FORMULATION OF EFFICIENCY IMPROVEMENTS IN THE DEVELOPMENT OF THE HOUSING SECTOR THROUGH ECONOMETRIC MODELS

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Annotatsiya: Ushbu maqolada uy-joy fondlariga xizmat ko'rsatuvchi boshqaruv kompaniyalari faoliyatining tashkiliy va iqtisodiy jihatdan samarali ishlashini ta'minlovchi mexanizmlarni takomillashtirish mazkur sohadagi dolzarb masalalarni hal etish hamda belgilangan strategik maqsadlarga erishishda asosiy omillardan biri sifatida asoslab berilgan va yakuniy foydalanuvchilarga uy-joy xizmatlarini samarali yetkazib berish imkoniyatlarini yaratishi mumkinligi ekonometrik modellashtirish vositalari orqali ilmiy asosda isbotlab berilgan.

Kalit so'zlar: Uy-joy fondlari, tashkiliy-iqtisodiy mexanizm, ekonometrik tahlil, istemolchilarga xizmat ko'rsatish, bozor mexanizmi, iste'molchilar talabi.

Аннотация: В статье обосновано совершенствование механизмов, обеспечивающих организационно-экономически эффективную деятельность управляющих компаний, обслуживающих жилищные фонды, как один из основных факторов решения актуальных проблем в этой сфере и достижения поставленных стратегических целей, а также научно доказано с помощью инструментария эконометрического моделирования, что оно может создать возможности для эффективного предоставления жилищных услуг конечным потребителям.

Abstract: This article substantiates the improvement of mechanisms that ensure the organizational and economically efficient operation of management companies servicing housing funds as one of the main factors in solving current issues in this area and achieving set strategic goals, and scientifically proves through econometric modeling tools that it can create opportunities for the effective delivery of housing services to end users.

Introduction. Currently, a number of scientific and practical research and conceptual studies are being conducted in the world aimed at improving the organizational and economic foundations of housing fund management. The issues of introducing innovative methods and modern technologies to meet the needs and demands of the population for housing and communal services, improving the quality and efficiency of services, forming the sector as a single coordinated system, clarifying the level of state intervention in the sector, as well as optimizing the activities of service organizations based on the principles of strategic management are becoming relevant scientific directions today.

At the same time, reducing elements of natural monopoly in the utility services market, expanding the scope of market mechanisms, and diversifying types of services are also among the priority tasks of scientific research.

At a new stage of socio-economic development in the Republic of Uzbekistan, the expansion of the housing stock and the transformation of the sector serving it into a sustainable and effective management system are emerging as necessary issues. By the beginning of 2023, the housing stock in the country will amount to 7,301.1 thousand apartments, and the utility services provided to them will fully cover multi-story buildings, mainly in cities.

This requires the formation of service enterprises with an effective management system for the sector, the development of their activities based on the laws and regulations of a market economy, as well as updating the population's perceptions of the activities of housing property management companies, changing their attitude towards the property they own and increasing their activity in the exploitation of property.

The Concept for the Development of Uzbekistan until 2030 and the "New Uzbekistan" Development Strategy for 2022-2026 set the following tasks: improving urbanization policy, digitizing cities, improving the quality of construction and design, developing modern infrastructure based on the "Smart City" concept, laying the foundation for more than 19 million square meters of new housing instead of outdated housing through renovation and housing programs, relocating more than 275 thousand families to new residential areas, triple the volume of services over the next five years by developing the service sector in the regions, as well as implementing modern and effective mechanisms for managing housing funds.

The successful implementation of these strategic goals and objectives demonstrates the relevance and practical importance of scientific research in this area.

Analysis of literature on the topic. A number of research works, theoretical studies, and practical analyses are being conducted by industry experts and the scientific community to improve the living standards of the population, provide them with modern housing, repair existing housing stock, and effectively manage it.

