DOI: 10.31489/2023Ec1/43-50
EL C40, R32
UDC 332.622

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Statistical assessment of the development prospects of the primary residential real estate market in Kazakhstan

Abstract

Object: The use of mathematically sound methods to identify the main and secondary reasons for the rise in prices in the primary market of residential real estate in Kazakhstan is one of the topical areas of macroeconomic analysis, which provides a higher quality of information about socio-economic processes in the country and more correct understanding of their essence.

Methods: The use of mathematically sound methods to identify the main and secondary reasons for the rise in prices in the primary market of residential real estate in Kazakhstan is one of the topical areas of macroeconomic analysis, which provides a higher quality of information about socio-economic processes in the country and a more correct understanding of their essence.

Findings: Against the background of the seeming stability of the situation in the primary market of residential real estate in Kazakhstan, negative trends were identified and an approach was proposed to resolve the existing contradictions in this market, however, the trends under consideration require further more detailed study.

Conclusions: The study of trends in the primary market of residential real estate in Kazakhstan made it possible to identify the prevailing contradictions and problems associated with the pricing of new housing and with the mechanisms for monitoring the quality of housing objects. In this regard, it is necessary to develop an economic mechanism for monitoring the quality of housing objects, the main idea of which is that it is unprofitable for developers to build low-quality housing.

Keywords*:* residential real estate market, statistical assessment, market value forecasting.

Introduction

The construction industry in Kazakhstan is currently developing quite dynamically. As one of the most important branches of material production, construction has a decisive influence on the acceleration of scientific and technological progress in all other sectors of the economy, ensures the technical development and improvement of industrial enterprises as a whole as property complexes and real estate objects, solves the most important environmental and social problems, problems of population life support.

One of the priority tasks of the state is the need to provide the population with affordable housing. The issues of increasing the volume of construction and improving the housing infrastructure are under the special control of the Government of the Repuplic of Kazakhstan. The volume of construction work is provided mainly through the implementation of infrastructure projects within the framework of the State Program for Industrial and Innovative Development of the Republic of Kazakhstan 2020-2025, “Nurly Zhol”, “Nurly Zher”, tourism development and other areas of the economy.

Improving the efficiency of the residential real estate market is a large-scale economic task due to the large volume of material, financial and labor resources involved. A reliable assessment of the development prospects of the primary residential real estate market is one of the ways to increase the efficiency of the residential real estate market. However, the process of forecasting the market value has a high degree of complexity, which is due to the dependence of market processes on a variety of meso- and macroeconomic factors of the Kazakhstani economy. Therefore, these economic processes are mainly studied using methods of economic and mathematical modeling.

Literature Review

The following works are devoted to the problems of researching the residential real estate market and the development of mathematical models for assessing value: (Fridman, D., Orduey, N., 1997; Gribovskiy, et al.,

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2005; Sternik, G. M., 2010; Molchanova, M., Pechenkina, A. V., 2011; Sives, S. A., 2011; Tarasevich, E. I., 2000). These authors formulated and proposed the main methods of market analysis and appraisal of residential real estate. The most widespread in the direction of developing models for mass appraisal of the market value of residential real estate are two approaches based on correlation-regression analysis and discrete spatial-parametric modeling. However, all methods are focused on internal aspects, taking into account the construction and operational properties of residential real estate, but not taking into account external economic parameters.

The scientific positions of the authors of the article were formed on the basis of the study and analysis of works affecting this issue: (Tay D. P., Ho, D. K., 1991; Do A. Q., Grudnitski G., 1992; McCluskey W. J., 1997; Becker C., 1999; Curry B., 2002; Tsalo I. M. & Savelyeva, I. P., 2011). However, external economic parameters are not considered in these models either. Therefore, the models lose their relevance and require constant adjustments, since they do not take into account the ongoing changes in the economic environment.

Thus, on the one hand, there are studies devoted to the creation of static models intended for the mass appraisal of real estate objects and taking into account their construction, operational, geographical characteristics, but not considering the factors of the changing external economic environment. On the other hand, there are dynamic models that take into account the general state of the economy and are designed to predict and study the general price situation in the residential real estate market, but not for mass appraisal of the value of individual residential real estate objects. However, in the course of the analysis of literary sources, no attempts were found to create complex models that combine the properties of static and dynamic models.

