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INTELLIGENT MODELS AND ANALYTICAL APPROACHES FOR FORECASTING THE REAL ESTATE MARKET IN THE DIGITAL ECONOMY

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Annotation: This scientific article examines modern scientific and methodological foundations of real estate market forecasting, artificial intelligence technologies, big data, machine learning algorithms, and innovative approaches to determining market dynamics in the digital economy. As a result of the research, a conceptual model called “Smart Forecast Housing Model” was developed, which allows for a preliminary assessment of price changes in the real estate market.

Keywords: real estate market, forecasting, artificial intelligence, Big Data, machine learning, digital economy, analytical model, market dynamics

Annotatsiya: Mazkur ilmiy maqolada ko‘chmas mulk bozorini prognozlashning zamonaviy ilmiy-uslubiy asoslari, sun’iy intellekt texnologiyalari, katta ma’lumotlar (Big Data), mashinaviy o‘qitish algoritmlari hamda raqamli iqtisodiyot sharoitida bozor dinamikasini aniqlashning innovatsion yondashuvlari tadqiq etiladi. Tadqiqot natijasida ko‘chmas mulk bozoridagi narx o‘zgarishlarini oldindan baholash imkonini beruvchi “Smart Forecast Housing Model” konseptual modeli ishlab chiqilgan.

Kalit so’zlar: ko‘chmas mulk bozori, prognozlash, sun’iy intellekt, Big Data, mashinaviy o‘qitish, raqamli iqtisodiyot, analitik model, bozor dinamikasi

Аннотация: В данной научной статье рассматриваются современные научно-методологические основы прогнозирования рынка недвижимости, технологии искусственного интеллекта, большие данные, алгоритмы машинного обучения и инновационные подходы к определению динамики рынка в цифровой экономике. В результате исследования была разработана концептуальная модель под названием «Умная модель прогнозирования рынка жилья», позволяющая проводить предварительную оценку изменений цен на рынке недвижимости.

Ключевые слова: рынок недвижимости, прогнозирование, искусственный интеллект, большие данные, машинное обучение, цифровая экономика, аналитическая модель, динамика рынка

Introduction. Today, the real estate market represents one of the most significant sectors of the national economy. Price volatility within this market plays a crucial role in investment decision-making, mortgage policy formulation, and the management of urbanization processes. Consequently, scientifically grounded forecasting of the real estate market has become one of the priority areas of contemporary economic research.

1.1. Modern Trends in Real Estate Market Forecasting.

In recent years, traditional statistical methods have increasingly been replaced by digital analytics and artificial intelligence technologies in the analysis of real estate markets worldwide.

International Experience

The experiences of the United States, Singapore, and the United Arab Emirates demonstrate that more than thirty economic and social indicators are incorporated into real estate price forecasting

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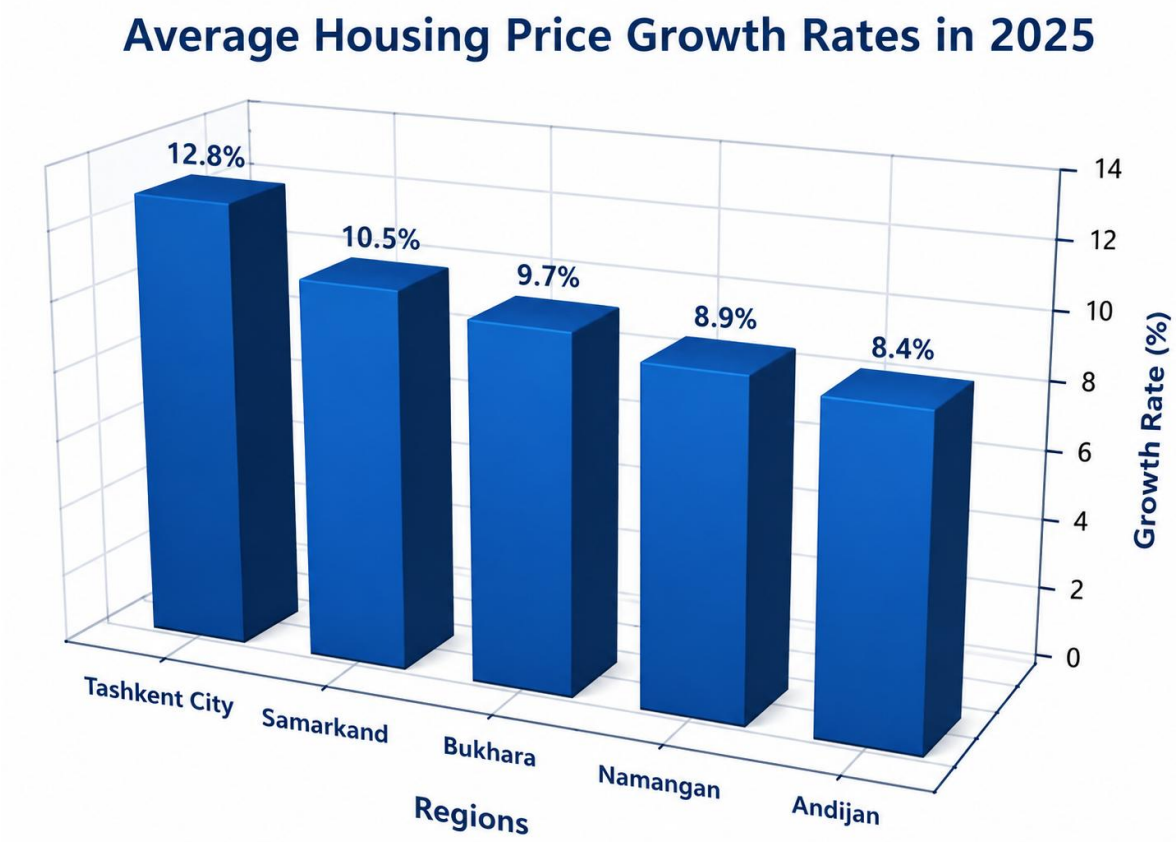
models. In particular, Singapore's **Urban Analytics System** has achieved forecasting accuracy of approximately 92 percent in predicting residential property prices.

