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RESULTS OF LONG - TERM FORECAST AND STRATEGIC ANALYSIS FOR THE EFFECTIVE ORGANIZATION OF MODERN HOUSING FUND MANAGEMENT

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ABSTRACT

This article presents reliable information on the relevance of long-term forecasting and strategic analysis for the effective organization of the modern housing stock, identifying influencing factors and solutions to existing problems. Econometric methods were utilized in this economic strategic analysis, as they help link statistical data with economic theories. The analysis aimed to develop monitoring systems to account for current changes and adapt quickly to them. Based on the results of the analysis, recommendations and proposals were developed in this article to improve the management of the housing stock and ensure its sustainable development.Калит сўзлар: замонавий уй-жой фонди, инвестиция ҳисоби, уй-жой фондини самарали ташкил этиш, эконометрик моделлар, экспоненционал тренд модели, автокорреляция ҳолати, мавсумийлик, тасодифийлик ва цикллик компоненталар.

KEY WORDS: *Modern Housing Stock, Investment Accounting, Effective Organization Of The Housing Stock, Econometric Models, Exponential Trend Model, Autocorrelation, Seasonality, Randomness, And Cyclical Components..*

1. INTRODUCTION

The effective organization of modern housing stock is a critical issue for every state and society, significantly impacting daily life. Practical approaches to this issue are of great importance when considered from economic, social, and environmental perspectives. Today, the processes of urbanization, population growth, new stages of economic development, and the desire to improve the standard of living necessitate ensuring high efficiency in housing construction.

The organization of modern housing stock involves not only constructing buildings but also considering crucial factors such as quality, environmental safety, social infrastructure, energy efficiency, transportation, and other related aspects. This process is influenced by numerous economic factors, including the cost of construction materials, production capacities, income levels of the population, availability of bank loans, and government policies, all of which play a vital role.

The goal of effectively organizing modern housing stock is not only to meet housing demand but also to ensure social stability, create a reliable foundation for economic growth, and positively impact people's quality of life. Achieving these objectives requires modern economic, social, and environmental approaches, as well as long-term forecasting and strategic analyses.

2. LITERATURE REVIEW

Science and technology are advancing rapidly worldwide. As a result, this leads to the socio-economic development of the state, improving the standard of living and increasing the income of the population. Naturally, as income levels rise, people's desire to improve their living conditions also increases. In particular, the demand for modern housing with all amenities is increasing year by year. This creates the need for the effective organization of modern housing stock to fully meet the population's demand for contemporary housing. In this context, it is essential to pay close attention to modern construction methods, construction procedures, the state's housing policy, and cooperation with the private sector. The long-term forecasting and strategic analysis of the effective organization of modern housing stock reflect a wide range of important perspectives and approaches from scholars, covering several key directions. Below, we will review their scientific views and analyses.

Robert Solow (2010), a renowned scholar known for his scientific works on "Macroeconomics and Economic Growth in Housing Markets," focused on the impact of the housing sector on economic growth. According to him, the effective organization of the housing stock is crucial for supporting economic growth. Based on specific models and economic indicators, increased efficiency in the housing market stimulates the overall economic development of the country. In other words, the efficient functioning of the housing stock can be a part of economic growth. To achieve this, he emphasizes the need to analyze the efficiency of rental markets

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and construction costs, as well as optimize the integration of the housing sector's infrastructure and energy cooperation to maximize economic growth.

Additionally, George Akerlof (2017), in his scientific research, laid the foundation for economic models of the housing sector through his analysis of "Symmetric and Asymmetric Information" The efficiency of the housing stock is primarily dependent on analyzing human decision-making and the factors influencing decisions in the decision-making process. In his views, he emphasized that analyzing information asymmetry in the housing sector, namely improving the accuracy and transparency of data regarding customs, construction, and rental prices, is a key direction for increasing efficiency. He also highlighted the importance of analyzing the relationships between supply and demand through specific models to effectively organize the market.

In economic theory, macroeconomic policy and government intervention play a crucial role. He emphasized the need to focus on the impact of government policies when analyzing rental prices, construction, and renovation within the housing stock.

