*, 61, 101649.

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macroeconomic, and non-financial information may further improve the reliability of distress prediction. For Uzbekistan, the development of AI-based financial distress assessment systems could support more effective corporate risk management, investment decisions, and long-term financial stability.

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