International Conference on Advanced Research in
BUSINESS, MANAGEMENT & ECONOMICS

24 - 26 October 2025 Geneva , Switzerland

Bridging Predictive Accuracy and Interpretability in Banking Forecasting: a Holistic Explainable Ai Approach with Regulatory Integration

Daniela Tolici

Bank Deposit Guarantee Fund, Romania

Abstract

This study investigates the integration of predictive analytics and explainable artificial intelligence (XAI) in banking forecasting, focusing on reconciling the trade-off between predictive accuracy and interpretability within regulatory and systemic risk frameworks. Using a conceptual–simulation approach, we evaluate three modelling paradigms—Autoregressive Integrated Moving Average with exogenous covariates (ARIMAX), Long Short-Term Memory (LSTM) networks, and Transformer-based multi-horizon forecasters—applied to a synthetic panel of 50 banks over 132 monthly periods. The dataset incorporates liquidity coverage ratios, portfolio default rates, net interest margins, and macro-financial covariates, enabling robust stress-testing under dynamic structural shifts. Model performance is assessed using multiple error metrics (MAE, RMSE, sMAPE) alongside explainability indicators aligned to the Holistic-XAI framework, including fidelity, stability, sparsity, stakeholder satisfaction, and regulatory audit readiness. The findings reveal that LSTM achieves superior short-term predictive accuracy, Transformer architectures outperform at longer horizons with enhanced stakeholder engagement, while ARIMAX remains the optimal choice in high-compliance contexts due to superior interpretability and auditability. The study highlights the critical need for hybrid deployment strategies, combining statistical transparency with deep learning capabilities, to meet the dual imperatives of operational forecasting performance and governance-driven regulatory compliance under evolving mandates such as Basel III/IV, the EU AI Act, and GDPR. By providing a structured methodology and comparative evidence, this paper contributes to bridging the gap between advanced machine learning techniques and the transparency expectations of regulators, risk managers, and financial institutions, offering actionable insights for future supervisory architectures.

Keywords: **Systemic Risk, Model Governance, Regulatory Compliance, Financial Stability, Transparency Frameworks**