Thus, John M. Keegan (2008) argued that government support stimulates economic demand and leads to improved efficiency in the housing market. He stressed the need to strengthen government intervention to stimulate activity in the construction and rental markets. He also believed that infrastructure support aimed at saving equipment and energy resources in housing would help improve efficiency.

Patrick Bajari, Phoebe Chan, Dirk Krueger, and Daniel Miller (2010) conducted practical research on the efficiency of the housing stock and its optimization based on the experience of modern economic-mathematical models.

Based on their research, they argue that the modeling of the housing stock should be carried out using dynamic models that take into account fluctuating demand and supply. In their scientific views, they emphasize the importance of considering dynamic issues and changes over time in the modeling of the housing stock. They also highlight that energy efficiency or the implementation of new environmental technologies could play a crucial role in improving the efficiency of modern housing stockIn their scientific research on econometrics and housing stock models in economics, they emphasized introducing innovations and using statistical analysis methods to optimize the housing stock.

The researcher Xin Lin (2021), through his analysis of economic-mathematical models and the construction market, examined the economic efficiency of the housing sector and evaluated its social and economic impacts using new methodologies. He proposed analyzing the inequality in the housing market in many studies as a way to address social and economic issues. According to him, in organizing the housing stock to ensure social equality, it is necessary to consider the standard of living and economic opportunities of the population. He emphasized that in the effective organization of the housing stock, the social and economic needs of the community must be addressed. Models that take into account the demand and supply in the housing sector can help promote social equality.

In the research works of A. Deineko, V.A. Kurachkina, and Y. Bronnikova (2021), special attention was given to the ecological aspects of modern housing stock. According to their views, energy efficiency and environmental issues are crucial factors in the organization of modern housing stock. Уй-жойларда энергия истеъмолини оптималлаштириш, курилишнинг экологик самарадорлигини ошириш замонавий талаблардан биридир. As a result, ecological relations and energy-saving technologies in the construction process help improve efficiency. The implementation of ecological models and renewable energy sources is considered a significant direction for modern housing stock.

The long-term forecast and strategic analysis of the effective organization of the modern housing stock, according to scholars' views, are directed toward finding solutions to problems in various areas. Their scientific research focuses on the housing market, rental prices, market demands, the impact of government policies, ecological efficiency, and energy economics. These scientific approaches define distinct directions in the utilization of modern housing stock.

3. RESEARCH METHODOLOGY

The analyses in this article are focused on studying new methods used to explore the development trends of modern housing stock, its problems, and finding the most effective solutions. Through long-term forecasting and strategic analysis, it becomes possible to identify the factors influencing the effective organization of the housing stock and assess their interrelationships in alignment with changes. For this reason, the research aims to study the economic, social, and ecological aspects of effectively organizing modern housing stock through economic models and statistical analyses.

4. ANALYSIS AND RESULTS

It is well known that analyzing the economic processes related to meeting the demand for modern housing and further developing

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them, particularly by creating future forecast scenarios for key indicators influencing the effective organization of modern housing stock, is of significant importance.

Therefore, it is advisable to develop forecast scenarios for the following key indicators related to the effective organization of modern housing stock up to the year 2030.

The total area of the residential fund (y).

$$y_1 = a_0 e^{a_1 t} + \varepsilon \qquad (1)$$

Here, – the unknown parameters of the exponential trend model, – the time factor, – the base of the natural logarithm (2.718).

As a result of the calculations, the following exponential trend model was constructed.

$$y_1 = 395104875\ ,405 e^{0,0356t}$$

And the model was evaluated according to the evaluation criteria.

