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The impact of economic factors on housing prices. Case of Almaty city

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Abstract

The real estate market in Kazakhstan is the sector that shows a noticeable increase in prices each year. This research work tries to identify which factors influence price changes. The analysis was carried out within the city of Almaty, based on the 6 chosen factors: volume of mortgage loans issued, average nominal income, USD/KZT exchange rate, price change in the construction sector, population, and the number of unemployed people. The work aims to distinguish the influence of the selected factors on the price per square meter, whether a middle-income family in Kazakhstan can afford an apartment in Almaty, and try to explain how prices are formed in the real estate market.

The methodology of a project was chosen to be a quantitative research method and data for the analysis were collected from official statistical platforms. The regression model was tested using the ordinary least squares (OLS) method by using the STATA program. Based on the results of the analysis, 3 models were created for the period from 2011 to 2021.

The first model showed that the number of unemployed people has a negligible effect on price growth, and in the second model, only prices in the construction sector and the USD/KZT exchange rate had a significant impact on price changes. With regards to the third model, the only independent variable included turned out to not have sufficient goodness of fit. The volume of mortgage loans and the number of unemployed people did not have a significant impact on the growth of housing prices in any of the models, while the average nominal income and population turned out to be significant only in the first model.

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Introduction

Housing expenses compose a big part of the total household spending, being one of the major indicators of wealth around the world. Household wealth, from its side, is influenced by the real estate market and its prices and could have a significant impact on consumer demand.

The real estate market is one of the vital sectors of the Kazakhstani market as a whole. The reason is that owning an apartment for personal use or investing in apartments as a commercial business type is pretty common among the country's citizens. That is why one of the "hottest" topics in economics, statistics, and finance is "Which factors affect the price of the real estate?". An article[1] by Tengrinews.kz, one of the leading news portals in Kazakhstan, stated that "apartments on the secondary market are almost 1.5 times more expensive than new buildings as of January 2022. In just one year the cost of such apartments has grown by 30%. For instance, a single-room flat in Yesil district of Nur-Sultan instead of the usual 15 million KZT now costs at least 20 million KZT". Adil Sergazinov, a real estate agent in one of the biggest companies in Almaty, argued that "In 2021, there was a big jump due to UAPF (Pension Fund). Sellers on the secondary market raised the price, and this move created a big stir. The latest prices of 2021 will remain for the next quarter". Ermek Musrepov, President of the Kazakhstani Federation of real estate commented[2] that "The price per square meter in Kazakhstan does not correspond to the nominal income of the population". In addition, he pointed out that accidents in January[3] hit Small and Medium Enterprises (SMEs) hard, and that this is the segment of the population that can make a huge influence on the activity of the real estate market. Mr. Musrepov gave a strict direction: "In order to make apartments affordable for citizens, it is necessary to use domestic materials in construction, meaning to open new factories and produce local goods. Those projects are needed to be developed in all regions".

[1] Read a full article by clicking the link: https://tengrinews.kz/buildings/ekspertyi-predskazali-rost-stoimosti-nedvijimosti-kazahstane-459889/
[2] Read a full article by clicking the link: https://24.kz/ru/news/delovye-novosti/item/522394-v-almaty-vosstanavlivaetsya-rynok-nedvizhimosti
[3] Mass protests against the doubling of gas prices, that took place in January 2022 in Kazakhstan

Trends in the real estate market strongly depend on consumer demand and on the actual level of monetary income of the population. Unfortunately, the dynamics of the real income of Kazakhstanis do not show positive changes, which is why there can be seen a lack of necessary demand. Additionally, the whole market in Kazakhstan is strongly dependent on the National Bank. Every time the National Bank decides to raise the annual base rate, it directly affects mortgage rates, which, as a result, leads to an increase in prices in the real estate market.

In recent years, major changes have taken place around the world that have directly affected all areas of the economy. Thus, the real estate market in Kazakhstan, in particular, started to transform rapidly back in 2020 during the global pandemic, when people have started to lose their income really fast and experienced major shocks due to the mandatory restrictions, followed by a series of big events. One of them was a change in the rules for withdrawing pension savings[4] for housing which led to a sharp jump. A strong excitement in the real estate market took place and the majority of people who managed to accumulate some amount of money started to purchase houses and apartments, which pushed housing prices to the expected growth. Additionally, the real estate market was influenced and is still experiencing changes by the January uprisings, as well as hostilities between Russia and Ukraine. In modern realities, the situation is changing very quickly, thus, there are some fears regarding a repeat of the 2008 mortgage crisis due to the fact that an increase in Kazakhstan's house prices may lead to the creation of a house pries bubble directly affecting the economy.