Russian economist A.R. Abdullina notes that "housing and communal services" are an integral engineering infrastructure of the economy, which is interpreted as one of the main supporting sectors that provide the population with necessary services. At the same time, the scientist explains housing and communal services as follows: "Housing and communal services are a complex of systems that provide a wide range of communal services and uninterrupted provision of engineering and communication infrastructure to citizens living in various types of settlements to ensure their living comfort."

In the experience of the CIS countries, advanced views in this area have been deeply studied by specialists such as S.A. Kirsanov, M.N. Lomova, and K.S. Stepayev, whose scientific works have extensively covered the possibilities of rational use of the housing stock and the organization of effective management.

According to our local scientists R.I. Nurimbetov and his colleagues, as a result of the introduction of free market mechanisms and the diversification of forms of ownership in Uzbekistan, opportunities have emerged to own private housing and exploit it in various directions. In particular, the issue of effective and purposeful use of residential facilities is one of the current and urgent problems that require an urgent solution.

In recent years, the housing crisis has become one of the most pressing problems of state policy. This situation is primarily due to the obsolescence of the existing housing stock, unreasonable formation of tariffs for services, failure of management companies to fulfill their obligations to the population, untimely implementation of current and capital repairs, as well as problems with the resettlement of residents from dilapidated housing.

The effectiveness of the management system in enterprises providing housing and communal services is closely related to the active participation of local self-government bodies, as well as the level of consumer involvement in decision-making processes.

Among the scientists who conducted research in this area in the Russian Federation, the head of the Department of "State and Municipal Administration" of the St. Petersburg Institute of Social Education, Candidate of Economic Sciences S.A. Kirsanov in his scientific article "Foreign Experience in Managing Multi-Apartment Buildings", as well as M.N. Lomova's "Experience of Foreign Countries in Solving the Problem of Housing Management in Russia" and K.S. Stepaev's scientific works "Management of Multi-Apartment Buildings: Foreign Experience and Russian Specifics" thoroughly studied and systematically analyzed the main areas of experience of developed countries.

Research methodology. The article widely uses comparative analysis and comparative approaches, in-depth analysis based on statistical indicators, comparison of economic parameters, econometric modeling and practical modeling, logical observation, scientific abstraction and theoretical generalization, analysis, and synthesis, inductive and deductive reasoning, as well as scientific and practical methods in the process of forming organizational and economic mechanisms for managing housing funds.

Analysis and results. Effective management of housing stock service companies in the transformation process is a crucial factor in providing individuals and families with affordable, yet high-quality housing. Such management serves as an important mechanism for the rational allocation of financial resources, regulation of housing construction and maintenance processes, and sustainable socio-economic development in local communities. At the same time, today, many housing stocks around the world face various problems and conflicts in their organizational and economic management systems, which prevent them from effectively fulfilling their assigned tasks.

Improving the organizational and economic mechanisms of management companies servicing housing funds is considered one of the main tools for eliminating existing problems and achieving set goals. By improving management processes, strengthening decision-making bases, and effectively implementing financial strategies, housing funds can stabilize their activities, effectively use available resources, and, most importantly, improve the quality of housing services provided to their stakeholders (beneficiaries).

At the current stage, it is urgent to develop strategies to further improve the organizational and economic mechanisms of the management entities servicing the housing stock and implement them in practice. In particular, in this process, problems such as uncertainties in financial planning, inefficiency of management structures, and insufficiently efficient use of resources are attracting attention.

Through scientific and practical research and in-depth study of advanced foreign and national experiences, this research aims to develop practical solutions and

alternative policy proposals that will improve the overall performance and operational efficiency of housing funds. The practical value of the research is to contribute to the process of developing political decisions on housing construction, its financing, and management.

The main purpose of this study is to scientifically analyze the organizational and economic relations and their interdependencies in the management of housing funds in Tashkent. During the econometric analysis, statistical models such as OLS (ordinary least squares), Tobit, and SEM (structural equation model) with latent variables were used using STATA 17.0 software. In order to better understand and optimize the organizational and economic mechanisms of management, path analysis, indirect effect, and mediation variables were used.

