

**DEVELOPMENT OF AN ECONOMIC-MATHEMATICAL
MODEL BASED ON ARTIFICIAL INTELLIGENCE IN
MACROECONOMIC SYSTEMS**

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In the modern economy, innovation processes are one of the factors ensuring the development of the country. Effective management and forecasting of innovations in macroeconomic systems is a complex issue, and traditional economic methods often do not provide accuracy.

Although the issues of management and forecasting of innovative production in macroeconomic systems are widely discussed in the scientific literature, they have not been studied at the level of developing complex economic and mathematical models based on artificial intelligence. The use of modern computer technologies in the development of the dynamics of innovative processes and their forecasting with the help of a re-working economy solves the scientific problem of cargo transportation.

In the research work of this study, it helps to provide existing methodological things by applying artificial intelligence tools in the analysis and programming of innovation processes in macroeconomic systems.

The purpose of the study is- to study the possibilities of using artificial intelligence technologies in the process of forecasting and analyzing macroeconomic indicators and to develop effective forecasting methods based on economic and mathematical models .

J. Stock and M. Watson (2020) compared and analyzed modern econometric models and artificial intelligence methods in forecasting

macroeconomic indicators. Their research noted the high efficiency of machine learning algorithms in forecasting economic indicators.

Artificial Neural Networks , Random Forest , Support Vector Machine have been widely used in modeling economic processes . Scientists have also conducted a number of scientific studies on modeling and forecasting economic processes. In particular, there are scientific studies on the use of econometric models, regression analysis and statistical methods in forecasting macroeconomic indicators in the economy of Uzbekistan. However, the issue of using economic models based on artificial intelligence has not yet been sufficiently studied.

The following verification methods were used in the research process:

- economic and statistical analysis
- regression analysis
- machine learning algorithms
- time series research

Artificial intelligence methods were used to build the model:

- **Artificial Neural Networks (ANN)**
- **Random Forest Algorithm**
- **LSTM (Long Short-Term Memory)** – for time series

forecasting

Macroeconomic indicators (GDP, innovation activity indices, investment volume, research and development resources) were obtained for investment objects.

The following criteria were used to obtain the model:

- MAE (mean absolute)
- RMSE (Root Mean Square Error)
- MAPE (Mean Percentage Error)

Research recommendations innovative processes forecast for artificial intellect based on economic - mathematical model working It was released .

- LSTM gave high accuracy in time series model forecasting
- Random Forest is effective in identifying model effects
- The proposed model was created to predict inflationary dynamics in macroeconomic systems using software, a model with greater accuracy than traditional regression models.

The use of artificial intelligence technologies in modeling macroeconomic indicators has a number of important advantages. First, these technologies allow for rapid processing of large volumes of economic data. Second, the flexibility of artificial intelligence models helps to quickly adapt to changes in economic processes. Third, artificial intelligence-based models play an important role in the process of economic policy planning by increasing the accuracy of forecast results.

However, there are some problems in the application of economic models based on artificial intelligence. In particular, the lack of high-quality and complete statistical data, the need for large amounts of data to train models, and the complexity of algorithms can make their application in practice somewhat difficult.

An economic model is a mathematical, graphical, or logical representation created to explain, analyze, and forecast economic processes and phenomena . An economic model describes a real economic system in a simplified form and allows for the identification of relationships between economic indicators.

artificial intelligence algorithms are also used to create economic models (**Machine Learning, Artificial Neural Network, Big Data analysis**).

In this study, an economic-mathematical model based on artificial intelligence was developed for analyzing and forecasting innovation processes in macroeconomic systems. The results show that the model has high accuracy and practicality. This is of great importance in the effective management and forecasting of economic activity. The use of artificial intelligence technologies

serves to increase the efficiency of the process of economic-mathematical modeling of macroeconomic indicators. In the future, the integration of artificial intelligence algorithms with econometric models, the development of new forecasting methods, and the improvement of models based on real economic data will be of great scientific importance in economic research.

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