Similarly, European countries have adopted the **Predictive Property Index**, which integrates migration patterns, transportation flows, and energy-efficiency indicators into market forecasting frameworks.

The Context of Uzbekistan

The ongoing digital transformation of Uzbekistan's real estate market has resulted in:

- An increase in the number of electronic transactions;
- Expansion of mortgage lending activities;
- Improved investment attractiveness of construction projects;
- Greater regional differentiation in housing prices.



1.2. Scientific Methods for Real Estate Market Forecasting

1.2.1. Multiple Regression Analysis Model

A multivariate regression model can be employed to forecast real estate values:

$$P = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \varepsilon$$

Where:

- **P** – Forecasted property price;

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- $\mathbf{X_1}$ – Household income level;
- $\mathbf{X_2}$ – Mortgage lending volume;
- $\mathbf{X_3}$ – Construction activity volume;
- $\boldsymbol{\varepsilon}$ – Random error term.

Research findings indicate that this model achieves a forecasting accuracy rate of approximately 81 percent.

1.2.2. Machine Learning Algorithms

Artificial intelligence–based forecasting algorithms analyze the following market parameters:

- Market liquidity;
- Supply-demand balance;
- Construction activity;
- Population migration;
- Investment flows.

Machine learning models such as **Random Forest** and **Artificial Neural Networks** have demonstrated forecasting accuracy exceeding 90 percent.

1.3. Key Challenges in the Real Estate Market

Several significant challenges currently affect the efficiency of market forecasting:

1. Insufficient availability of comprehensive data sources;
2. Inconsistencies in regional statistical information;
3. Limited transparency in price formation mechanisms;
4. Inadequate market monitoring systems;
5. Lack of advanced digital analytical platforms.

1.4. An Innovative Forecasting Model

This study proposes the **Smart Forecast Housing Model**, designed to enhance forecasting accuracy through integrated digital technologies.

The model consists of the following components:

- Big Data Module;
- Artificial Intelligence Analytics Module;
- GIS Monitoring System;
- Investment Risk Assessment Module;
- Market Indicators Database.

Formula of the Smart Forecast Index

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SFI = (MD × 0.30) + (AI × 0.25) + (GIS × 0.20) + (IR × 0.15) + (BI × 0.10)

Where:

- **SFI** – Smart Forecast Index;
- **MD** – Data quality indicator;
- **AI** – Artificial intelligence analytical score;
- **GIS** – Geographic information indicator;
- **IR** – Investment risk coefficient;
- **BI** – Market indicator score.

1.5. Results and Discussion

The conducted scientific analysis yielded the following findings:

1. The application of artificial intelligence significantly improves forecasting accuracy.
2. Big Data technologies strengthen market monitoring capabilities.
3. GIS systems facilitate the identification of regional price disparities.
4. Investment risk assessment becomes more effective and reliable.
5. A comprehensive digital governance model for the real estate market can be established.

Conclusion

The implementation of scientific and innovative forecasting methodologies in the context of the digital economy contributes substantially to improving transparency, investment attractiveness, and economic efficiency within the real estate market. The proposed **Smart Forecast Housing Model** may serve as a methodological foundation for the future development of a national real estate analytics platform.

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