The Tobit model is a regression model designed to analyze the values of an observed dependent variable when they are truncated or censored. In such cases, the original values may lie outside the available range, which will introduce lower or upper-bound effects in the analysis.

The following statistical hypotheses were put forward as part of the analysis:

H1: The joint effect of the independent variables on housing stock management is statistically insignificant ($p<0.05$) — that is, there is no significant relationship between them.

H2: According to the latent variable analysis, the impact on housing stock management is statistically insignificant—no relationship was detected.

H3: There is no mediation relationship between the independent variables—that is, there are no indirect effects or associations between them.

The primary focus of the research is to identify the interrelationships and changing relationships between housing stock management and state reforms.
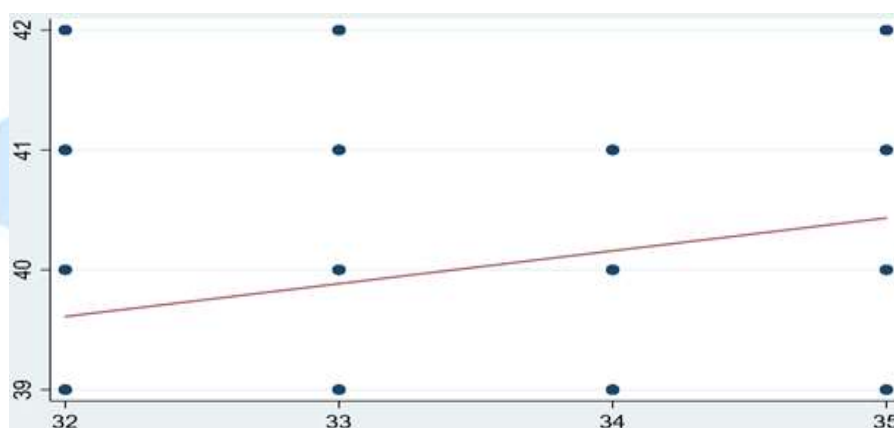
Figure 1. Linear relationship between HF governance and state reforms.

The graph above shows a positive correlation, meaning that there is an increasing dynamic between the management of housing funds (HF) and state reforms. Based on the regression line shown in the graph, it is determined that there is a direct positive correlation between the variables "HF_management" and "state_reforms". In other words, as the "HF_management" indicator increases, the "state_reforms" indicator also tends to increase in proportion to it. This situation is clearly expressed by the distribution of data points located around the line. This visual image clearly demonstrates the regressive relationship between the data and indicates the presence of a statistically significant correlation between them.
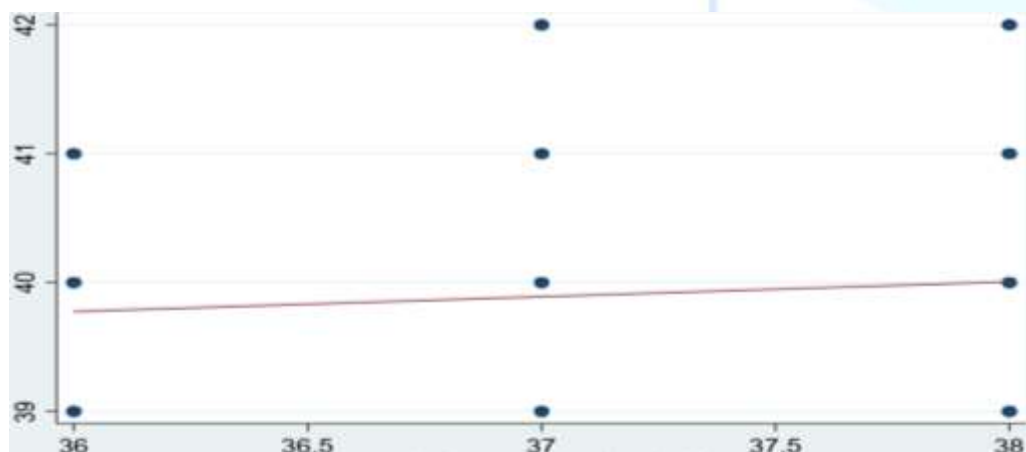

Figure 2. Linear relationship between HF management and company collaboration.