To conduct the study, Almaty city, the largest town in Kazakhstan which sets a trend for prices in the whole country, was chosen. Focusing on only one city helps to narrow down the scale of the analyzed market, and at the same time not to miss much out of sight, due to the fact that at the moment the population[5] of this city is about 2 million people, which is more than 10% of the total population of

[4] Read full articles by clicking links:

https://tengrinews.kz/kazakhstan_news/opublikovanyi-pravila-snyatiya-pensionnyih-nakopleniy-jile-426665/

http://zan.gov.kz/client/?fbclid=IwAR0X8VvJdtnhmq2355pv2TNY1LCbm153rgm3PJdGou5bvqgJP4PPNqh48XU#!/doc/152361/rus

[5] https://vlast.kz/novosti/46116-naselenie-almaty-prevysilo-2-mln-celovek.html

Kazakhstan. Taking into account the fact that over the past 15 years the number of residents has increased[6] by 50%, it is an excellent market with a continuous demand for real estate to base research on. Another point is that in the real estate market of the southern capital secondary housing transactions are not inferior to primary ones, which is important for obtaining realistic results. Official data from the website of the National Bank and Bureau of National Statistics of Kazakhstan has been gathered from 2011 to 2021 and will be analyzed both quarterly and monthly further in more detail, making the time period the only changing variable in the calculations for obtaining the most accurate outcomes. The motivation behind choosing exactly that period of time is explained by the attempt to observe the effect of the 2008 crisis on Kazakhstan and its economy. Tables and graphics will be derived, and the meaning behind them will be discussed later on.

Lastly, there are a few expectations about the outcomes of the work. In general, demand for apartments in Almaty city is high, which stimulates the growth of prices. One of the possible causes of high demand is population growth. Hence, a strong influence of that factor is expected to be obtained after conducting an analysis. On the other side, an unemployment rate is considered to have little effect on housing prices. However, the reason for including it is the fact that the unemployment rate is one of the main economic factors which should not be excluded from the research work. In addition, it is expected to get a good fitness of the model regarding all the variables chosen after conducting an analysis.

[6] https://stat.gov.kz/official/industry/61/statistic/6

Analysis of the Almaty household market

Kazakhstan's real estate market, like any other market, has its own characteristics related not only to economic factors but also to state policy and specifics of the mentality of the population. The average price in the city of Almaty per square meter on January 1, 2020, was 417,400 tenge, while the average nominal income of an Almaty resident on the same date was only 162,547 tenge.

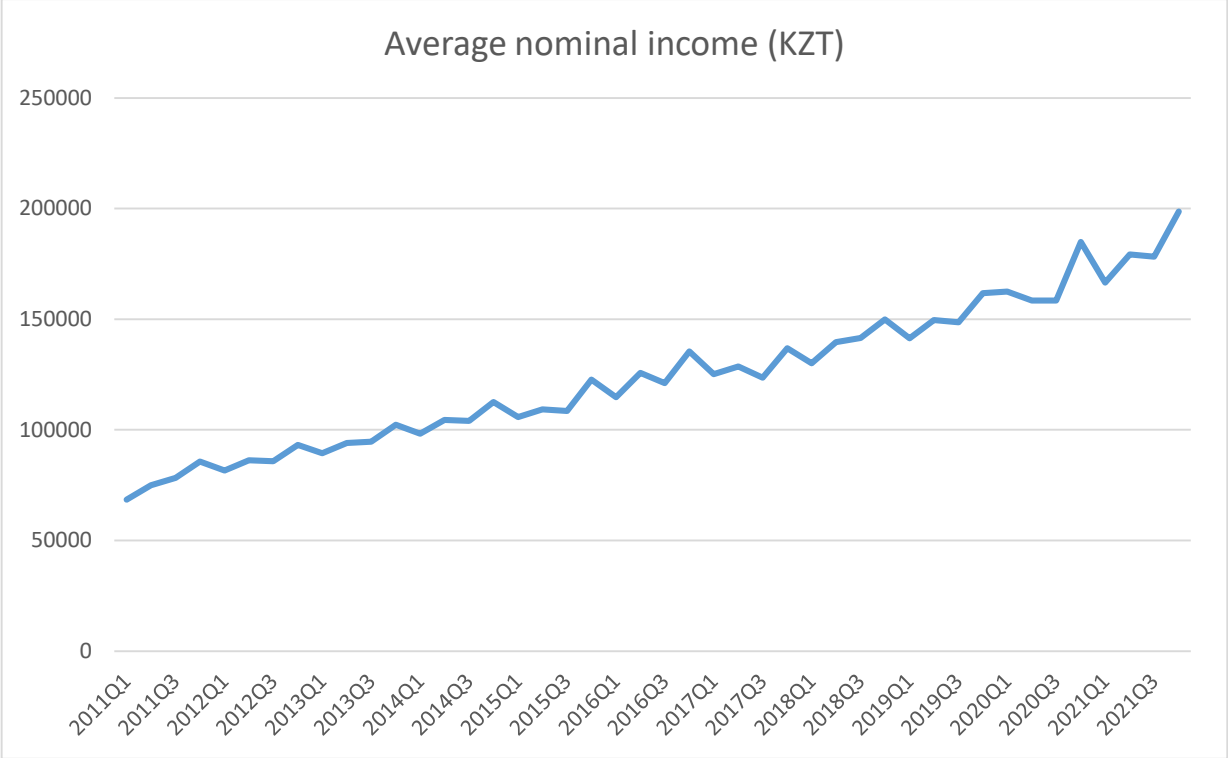

Figure 1. Growth dynamics of the average nominal income for the period from 2011 to 2021