Methods

The research methodology is based on the laws of dialectical logic, systemic and integrated approaches. The main methods of cognition used are synthesis, structuring, expert-analytical, analytical hierarchy and others.

The synthesis method made it possible to combine, according to general classification criteria, the existing, disparate approaches to assessing the prospects for the development of the primary residential real estate market.

The structuring method helped to organize all the information received on approaches to assessing the prospects for the development of the primary residential real estate market into a system that is easy to understand.

The method of constructing statistical databases for constructing models was based on the approaches of database theory and included: searching and extracting the necessary statistical data from the appropriate electronic and paper sources; creation, storage, development and use of statistical databases in the environments of functioning of programs for constructing mathematical models. To construct a forecast of the indicator of commissioned housing per resident of Kazakhstan, an econometric approach was used, with the help of which mathematical modeling of the trend of the time series was carried out.

Results

The situation in the residential real estate construction market is often decisive for the development of a strategy for the development of the construction industry, which inevitably requires an assessment of the availability, condition and dynamics of the main resource elements of the housing sector.

According to the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, the average cost of selling 1 m^2 of new housing in Kazakhstan is increasing and the average annual growth is 14 %. From 2001 to 2020, the price increased 13 times. In 2001, this figure was 23 637 tenge, in 2020 – 307 600 tenge. From the point of view of the theory and practice of pricing, there are two main factors affecting the cost: market conditions and cost (construction cost). The market situation is the ratio of supply and demand for new housing and their dynamics. Demand and its dynamics are primarily determined by the dynamics of the population of Kazakhstan. For the period from 1991 to 2020, the population growth rate was 114.74 %, the average annual population growth was 0.48 %. As an indicator characterizing the supply of new housing, Table 1 shows the total area of residential buildings commissioned per person.

Table 1. Basic and chain indicators of the dynamics of the population size and the commissioned area of residential buildings in Kazakhstan

Index	Population at the end of the year, thousand people	Total area of residential buildings put into operation, thousand m^2 of total area	The entered area of residential buildings per person, m^2
Average annual growth rate (geometric average), %	100,48	103,21	103,41
Growth index in 2020 relative to 1991	114,74	250,07	217,94
Note – compiled by the authors			

New housing commissioned on average per year increases by 3.41 % per one resident of Kazakhstan, while the average annual population growth is 0.48 %, that is, the growth of the indicator characterizing the supply of new housing, outstripping the growth of the indicator characterizing the demand, which means that the rise in prices for new housing in Kazakhstan is primarily due to an increase in the cost of its construction.

To construct the predictive function of the indicator "Housing commissioned per one resident of Kazakhstan", the following stages were performed:

– smoothed a number of dynamics to highlight the random component of the series;
– the smoothed series was approximated by the closest function;
– calculated trend components of a number of dynamics;
– the predictive function is constructed as consisting of a trend element, taking into account the average approximation error and a random element.

The calculation results are presented below. Figure graphically depicts the smoothed series of the indicator using moving averages (with a smoothing interval of 3 periods) and the trend (polynomial of the 6th degree) closest to the smoothed data.