Table 1

Evaluation criteria for the constructed exponential trend model. [1]

Model evaluation criteria:	Calculation formula	Standard value	Model evaluation results
Approximation error	$\overline{A} = \frac{\sum_{i=1}^{n} \frac{\lvert y_i - y_t \rvert}{y_i}}{n} \cdot 100\%$	$\overline{A} \le 10\%$	0,18%
Standard error	$S_y = \sqrt{s^2}$	$S_y \to \min$	0,04
t-statistic	$t_i = \frac{b_i}{Sb_i}$	$t_{his} > t_{jad} = 2,56$	12,19; 796,69
Coefficient of determination	$R^2 = 1 - \frac{s_e^2}{\sum \left(y_i - \overline{y}\right)^2}$	$R \in [0;1]$	0,92
Fisher statistic	$F = \frac{R^2}{1-R^2} \cdot \frac{n-m-1}{m}$	$F_{his} > F_{jad} = 4,74$	148,72
Durbin-Watson statistic	$DW = \frac{\sum (e_i - e_{i-1})^2}{\sum e_i^2}$	$1,5 < DW > 2,5$	1,61

Thus, the constructed exponential trend model was positively evaluated according to all evaluation criteria, and based on this model, the total area of the residential fund (y) was forecasted.

Table 2

Forecast scenarios for the total area of the residential fund until 2030. [2]**, Square meters (sq.m.)**

Year	Pessimistic scenario |	Dynamic scenario	Optimistic scenario
2024	671909527,4	673909527,4	675909527,4
2025	696330285,0	698330285,0	700330285,0
2026	721635988,3	723635988,3	725635988,3
2027	747858705,5	749858705,5	751858705,5
2028	775031667,0	777031667,0	779031667,0
2029	803189307,1	805189307,1	807189307,1
2030	832367308,0	834367308,0	836367308,0

Based on this research, among the scenarios projected for the total area of the residential fund until 2030, the "dynamic scenario" was selected as the optimal option.

[1] *Author's Calculations*

[2] *Author's Calculations*

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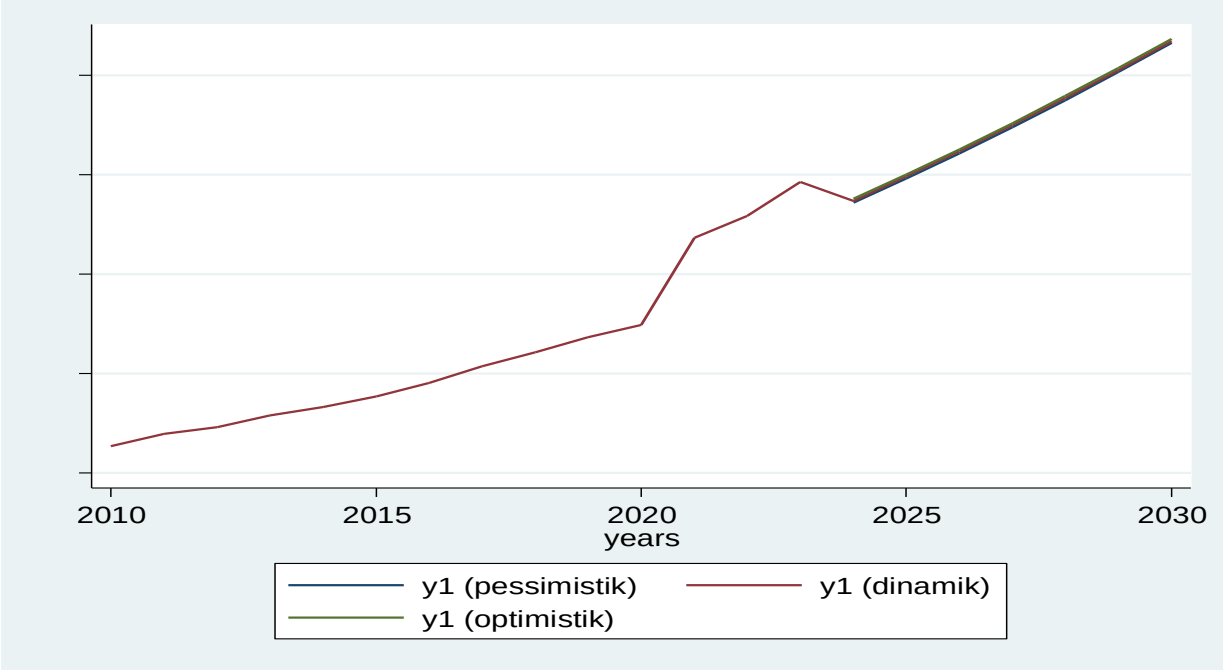


Figure 1. Graph of the actual and forecasted values of the total area of the residential fund.[3], Square meters (sq.m.)