Thus, it may be concluded that it is almost impossible for an average resident of the town to buy a home without a mortgage program. In this connection, the state sponsors a number of mortgage programs that significantly help citizens to afford their own apartments, such as:

Program name	Interest rate	Initial payment	Maturity date
Umai	13,5%	15%	up to 25 years
7-20-25	7%	20%	up to 25 years
Secondary housing	from 3,5% to 8,5%	50%	up to 25 years
Your home	from 3,5% to 7%	20%	up to 25 years
Nurly Zher / 5-20-25	5%	20%	up to 25 years
Bakytty otbasy	2%	10%	up to 18 years
Zhas otbasy	6%	50%	up to 9 years

Table 1. State-sponsored mortgage programs

Under the influence of state housing programs, the weighted average interest rates on mortgage loans remain attractive to borrowers and stay at a level below the base rate of the National Bank. The weighted average mortgage rate in August 2021 was 7.9% (in December 2020 - 7.5%). In recent years, there has been an impressive increase in the portfolio of mortgage loans, which as of September 1, 2021 amounted to 2.8 trillion tenge, or 17% of loans to the economy.

One of the most popular mortgage programs is a "7-20-25" social program[7] from the Kazakhstan Sustainability Fund. Its main characteristics are: 7% interest rate, the size of the down payment from 20% of the cost of housing, and up to 25-year maturity. When buying a house on these terms, the maximum value of real estate should be 15, 20 or 25 million tenge, depending on the region of residence. An important condition for participating in the "7-20-25" social program is for the borrower to not own any real estate and not have any other mortgages. In addition, citizens can take out a mortgage under this state program only for the purchase of primary housing.

[7] https://baspana72025.kz/

"Zhas otbasy"[8], or "Young family" from Otbasy Bank, with an annual interest rate of 6%, from 6 up to 9 years maturity, and an amount of up to 100 million tenge. The requirements oblige families to have a deposit of 50% of the cost of housing. However, a one-time deposit of the amount is allowed. Based on the name of the program family should actually be young, namely, the marriage should not be more than 5 years old. Under this program, unlike "7-20-25", families can use a mortgage to purchase a land plot, build and repair a house, as well as to buy a house regardless of the year of commissioning.

After all, considering the fact that there is a variety of programs and options with different conditions, it becomes more affordable for Kazakhstani citizens to purchase a house. With regards to demand, formerly, its growth for state mortgage programs has been observed, and at some point the problem of demand greatly exceeding supply took place. However, currently, the trend for mortgage lending is rather decreasing, which is explained by banks by continuously rising prices in the real estate market.

Nevertheless, one of the fundamental reasons for the growth in demand for real estate was the retirement savings withdrawal program, which in some way negatively affected the real estate market, as prices rose dramatically. Comparing house prices in 2020 and from January to November 2021, during these two time periods new buildings have risen in price by almost 20%. Prices for secondary housing increased by 34% making it even more difficult for citizens to afford a house. The current situation is not profitable for the National Bank which wants to "curb" inflation either. In this regard, such measures as curtailing public housing programs were taken from the government's side. For instance, in 2021, the market mortgage product of the Eurasian Bank "Baspana Hit" program was suspended. Now the state is trying to monitor the situation on the market, including the withdrawal of pension surpluses that citizens continue to use. The number of citizens who directly bought housing at the expense of pension savings (without a mortgage), as of December 9, 2021, amounted to 174 thousand people. When adding the number of mortgage loans issued in 11 months of 2021 (about 90 thousand loans), the total demand for housing last year amounts to about 264 thousand. This is 2.6 times

[8] https://hcsbk.kz/ru/save/young-family/

more than the annual commissioning of apartments in apartment buildings (2020) and twice as many current ads for apartments on the site Krisha.kz. Suppliers are trying to compensate for the high demand for real estate by increasing the number of housing commissioned, since if there were 2.4 million in 2020, then in 2021 the number of square meters increased to 2.6 million, which shows an increase of 8%.

In 2021, according to the estimates of the head of the Kazakhstan Real Estate Federation Ermek Musrepov, prices for primary real estate increased by 15%, secondary – by 10%. At the moment, the situation on in the residential real estate market in terms of the ratio of housing quality to its value characterizes the market as developing. The price is too high, and the quality leaves much to be desired. This is reflected in the structure of the distribution of housing class in the total volume of the market. In 2021, economy-class apartments were in high demand. This also applies to affordable housing, which is being built under state programs. Now about 60% of the market is represented by economy class apartments, 20% - by comfort class, and 20% are divided between elite and business class objects. With regards to Almaty city, the suburban area of Nauryzbay, Zhetysu, Turksib, and Medeu districts is more in demand for the purchase of economy class housing in Almaty. For example, the construction of economy class housing near the Kuldzhinskaya highway is actively underway. And comfort-class apartments were in demand in Almaly and Bostandyk districts, where houses are located closer to the old center.