Based on the analysis of this regression line, it can be said that if there is a positive functional relationship between the variables "HF_management" and "service_company_partnership", then as the "HF_management" indicator increases,

the level of "service_company_partnership" also tends to increase. The results of our study show that the line shown in the graph has a positive deviation (positive slope), which indicates a direct and positive correlation between these two indicators. (Table 1). This result indicates that an increase in the level of "HF_management" leads to an increase in the intensity and activation of cooperation relations with service companies.

Now, let us give some comments on the descriptive statistics of the variables. The table below shows information on the cooperation between the management of the Housing Fund (HF) and service companies. The table reflects the following response options: "HF_management" (Housing Fund management), "service_company_partnership", "yes", "time_problem" (time-consuming), "no", and "Total". Based on the presented statistical indicators, Pearson's χ^2 (chi-square) test was conducted, the results of which indicate the presence of a statistically significant (significant) relationship between the variables. As a result of the test, the chi-square value was determined as 60.70, and the probability level was determined as p = 0.0000.

Table 1.

Descriptive statistics of the factors of HF management and company cooperation

HF_ management	Service_company_partnership			
	yes	no problem	no	total
PPP	86	229	201	516
Themselves	41	109	63	213
PO	43	41	75	159
government	0	453	62	136
Total	170	453	401	1024

In the cases where the HF management form is "PPP", 86 active cooperation cases were recorded, while in 229 cases cooperation was assessed as a time-consuming process. The total number of examples within this category is 516.

In the category where the management form is "Ozlyari", there are 41 active cooperation cases, and in 109 cases cooperation was complex and lengthy in terms of time. In this group, there were also 63 cases of no cooperation at all. The total number

of observations related to the category is 213. Also, in the "HT" (private organizations) management form, 43 cases of positive cooperation were identified, and in 41 cases this cooperation was long-lasting. The number of cases where cooperation did not exist at all is 75, bringing the total to 159.

In the "State" management form, no cases of active cooperation were identified, but in 74 cases, cooperation was assessed as time-consuming, and in 62 cases, no cooperation was identified at all. The total number of cases in this category is 136.

According to Table 2, for the "PPP" category in the HF control group, average quality indicators were recorded in 406 cases, and low-quality indicators were detected in 46 cases. Also, neutral cases and high-quality indicators were classified into 64 and other categories, respectively. The observations in this group consisted of a total of 516 examples. In the "O'zlari" control category, 66 cases were rated as average quality, 64 as low quality, 43 as neutral, and 40 as high-quality indicators. The total number of observations in this set was 213.

Table 2.

Descriptive statistics of the correlation between HF management and private HF cooperation factors

HF management	Private HF				
	middle-low		does not affect	high	Total
PPP	406	46	0	64	516
Themselves	66	64	43	40	213
PO	118	1	0	40	159
government	82	0	21	33	136
Total	672	111	64	177	1024

In the "PO" control category, 118 cases were rated as average quality, only 1 case was rated as low quality, the number of unaffected cases was not specified, and 40 were rated as high quality. The total number of examples in this category is 159. In the public administration category, 82 cases are classified as medium quality, no low-

quality cases are identified, 21 are classified as neutral, and 33 are classified as high quality.

The analysis of quality indicators revealed that in the "PPP" management group, the number of partnerships with a positive impact was 74, those with a neutral (neutral) impact were 344, and those with a negative impact were 58. In addition, in 40 cases, the activity was not carried out because the partnership was not necessary or required. The total number of examples in this category is 516. In the "O'zlari" management category, the number of partnerships with a positive impact was only 1, neutral impacts were 21, and negative impacts were 61. At the same time, in 130 cases, it was determined that there was no need for partnership (according to Table 3).

