ABSTRACT

Explanatory note size – 159 pages, contains 10 illustrations, 21 tables, 11 appendices, 32 references.

Topicality. Volatility is a key risk indicator reflecting the scale of asset price fluctuations and their instability. Accurate and timely volatility forecasting is critical for investors, traders, and financial institutions as it allows assessing risk levels and making informed decisions regarding investments and portfolio management. Given the growing volume of market data and the complexity of relationships between assets, there is a need to create effective forecasting methods based on modern mathematical and software tools. The integration of artificial intelligence and machine learning algorithms with classical econometric models creates a powerful toolkit for improving forecast accuracy, which is especially relevant in conditions of market instability.

The aim of the study. To improve the accuracy of real-time volatility forecasting in financial markets by developing software based on artificial intelligence models and integrating them into a scalable streaming architecture.

The object of research. Software for analysis and forecasting of financial market volatility.

The subject of research. Methods of analysis and forecasting of financial market volatility.

To achieve this goal, the following tasks were formulated:

− analyze existing models and algorithms for volatility forecasting in financial markets;

− develop a proprietary forecasting model;

− develop software using the developed model;

− perform experimental studies and evaluate the effectiveness of the proposed model and software.

Scientific novelty. The scientific novelty of the study lies in the proposed architecture, which allows integrating different analytical approaches into a single model, considering both historical price time series and external macroeconomic indicators and market sentiment analysis. This ensures improved forecasting accuracy

through deeper analysis of nonlinear dependencies and comprehensive consideration of various factors. Scientific novelty also lies in the development of algorithms that optimize the processing of large data volumes using distributed computing, ensuring increased processing speed and model scalability.

Relationship with working with scientific programs, plans, topics. Work was performed at the Department of Informatics and Software Engineering of the National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute».

Approbation. The scientific provisions of the dissertation were tested at the IX International Scientific and Practical Conference of Young Scientists and Students «Software Engineering and Advanced Information Technologies (SoftTech-2025) ».

Publications. The scientific provisions of the dissertation published in:

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