Purpose of the study

There are several aims of this study:

Firstly, to understand the effect (positive/negative) of six main variables, namely volume of mortgage loans issued, average nominal income, USD/KZT exchange rate, price change in the

construction sector, population and number of unemployed people on the real estate price per square meter in Almaty city, and its' extents.

Secondly, to learn whether a middle income family living in Kazakhstan can afford an apartment in Almaty city considering the factors studied in this research: whether it is difficult or not, and if so, to what extent.

Additionally, this paper will try to explain how prices in Almaty real estate market are set by analyzing the factors from which it is mainly composed as well as learning about other influencing powers.

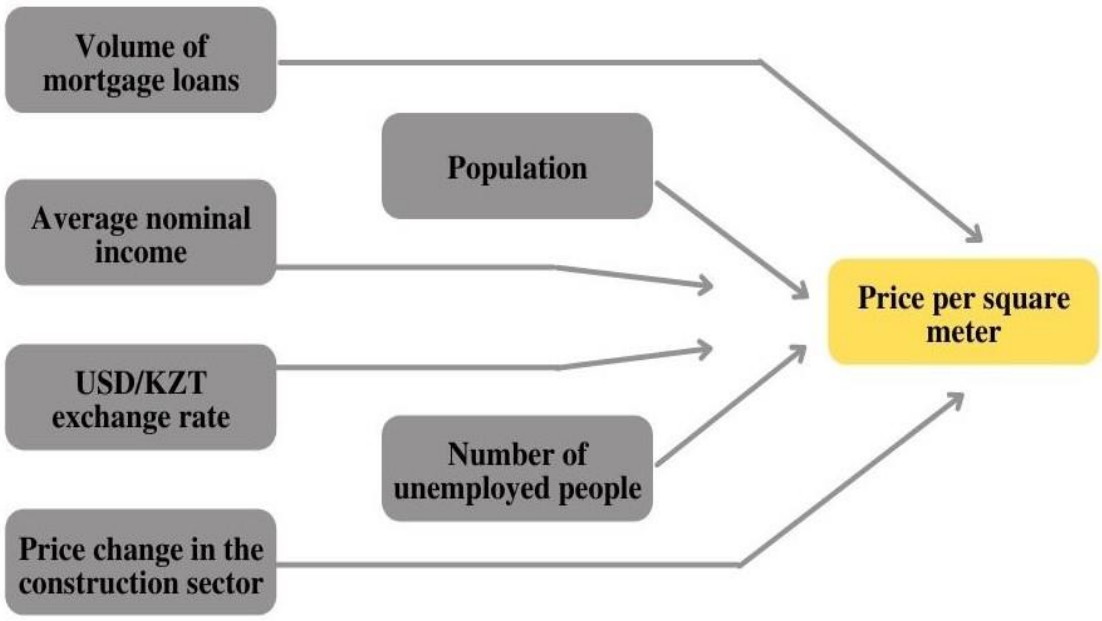

Figure 2. Factors affecting real estate Price.

The main thesis hypotheses are:

1) All factors, except the number of unemployed people, have a positive influence on the price of an apartment in Almaty city. The effect of unemployment on price formation is likely to be negative.
2) Price change in the construction sector affects the price of an apartment the most. The higher prices for the building materials are, the higher the apartment prices rise.

3) Number of unemployed people affects the price of an apartment the least. Fluctuations in the unemployment rate will insignificantly influence house prices.

Research questions of the study:

1. Does the volume of mortgage loans issued have a positive impact on the growth of the price per square meter of an apartment in Almaty city?
2. Does the average nominal monetary income have a positive impact on the growth of the price per square meter of an apartment in Almaty city?
3. How positively does the USD/KZT exchange rate affect the growth of the price per square meter of an apartment in Almaty city?
4. How positively does the change in prices in the construction sector affect the growth of the price per square meter of an apartment in Almaty city?
5. Does the population growth have a positive impact on the growth of the price per square meter of an apartment in Almaty city?
6. Does the increase in the number of unemployed people have a negative impact on the growth of the price per square meter of an apartment in Almaty city?

The motivation behind choosing this research topic is the fact that the real estate sector holds huge importance for both Kazakhstani GDP and growth, and for its citizens. Since the economy depends on the banking sector and SMEs/individuals with real estate, the financial and economic stability of the country directly depends on the situation in the market. An in-depth investigation of the main factors influencing real estate prices could be practical from the side of risk management and forecasting the future state of the economy, since they influence the overall performance of the financial system.

Theoretical background

This work is based on the neoclassical theory. The basis of the research of neoclassical economic theory is the behavior of people who, being producers or consumers of goods and services, seek to reduce their costs and try to receive the greatest possible income. The neoclassical theory allows to ignore such external indirect factors as brand awareness and other irrational customer behavior. The neoclassical concept indicates that housing prices are determined by the law of supply and demand. Thus, all the influencing factors of supply and demand affect housing prices. On the demand side, there are some main factors including mortgage rates, household income, population, and unemployment rate. And on the supply side, such determinants as the cost of land and building materials and the number of square meters built can be specified.