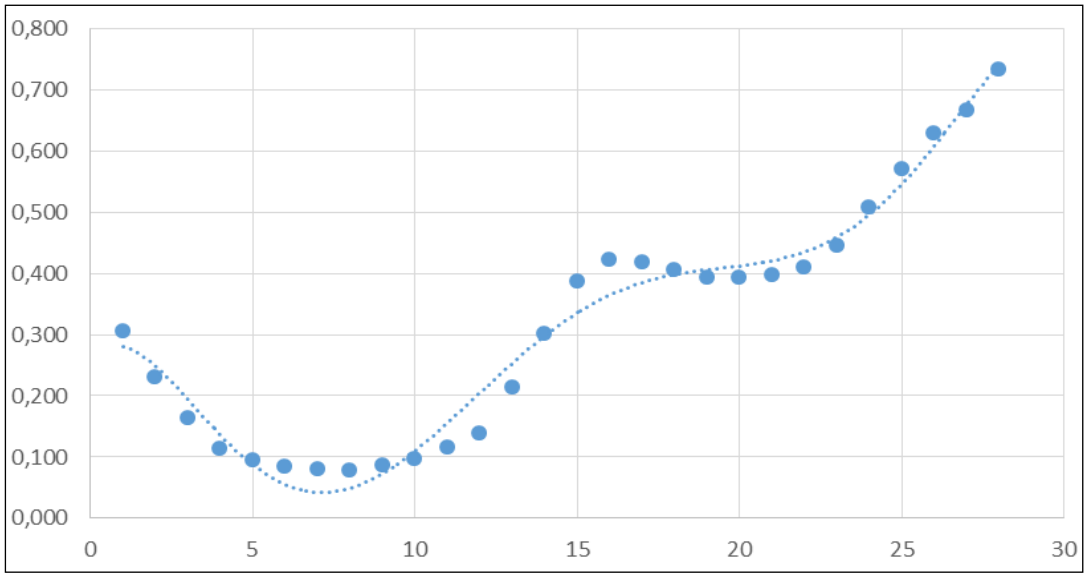

Figure. Mathematical model of the tendency of the entered area of residential buildings per person, m^2

The trend was obtained by the least squares method: $Y = -0.0000001439 * t6 + 0.00001321t^5 - 0.00045022t^4 + 0.00686984t^3 - 0.04225361t^2 + 0.05279464t + 0.26311$ (determination coefficient 0.97, which indicates 97 % approximation of the 6th degree polynomial to smoothed values). Taking into account the calculated values of the random component, the trend component and approximation errors, the structure of a number of dynamics of the introduced area of residential buildings per one resident of Kazakhstan is presented in Table 2.

Table 2. The structure of a number of dynamics of the introduced area of residential buildings per one inhabitant of Kazakhstan

Year	The entered area of residential buildings per 1 inhabitant, square meters	Smoothed values (main component)	Random component	Trending component	Leftovers	Relative modeling error, %
1991	0,373					
1992-2019	0,307-0,704	0,3053 - 0,7324	0,0019 - 0,0279	0,2801 - 0,7402	0,0252-0,0078	8,9981 - 1,0521
2020	0,812					
Average value						15,48
Note – compiled by the authors						

On average, the modeling error in % of the theoretical (trend) value is 15.48 %. Thus, the predictive model will look like this:

$$Y = TC \pm OM \pm CC, \quad (1)$$

where, Y is the entered area of residential buildings per 1 inhabitant, sq. meters; TC is trend component; OM is the average simulation error; CC is random component

$$Y = (- 0.0000001439*t^6 + 0.00001321t^5 – 0.00045022t^4 + 0.00686984t^3 – 0.04225361t^2 +0.05279464t + 0.26311) \times 1{,}1548 + |0{,}01| .$$

The forecast of the commissioned area per one resident of Kazakhstan for 2021 is 0.839 sq. meters ± 0.01 sq. meter (random component), for 2022 – 0.745 sq. meters ± 0.01 sq. meter (random component).

Analysis of the cost component that determines the dynamics of prices for new housing (comparative analysis of price indices in construction and price indices for new housing) showed that the growth in prices for new housing occurs at a faster pace, thus, the growth in prices for new housing is primarily due to an increase in the developer's profit. Thus, the average annual growth in prices in construction is 4.3 %, while the average annual growth in prices for new housing is 14.5 %. Over the period from 2001 to 2020, prices for construction work and materials increased 2.24 times, and prices for new housing increased 13.014 times (Table 3).

