AI-Driven Systemic Risk Forecasting for Optimal Bailout Allocation: Enhancing Long-Term Financial Stability in Global Banking Networks

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Abstract

This study introduces a novel AI-driven framework for forecasting systemic risk and optimizing bailout allocation in globally interconnected financial networks. Leveraging graph neural networks (GNNs) trained on cross-border exposure data and dynamic stress scenarios, the framework identifies highly systemic institutions whose failures amplify contagion. Through extensive simulations, we compare AI-optimized bailouts against traditional size-based and randomized interventions under multiple crisis conditions, including asset price shocks, liquidity freezes, and cross-border contagion cascades. The results demonstrate that AI-driven allocations reduce SRISK by 48%, lower CoVaR by 45%, and halve systemic fragility trajectories compared to conventional strategies. Our approach also introduces a policy-aware systemicity index that informs regulators, deposit insurers, and central banks on where to deploy limited bailout resources for maximum systemic stability impact. These findings provide actionable insights for macroprudential supervision, insurance fund reserve allocation, and cross-border crisis coordination under frameworks such as Basel III/IV and the EU AI Act. By integrating explainable AI techniques, the framework remains interpretable and fully auditable, enabling its deployment within high-stakes financial oversight environments. This research bridges the gap between advanced AI modeling and practical policy design, offering regulators an operational tool for anticipating fragility and averting cascading failures in complex financial systems.

Keywords

Graph Neural Networks (GNNs), Systemic Risk Forecasting, AI-Optimized Bailouts, Financial Contagion, Macroprudential Policy, Cross-Border Crisis Management, Explainable AI (XAI).