It should also be noted that of the above factors there are both macroeconomic, that is, those that function on the scale of the entire economy (mortgage rates, household income, population, unemployment rates, and exchange rate), and microeconomic, those that function in the context of the enterprise (costs for building materials, number of square meters built). Nevertheless, it was decided to take the factor of prices for building materials as one of the subjects of study, due to the fact that it can also be considered an industry factor. Moreover, for most enterprises in the field of construction, the cost of construction materials is one of the most fundamental factors in pricing, in addition to natural demand (Abraham & Hendershot, 1966). If this factor has not been included, then the picture presented would be a one-sided view of the influence of macroeconomic factors on demand. Additionally, formed on the specifics of the Kazakhstani market, it should be noted that the results obtained from the influence of the dollar exchange rate against the tenge would be considered as an impact not only on demand, but also on supply. Since about 39,5% of building materials are imported[9] annually for construction purposes to the territory of the Republic of Kazakhstan. Based on this, it becomes clear that the dollar is also a factor increasing construction costs, which, in turn, may lead to higher apartment

[9] https://lsm.kz/kto-prodaet-kazahstanu-strojmaterialy-infografika

prices. Nevertheless, due to the direct impact of the change in the exchange rate on the income of the population in dollar terms, a decrease in natural demand is expected and, therefore, the price on the market, in theory, should be balanced over a certain period of time.

Based on the foregoing, it is not possible to track all possible relationships between factors and their direct or indirect influence on each other. However, it is recognized that most of the studied factors are closely related, and the direct influence of some of them on each other is not denied.

Literature Review

Mortgage loans

The strong confirmation of the interconnection between housing prices and the volume of mortgage loans issued in different markets is already present in the existing literature. It should be noted that even though the chosen factor in the research is the volume of mortgage loans issued, one of the most commonly used economic factors is the mortgage rate. Thus, due to the lack of resources, data on mortgage rates, and previous examinations written considering specifically the chosen factor, the literature review was written on the mortgage rate variable.

Mortgage rate has an impact on the real estate market for a variety of reasons. They influence the value of the real estate by calculating how much individuals will be obligated to pay in interest if they borrow money to buy a house. Low interest rates often encourage property demand, stimulating prices to go up, whilst high interest rates have the reverse effect (Investopedia, November 2021). According to Adelino et al. (2012), the more accessible mortgage the more significant house prices increase is, since loan limit becomes an instrument for lower cost of financing.

Moving to the analysis of the correlation by markets, Munro and Tu (1996) explored national house prices in the UK utilizing a Johansen co-integrated error correction model and discovered that

household income, real mortgage rates, and construction completions all have a substantial influence on the UK housing market.

McGibany and Nourzad, in a 2004 research, used sophisticated nonstructural estimate methods to show the relevance of mortgage rates in the US housing market. The study was primarily focused on the influence of changes in mortgage rates on the sales price of properties sold. The results demonstrate an convincing long term association among the two variables and prove that they are co-integrated.

Similar results have been achieved by Tu (2000) through the usage of econometric modeling approaches, whose findings proved that the most important predictors of the Australian national housing market are real weekly wages of each worker, nominal mortgage rates, unemployment rates, and house building activities.

More recent research of housing prices' determinants was conducted by Zhang, Hua & Zhao (2012), who made an investigation in China throughout 1999-2010. Combining the NARMAX and VECM approaches, linear as well as non-linear outputs have been identified. The study's findings suggest that mortgage rates, producer prices, and actual effective exchange rate are the most crucial elements.

Acknowledging the fact that home sales usually require external sources of financing, and thus mortgage conditions, including rate, affect the overall house price pattern, Tsatsaronis & Zhu (2004) analyzed the main factors driving the dynamics of those prices. The authors investigated progressive interactions between variables using a Vector Auto Regression (VAR) model in which all of the variables are considered endogenous. And, as a result, the influence of the mortgage rate, in the long run, has been proved once again.

Average nominal monetary income (tenge)

The next independent variable of the research is the Average nominal monetary income. An article by Palumbo et al. (members of Federal Reserve Board and Central Bank of Ireland) in 2002 examined that Real Consumption, Income and Wealth significantly influence each other. However,

when considering such durable (long-life) goods as housing/apartments results can deteriorate, because the Permanent Income Hypothesis (PIH)[10] test is used for nondurable goods consumption and that can be improved only by using nominal income measures, not real income data. Thus, it was chosen to analyze the relationship between Nominal Income and Consumption rate, so that the change in the price of real estate will be measured keeping into account supply and demand movements.