Table 3. Dynamics of price indices for construction and new housing in Kazakhstan from 2001 to 2020

Year	Construction price index (at the end of the period to December of the previous year)	Average price at the end of the period, tenge / m^2	Average price index (at the end of the period to December of the previous year)
2001	1,088	23 637	
2002	1,045	36 757	1,555
2003	1,03	49 675	1,351
2004	1,056	70 069	1,411
2005	1,053	92 622	1,322
2006	1,05	123 897	1,338
2007	1,071	161 346	1,302
2008	1,085	147 469	0,914
2009	1,045	137 279	0,931
2010	1,036	143 903	1,048
2011	1,054	154 123	1,071
2012	1,046	172 770	1,121
2013	1,033	189 124	1,095
2014	1,044	215 531	1,140
2015	1,028	257 644	1,195
2016	1,047	247 364	0,960
2017	1,05	253 242	1,024
2018	1,039	266 863	1,054
2019	1,016	293 518	1,100
2020	0,997	307 600	1,048
Average annual index	1,043		1,145
Index 2020 relative to 2001	2,236		13,014

Note – compiled by the authors

So, using the example of the city of Nur-Sultan, if in 2003 the difference between the cost of building new housing and its price was 40 %, then by 2015 this difference increased more than 3 times and amounted to about 125 %. Thus, a comparative analysis of the average annual price indices in construction and the average annual price indices for new housing allows us to conclude that the main reason for the growth in prices for new housing is a large share of profit in price and its significant growth in dynamics.

Correlation analysis of price indices in construction and price indices for new housing in Kazakhstan showed that prices for new housing are growing with a lag of 6 periods, that is, for example, the rise in prices for building materials and construction and installation works in 2002 led to an increase in the cost of sale 1 m^2 of new housing in 6 years (Table 4). Thus, we can conclude that the average construction period for a residential building in Kazakhstan is 6 years.

Table 4. Correlation analysis of price indices in construction and price indices of new housing sales in Kazakhstan

Correlation coefficient type	Initial	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5	Lag 6
Linear	0,05	0,20	0,22	0,13	0,19	0,06	0,46
Exponential	0,02	0,22	0,23	0,12	0,19	0,07	0,46
Logarithmic	0,05	0,20	0,22	0,13	0,19	0,06	0,46
Exponential	0,02	0,22	0,23	0,12	0,19	0,07	0,47
Note – compiled by the authors							

Correlation coefficients were calculated between a number of dynamics of the indexes of the cost of 1 m^2 of new housing in Kazakhstan and the shifted series of indexes of the cost of construction. Sufficiently high correlation coefficients (about 0.5) for a number of dynamics of construction cost indices, shifted 6 periods ago, suggests that there is a relationship between these indices, but with a time lag of 6 periods.

As already noted, the average annual growth rate of sales prices for new housing is 14.5 %. To construct the predictive function, the structure of the time series of the selling value was analyzed by smoothing the data, approximating the closest trend and highlighting the random and trend components, which made it possible to construct a cost forecast for 2021, 2022. The smoothed data is obtained by replacing the original series with moving averages. The smoothed data of the series of dynamics, that is, the data minus the random component of the series, are close to the linear trend by 97 % (the coefficient of determination for the linear trend is 0.9713) (Table 5, Fig. 2).

Table 5. The structure of the series of dynamics of the cost of selling 1 m^2 of new housing in Kazakhstan

Year	Average price at the end of the period in tenge per m^2	Smoothed values (main component), tenge / m^2	Random component, tenge / m^2	Trend component, tenge / m^2
2002-2019	36 757 – 293 518	36 690 – 289 327	67 – 4 191	48 144 – 286 688
Note – compiled by the authors				