According to the forecast results developed under the dynamic scenario, by 2030, the total area of the residential fund could reach 834,367,308.0 sq.m. This is approximately 1.20 times larger than the current period.

The growth rate of services related to real estate (y_2): $$\Delta^d y_t = c + \sum_{i=1}^{p} a_i \Delta^d y_{t-1} + \sum_{j=1}^{q} b_j \varepsilon_{t-j} + \varepsilon_t$$

(2) Here, – model parameters, – the change values of the d-order time series. "When checking the time series for the growth rate of services related to real estate (y_2) using the "Dickey-Fuller" test in the Stata program, it was determined that the time series is non-stationary in the initial stage.

According to the results of the Dickey-Fuller test, the p-value is 0.0582, which does not satisfy the condition p-value < 0.05. Therefore, it is necessary to differentiate the time series and recheck it using the Dickey-Fuller test.

```
Dickey-Fuller test for unit root                 Number of obs   = 12
Variable: D.y2                                   Number of lags  =  0

H0: Random walk without drift, d = 0

                                                 Dickey-Fuller
                     Test                    critical value
                  statistic                1%              5%              10%
------------------------------------------------------------------------------
 Z(t)            -6.143                -3.750          -3.000          -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000.
```

According to the results of the Dickey-Fuller test, after differentiating the time series at the first order, the p-value is 0.000001, which satisfies the condition p-value < 0.05. This means that the value of d required for the ARIMA method's Identification stage is 1 (d = 1).

[3] *By The Author*

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Additionally, in the ARIMA method's Estimation stage, the significance (quality) of the selected models is evaluated using criteria such as Log Likelihood, Akaike, and Bayesian. Based on these evaluations, the optimal option is chosen.

Table 3
Model evaluation results [4]

Criteria	ARIMA (2, 1, 3)	ARIMA (1,1,1)	**ARIMA (1,0,2)**
	$y_t = 0{,}61 - 0{,}75\,y_{t-2} - 0{,}96e_{t-3}$	$y_t = -1{,}43 - 0{,}003\,y_{t-1} - 1{,}0e_{t-1}$	$y_t = 115{,}65 + 0{,}29\,y_{t-1} + 0{,}99e_{t-2}$
Sigma	7.308142	7.988384	7.327157
Log likelihood	-44.44942	-46.78233	-49.87307
Akaike	102.8988	99.56465	109.7461
Bayesian	106.2932	101.2595	112.9414

According to the evaluation results, among the selected models, ARIMA (1,0,2) was positively evaluated compared to the other models.

In the forecasting stage of the ARIMA method, pessimistic, dynamic, and optimistic scenarios were developed based on the selected optimal ARMA (1,0,2) model for the period up to 2030.

In the Estimation stage of the ARIMA method, the significance (quality) of the selected models is evaluated using criteria such as Log Likelihood, Akaike, and Bayesian, and the optimal option is chosen.

5. CONCLUSION

It can be stated that in the long-term forecasting and implementation of the strategy for effective management of modern residential property, the following directions will be developed:

1. Developing the residential property rental services market, correctly drafting lease agreements, and providing additional household conveniences to tenants.
2. Creating additional opportunities for investment, credit, and mortgage systems to purchase residential properties. As a result, easing mortgage loans and encouraging financing of housing projects.
3. Improving living conditions in multi-story buildings, ensuring complete inventory of properties, providing modern elevators, security systems, and systematic, long-term technical maintenance.
4. Implementing automated residential systems, conserving lost energy, establishing security systems, conducting regular monitoring of properties, and incorporating modern trends in aesthetics and design into homes.
5. Developing legal mechanisms to systematically resolve disputes and issues in the housing market.
6. Achieving effective management mechanisms by improving modern approaches, management systems, and monitoring mechanisms in residential property management.
7. Developing a social protection system for low-income populations, creating relevant programs through rental services and support.

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