In another paper written by Diacon and Maha (2014) authors examined a large sample formed from 79 countries divided into 3 categories: low-, middle-, and high-income. As the main output of the study, a stronger association between income and consumption was revealed in low- and high-income countries, while the relationship between consumption, income, and GDP is more robust for low and middle-income countries. This is due to the fact that the way a person spends their resources directly depends on what income they receive. The higher the income level, the higher the incentive for consumption among the population due to the increase in financial opportunities. Meaning high-income countries commit more resources to investments and are more specialized in R&D. Consequently, Kazakhstan is on the list of middle-income countries according to World Bank (middle-income countries are those which have GNI by Atlas method between $1 026 and $12 475. Kazakhstan's GNI in 2020 was $8 710.) And it may be considered that despite the fact that apartments are luxury goods, when income rises, people start to buy new flats. When there is a strong demand, the power is on the suppliers' side and the price of real estate will increase. Such a scenario was observed in 2014 by the Federal Reserve Bank of Cleveland (USA).

USD/KZT exchange rate

The proof of correlation between housing prices and the exchange rate has been found during previous examinations by researchers around the world. According to relevant studies, when the exchange rate rises, real estate values climb inevitably. For instance, Miller, Sklarz & Real (1988)

[10] Papers.ssm.com (7 May, 2003). Online. "On the Relationships between Real Consumption, Income, and Wealth". Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=333603

studied the interrelation of Hawaiian real estate prices and the fluctuation of the Japanese yen to the US dollar exchange rate. It was discovered that a change in the exchange rate of only 10% led to a 27% change in property prices. Not so high impact was recorded in the city of Billingham in 1999. A group of scientists led by Benson et al. (1999) compared the general price indices for 10 years. And they came to the curious conclusion that a 10% change in the exchange rate with a delay of 3 months is reflected in a significant gain of 7.7% for the American market.

Lipscomb, Harvey, & Hunt (2003) argued that exchange rate appreciation is only a consequence of rising property prices. However, during the study, their assumption was not confirmed. Since the increase in the exchange rate led to an even greater increase in real property prices.

Atabayeva, Amirkulova & Syzdykova (2018) found that with all factors remaining constant, the increase in property prices by an average of 552 KZT per m^2 is due to a 1 tenge per dollar increase in Kazakhstan. In other words, the increase in dollar per 1 tenge leads to an increase in house prices by 552 tenge per square meters. As of March 2, 2022 krisha.kz showed that the prices of houses in the secondary market in Almaty grew by 0,11%.

Price change in the construction sector

According to researchers, during construction, the main role goes to building materials, since they make a huge contribution to the implementation of all plans (Akanni et al., 2014). Isaac et al. (2010) & Millington (2000) pointed out that the promotion of real estate is a significantly capital-intensive work, and the construction process itself is very demanding and self-motivated, which is why the result should not become unnecessary in the end of the work due to its cost. Since construction often begins without certain guarantees for sales, the construction site, regardless of any unforeseen circumstances, tries not to stop the already launched process, including due to rising prices for construction materials.

Abraham and Hendershot (1966) previously conducted an analysis by region, namely, by the value of the real estate in the United States and their relationship to all housing construction statistics. As a result, they came to the conclusion that construction costs play an important role in forecasting real

estate prices. Judd and Winkler (2002) in their work wrote that the increase in the cost of real estate largely depends not only on the earnings of the population, interest rates, but also on the rise in prices for the construction itself.

However, it should not be overlooked that researchers such as Glaezer, Gyourko,and Raven (2005) wrote in their work that the final test of the hypothesis about the factors influencing the price of real estate is that it is worth returning to the part of the costs that are not related to the physical costs of construction. They were inclined to believe that the change in prices for building materials is not something that greatly affects the final cost that is assigned when selling, the decisive part of the cost of housing is the cost of land and paperwork.

Population

Demographic factors such as population play an important role in real estate price fluctuations. On one hand, Mankiw and Weil (1989) discovered that changes in birth rates cause major and predict the occurrence in housing demand over time, which in turn significantly affects real estate prices. And changes in demand for housing have a substantial influence on housing prices. According to Mudler (2006), housing and population have symbiotic relationship. Growth in population lead to changes in housing demand. Population growth, especially expansion in the percentage of households, leads to an increase in housing demand, while population declines can make the opposite.

On the other hand, Ontake & Shintake (1996) using Japanese data discovered that demographics have no significant influence on the determination of house prices by repeating Mankiw and Weil's study. They came to the conclusion that property prices are price elastic and that demographic changes have only a short-term impact on house prices. DiPasquale and Wheaton (1994), analogously, duplicated the study and discovered that real per-capita income was a significant determinant of real estate demand. They concluded that the price elasticity of housing supply would neutralize negative shocks such as demographic changes and real estate demand in the long run. Considering the above two

sides, this study will try to identify the influence of the growth in the number of people on the real estate market in Kazakhstan.

Number of unemployed people

Lastly, Peek and Wilcox (1991), in their article on the formation of the relationship between supply and demand in the real estate market of the United States observe the fact that the unemployment rate is one of many factors affecting the cost of housing. According to their research, prices in the real estate market after the crisis of the 1980s managed to stabilize largely due to a decrease in unemployment and interest rates.

In the study of the unemployment rate in Australia, Abelson, Joyeux, Milunovich, and Chung (2005) found that in the long term, an increase in unemployment by 10% leads to a decrease in the value of prices in the real estate market by 2% percent.