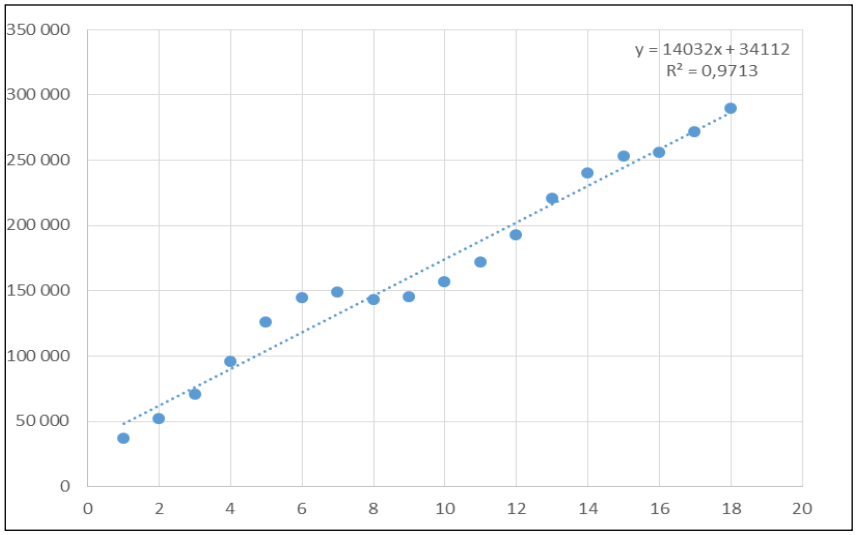

Figure 2. Mathematical model of the trend in the average cost of 1 m2 of new housing in Kazakhstan

The trend was also built using the least squares method and has the following form: Y = 14 032t + 34 112.

The average value of the random component in modulus is 4,417 tenge, the average relative error of approximation for the linear trend is 8.6 %. Based on this, the forecast function will be as follows:

$$Y = TC\ OM\ CC = (14\ 032t + 34\ 112) \times 1{,}086 \pm 4\ 417.$$

Forecast of the average cost of selling new housing in Kazakhstan according to the obtained forecast model at the end of 2021 KZT 341,821 ± 4,417 KZT (random component), at the end of 2022 - 357 059 KZT ±4,417 KZT (random component).

Thus, based on the analysis of the data, it can be said that the situation on the new housing market in Kazakhstan is quite favorable and does not contribute to an increase in the average selling price of new hous-

ing. The rise in prices is most likely due to the rise in prices in construction and the increase in profits of construction companies.

Discussions

Prospects for the development of the primary residential real estate market are still relevant. In our country, along with a whole range of social problems, the most acute of them remains a housing shortage. A large number of Kazakhstani citizens live in houses that are in unsatisfactory condition, and the restoration of the housing stock largely benefits from the speed of their withdrawal from service to evacuate citizens from houses recognized as emergency. The following negative trends have developed in the primary market of residential real estate in Kazakhstan:

1) the average annual growth rate of the selling price of 1 m^2 of new housing, which is 14.5 %, is 3.4 times higher than the average annual growth rate of prices in construction, which is 4.3 %;

2) the indicator that determines the demand for new housing grows more slowly than the indicator that determines its supply, therefore, the increase in prices for new housing is not due to the imbalance of supply and demand in the market under consideration;

3) analysis of a number of dynamics of the commissioned area of new housing per 1 resident of Kazakhstan indicates the instability of the factors that affect this indicator and support the supply and demand for new housing. Therefore, the forecast for 2022 based on the obtained forecast function is 0.745 m^2 / person. ± 0.01 m^2 – for a decrease, despite the outlined direction of growth since 2010;

4) it is also necessary to note the rather long duration of the construction of a new residential facility, since correlation analysis of price indices in construction and price indices for new housing indicates that the second indicator depends on the first, but with a 6-year lag in time;

5) to a greater extent, the increase in prices for new housing is due not to the growth in prices for construction and installation work and building materials (correlation coefficient 0.47), but to an increase in the profits of construction companies with a relatively low quality of new residential properties, despite innovative construction technologies.

Conclusions

Based on the analysis of the data, the growth in prices for new housing is largely due to the increase in profits of construction companies, and since housing is a human need for security, therefore, at the state level, it is necessary to develop a mechanism for managing the market value of the construction business, taking into account the uncertainty and risks of the external environment.

There is a contradictory situation on the new housing market – price increases with deterioration in the quality of residential properties; therefore, the regulatory mechanism for quality control is ineffective. In this regard, it is also necessary to develop an economic mechanism for monitoring the quality of housing objects, the main idea of which is that it is unprofitable for developers to build low-quality housing.

Currently, a significant proportion of residential buildings does not meet consumer expectations. As the incomes of residents of Kazakhstan grow, this discrepancy will only grow. To enter the housing market with competitive products, builders must take into account the needs of the population with medium and high incomes – to solve a set of tasks related to the design and construction of new generation residential buildings, unique in architecture, made of high-quality and modern building materials using advanced foreign technologies.