Now let's consider hypothesis H1: The combined effect of all independent variables related to HF management must be proven to be statistically significant at the $p<0.05$ level. Otherwise, the results of this study will be considered random and will lack scientific basis. The model, which included a total of 13 independent variables and one dependent variable — HF_management (dependent variable), was analyzed using the Tobit regression method. According to the results of the analysis, the mean and standard deviation of the dependent variable (including PPPs, self-employment, private entrepreneurship, government, and other quality indicators) were found to be 39.917 and 1.088, respectively. The regression results for all other variables are interpreted in the same manner. At the same time, the Chi-square test had an index of 4235.404, and since its probe > chi value was 0.000, hypothesis H1 was rejected, confirming the existence of a statistically significant correlation at the $p<0.05$ level.

Table 3.

Descriptive statistics on the relationship between HF management and foreign investor cooperation factors.

HF management	Foreign investors cooperation				
	JBQ	positive	negative	necessity	Total
PPP	74	344	58	40	516
Themselves	1	21	61	130	213

PO	21	60	39	39	159
government	0	64	72	0	136
Total	96	489	230	209	1024

Now, we will test the hypothesis H2. At this stage, it is checked whether it is possible to achieve high performance of HF management using a structural model consisting of latent variables. For this purpose, the SEM (Structural Equation Modeling) model was used in the STATA 17.0 program (Figure 3). In the calculations, each latent variable combines certain independent variables into its structure. For this, statistical methods such as Bartlett's test, KMO test, correlation matrix, orthogonal rotation, Varimax index, and Marginplot are used. As a result, the new variable creates new indicators on the coordinate axis in the range of values from −1 to 1. The results of the regression analysis provide detailed coefficients, standard errors, z-values, p-values , and confidence intervals for each independent variable.

In improving the economic mechanism of housing stock management, the main focus should be on ensuring the rational allocation of resources and their effective use. At the same time, the introduction of a transparent and accountable management system is of great importance. In the process of managing the housing stock, clear responsibilities and roles should be defined to ensure control mechanisms and regular and accurate reporting on the activities and results of the fund. A transparent management system serves to strengthen trust among stakeholders and ensures effective and timely decision-making processes.

It was found that the changes that have occurred over the past five years have led to an improvement in HF governance by 0.046 units with the participation of HF operators, and this indicator is statistically significant at a $p < 0.05$ value. At the same time, the regression results revealed that the remaining variables were insignificant at the $p < 0.05$ level, indicating that they do not affect the organizational and economic situation of housing stock management in Tashkent.

To further improve the organizational and economic mechanism of housing fund management, it is of utmost importance to ensure the effective distribution and optimal

use of resources. It is necessary to strengthen control mechanisms in the management system and establish a system of regular and high-quality reporting on the activities and results of the fund. This will not only ensure transparency, but also strengthen trust between stakeholders, and also serve as a basis for effective problem-solving.

For a deeper and more flexible development of the framework for regulating competition in the housing fund management system, the following measures are necessary: creating systematic and effective legal mechanisms for resolving disputes between market participants; ensuring transparency of tariff and pricing policies, and strengthening monitoring; attracting investments and developing municipal infrastructure; organizing processes for leasing or privatization of vacant facilities; as well as effective monitoring of the implementation of economic and social indicators.

In our opinion, there is an opportunity to develop new organizational mechanisms of management in the region based on intermediary models. Improving the economic mechanism of housing fund management plays an important role in improving the rational allocation and effective use of resources in the housing sector. It is necessary to introduce a transparent and accountable management system, create control mechanisms, and a solid mechanism for regular and accurate reporting on the activities and results of the fund. This will help to strengthen trust between stakeholders and ensure effective decision-making processes.

More effective results can be achieved by strengthening cooperation between your home foundations and encouraging the exchange of experience, resources, and knowledge in solving complex problems.

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