Bahmani-Oskooee & Ghodsi (2018) conducted a study where they found that despite the fact that the 2008 crisis was caused by falling housing prices, which in turn led to an increase in unemployment, it was the improvement in the unemployment situation that helped 37 out of 51 states recover from the crisis and stabilize housing prices.

Methodology

This section will introduce the research design, data collection & sampling procedures, chosen data analysis tools of the study and interpretation to the results got from the analysis, as well as results of the tests conducted after statistical analysis in more detail.

Research design

Based on the aim of the research work, to obtain data that will lead to the necessary conclusions on this thesis and answer the main questions, the methodology of the project was chosen to be a quantitative research method.

Traditionally, quantitative research has the exact format of the data used in the work and sources for obtaining it. The collected data is processed the same way according to already established and generally accepted procedures, as a result of which an analysis of reliable data is received, which is subject to comprehensive statistical processing. Variables in quantitative studies are measured using tools, as a result of which the collected data are analyzed using statistical processes.

To obtain results on the determinants of the real estate price considered in this study, the following actions were performed from the quantitative approach side:

- Collection of numerical and statistical data from official sources, including the Bureau of National statistics – Statgov.kz, its information-analytical system – Taldau.stat.gov.kz, Krisha.kz, and the National Bank of Kazakhstan website
- The regression model was tested using the OLS method by using the STATA program
- Building of figures and tables on the received results to make a visual interpretation

Data collection & sampling procedures

There are a few major housing price data sources available in Kazakhstan: Krisha.kz, Homsters.kz, Korter.kz and Etagi.com. In this particular study, data determining the market price per square meter of real estate was taken from Krisha.kz, a platform popular in the market of Kazakhstan, for the purchase of any type of real estate in the primary and secondary markets, in any “corner” of the country. The reason for choosing this source is that, statistically, it provides daily data, which makes the

modeling work feasible. Secondly, it covers all major cities' housing prices in Kazakhstan. Thirdly, the time series cover a chosen 11-year period.

For the analysis quarterly resale house price data for the city of Almaty over the period of January 2011 up to December 2021 was used. To avoid significant biases produced by integrating apartments that have recently been built, which are usually of better quality and in more attractive areas, the study mainly focuses on resale data. Moreover, to eliminate other biases, the material of the house (panel, monolete, or brick) and number of the rooms (single, 2, 3, 4, or more), which can be found on Krisha.kz, were not considered.

Regarding the variables of the quantitative study, the dependent variable of house price per square meter was taken, and six potential predictors of housing price growth were chosen. In order to make the price model more accurate, factors from both the demand and supply sides were considered. Those variables are the volume of mortgage loans issued, average nominal income, USD/KZT exchange rate, price change in the construction sector, population, and number of unemployed people.

At the beginning of the work, there were a few tries to enlarge the sample size and include all regions of the Republic of Kazakhstan, which would have also had quarter-based values and change in a 11-year time horizon from 2011 to 2021. As a result, there was a variance in billions since sample size consisted of more than 100 observations. That is why the construction of any logical hypotheses was not possible and did not succeed. For that reason, data was collected once again, this time including Almaty city and values for 11 years only. That way sample size consisted of 44 observations maximum and the only changing variable became time (excluding geographic variables).

Data analysis

To analyze the data collected the Ordinary Least Squares (OLS)[11] regression method, which examines the relationship between independent and dependent variables, has been used. The sum of squared vertical distances among the discovered results within the dataset and the responses anticipated with the aid of using the linear approximation is minimized under this method. In a linear regression model, the response variable is a linear function of the regressors:

$$Y=X0+aX1+bX2+cX3+....+e$$

where:

y – response variable (apartment price per square meter)

a, b, c – vectors of unknown parameters

x0 – column vector of the dependent variable

x1, x2, x3 … - column vectors of all the explanatory variables (volume of mortgage loans issued, average nominal income, USD/KZT exchange rate, price change in the construction sector, population, and number of unemployed people)

e – representation of random possible errors

This regression model has been chosen for the research for a couple of reasons. Firstly, for its simplicity and reliability. One of the differences of the OLS model is the number of observations. Comparing to other approaches where it can increase infinitely, OLS method usually supposes a fixed number. Thus, considering the time and data constraints of the work, it would have been irrational to use other methods. Secondly, this model allows to have a correlation between regressors, which was

[11] https://www.immagic.com/eLibrary/ARCHIVES/GENERAL/WIKIPEDI/W120529O.pdf

recognized as a fact in the beginning of the work, meaning the method suits to the paper's main ideas and assumptions.

Interpretation of the results

Before running regression models, the correlation test that analyzes the interrelationship between all variables has been conducted. As the result, a correlation matrix was obtained, on which it may be clearly seen that all six variables have a positive correlation with an average price per square meter. Price change in the construction sector has a very strong correlation with the dependent variable, which means that if raw materials' price increases, it will positively affect the price of apartments. The volume of mortgage loans issued on the other side has a moderate, almost weak relationship with all other factors. With regards to nominal income, it has a very strong correlation with population and exchange rate. Now, when correlation between variables has been identified, the significance of all parameters can be tested.