One of the indicators characterizing the level of economic and social development of society is the living conditions of the population, but in Kazakhstan, with an increase in the cost of 1 m^2 of new housing, deterioration in its quality is observed, which in turn affects the country's ratings and its competitiveness in the world market.

Increasing the level of well-being of the population is one of the priority tasks of state policy. One of the main directions for solving this problem is to ensure the availability of high-quality housing and living conditions for every family.

To solve the problems of the discrepancy between the price and quality of new housing, as well as the problems of unjustified price increases, a systematic approach is needed, synthesizing the efforts of managers of different levels and specialists of different profiles.

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О.К. Денисова, А.М. Кабдулшарипова, Е.А. Самусенко

Қазақстандағы тұрғын үй жылжымайтын мүлігінің бастапқы нарығының даму болашағын статистикалық бағалау

Аңдатпа:

Мақсаты: Қазақстанның тұрғын үй жылжымайтын мүлкінің бастапқы нарығында бағаның өсуінің негізгі және екінші реттік себептерін анықтауға математикалық негізделген әдістерді қолдану макроэкономикалық талдаудың өзекті бағыттарының бірі, бұл елдегі әлеуметтік-экономикалық процестер туралы алынатын ақпараттың неғұрлым жоғары сапасын және олардың мәнін неғұрлым дұрыс түсінуді қамтамасыз етеді.

Әдісі: Мақалада экономикалық талдаудың дәстүрлі әдістері (салыстыру, нақтылау) және экономикалық талдаудың стохастикалық әдістері *(корреляциялық-регрессиялық талдау, болжамдау функцияларын құру) қолданылды.*

Қорытынды: Қазақстанның тұрғын үй жылжымайтын мүлкінің бастапқы нарығындағы ахуалдың айқын тұрақтылығы аясында теріс үрдістер анықталды және осы нарықтағы қалыптасқан қайшылықтарды шешуге көзқарас ұсынылды, алайда қаралатын үрдістер одан әрі егжей-тегжейлі зерделеуді талап етеді.

Тұжырымдама: Қазақстанның тұрғын үй жылжымайтын мүлкінің бастапқы нарығындағы үрдістерді зерделеу жаңа тұрғын үйге баға белгілеумен және тұрғын үй құрылысы объектілерінің сапасын бақылау тетіктерімен байланысты қалыптасқан қайшылықтар мен проблемаларды анықтауға мүмкіндік берді. Осыған байланысты тұрғын үй құрылысы объектілерінің сапасын бақылаудың экономикалық тетігін әзірлеу қажет, оның негізгі идеясы құрылыс салушыларға сапасыз тұрғын үй салу тиімсіз.

Кілт сөздер: тұрғын үй жылжымайтын мүлкінің нарығы, статистикалық бағалау, нарықтық бағаны болжамдау.

О.К. Денисова, А.М. Кабдулшарипова, Е.А. Самусенко

Статистическая оценка перспектив развития первичного рынка жилой недвижимости в Казахстане

Аннотация

Цель: Применение математически обоснованных методов к выявлению основных и второстепенных причин роста цен на первичном рынке жилой недвижимости Казахстана является одним из актуальных направлений макроэкономического анализа, что обеспечивает более высокое качество получаемой информации о социально-экономических процессах в стране и более правильное понимание их сущности.

Методы: В работе были использованы традиционные методы экономического анализа (сравнение, детализация) и стохастические методы экономического анализа (корреляционно-регрессионный анализ, построение прогнозных функций).

Результаты: На фоне кажущейся стабильности ситуации на первичном рынке жилой недвижимости Казахстана выявлены негативные тенденции и предложен подход к разрешению сложившихся противоречий на данном рынке, однако рассматриваемые тенденции требуют дальнейшего более детального изучения.

Выводы: Изучение тенденций на первичном рынке жилой недвижимости Казахстана позволило выявить сложившиеся противоречия и проблемы, связанные с ценообразованием на новое жилье и с механизмами контроля качества объектов жилищного строительства. В связи с этим необходима разработка экономического механизма контроля качества объектов жилищного строительства, основная идея которого — некачественное жилье застройщикам строить невыгодно.

Ключевые слова: рынок жилой недвижимости, статистическая оценка, прогнозирование рыночной стоимости.

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