	Income	Popula~n	Unempl~t	UsdKzt	Pricec~s	Mortgage	Pricesqm
Income	1.0000						
Population	0.9596	1.0000					
Unemployment	0.8840	0.9405	1.0000				
UsdKzt	0.8331	0.8668	0.9207	1.0000			
Pricecons	0.8168	0.7885	0.7504	0.5807	1.0000		
Mortgage	0.6987	0.6364	0.4220	0.4155	0.4538	1.0000	
Pricesqm	0.7541	0.6909	0.6840	0.6362	0.8729	0.3932	1.0000

Table 2. Correlation matrix

Where:

- Income – Average nominal monetary income in Almaty
- Population – Population of Almaty
- Unemployment – Number of unemployed people
- UsdKzt – USD/KZT exchange rate
- Pricecons – Price change in the construction sector

- Mortgage – Volume of mortgage loans issued

To investigate which factors influence the real estate market prices the data for 6 independent variables has been collected and divided into 3 groups representing 3 models in order to achieve the most accurate results. The first model includes quarterly data from 2011 to 2021 for 5 independent variables: average nominal income, USD/KZT exchange rate, price change in the construction sector, population, and the number of unemployed people, and measures its effect on the dependent variable: price per square meter. The total number of observations in the first model is equal to 44. The volume of mortgage loans issued has been excluded from the first model due to the absence of the needed information and appropriate statistics from the side of official resources since the quarterly statistics are only available starting from 2015. The second model includes all 6 independent variables, however, the time period is shortened to 7 years including quarterly data from 2015 to 2021 and to 28 observations. And the third model analyzes the effect of the volume of mortgage loans issued on the price per square meter, taking the monthly data from 2018 to 2021, in order to get as much number of observations as possible, considering the lack of official statistics. The number of observations in the third model is 44, since data from September to December 2021 for mortgage loans is not available yet.

Source	SS	df	MS	Number of obs	=	44
				F(5, 38)	=	80.17
Model	1.45335739	5	.290671477	Prob > F	=	0.0000
Residual	.137776324	38	.003625693	R-squared	=	0.9134
				Adj R-squared	=	0.9020
Total	1.59113371	43	.03700311	Root MSE	=	.06021

pricesqm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	.5531442	.1574338	3.51	0.001	.2344362	.8718523
population	-1.792111	.5455282	-3.29	0.002	-2.896475	-.6877465
unemployment	.4739639	.5230226	0.91	0.371	-.58484	1.532768
usdkzt	.1928831	.0940301	2.05	0.047	.0025291	.3832372
pricecons	1.648032	.2886422	5.71	0.000	1.063707	2.232358
_cons	18.06591	6.285019	2.87	0.007	5.342558	30.78927

Table 3. OLS Regression Model 1

After running all the collected data divided into three models in Stata – StataCorp created statistical software program for data management, visualization, statistics, and automated reporting, an R-squared value, a coefficient representing goodness of fit, of 91.34%, 85.76%, and 53.69% for three models respectively was obtained. That demonstrates that the regression model fits the observed data by the following percentages, meaning the data is reliable and it is possible to conclude proper results.

Source	SS	df	MS		
Model	.451866537	6	.075311089	Number of obs	= 28
Residual	.075023717	21	.003572558	F(6, 21)	= 21.08
				Prob > F	= 0.0000
Total	.526890254	27	.019514454	R-squared	= 0.8576
				Adj R-squared	= 0.8169
				Root MSE	= .05977

pricesqm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	.1592545	.3259372	0.49	0.630	-.518569	.8370779
population	-1.360632	.9654307	-1.41	0.173	-3.368355	.6470906
unemployment	-1.123715	1.101187	-1.02	0.319	-3.41376	1.166329
usdkzt	.4482186	.1499207	2.99	0.007	.1364415	.7599957
pricecons	2.890411	.4977479	5.81	0.000	1.855287	3.925534
mortgage	.0051596	.0244237	0.21	0.835	-.0456322	.0559514
_cons	26.33114	7.774295	3.39	0.003	10.16361	42.49867

Table 4. OLS Regression Model 2

The volume of mortgage loans issued quarterly (mln tenge) for the period between 2015 and 2021 was taken from the National Bank of Kazakhstan website's Monetary and Banking Statistics. And the monthly data (bln tenge) from 2018 to 2021 was collected from the First Credit Bureau's Analytical Digest. In the second model results, a linear regression coefficient (k) for the mortgage is equal to 0.0052. The positive value means a positive relationship between the two variables, thus, for a unit increase in mortgage loans, the dependent variable will increase by 0.0052. The next important index is P>|t|, the p-value associated with the t-statistics, and the probability of obtaining the coefficient described earlier that is significantly different from zero. The achieved result of a p-value equal to 0.835 means that this variable does not explain the reason for the price change per square meter of Almaty apartments and thus is not significant. When analyzing the 4-year impact of mortgage loans, values change to k=0.19 and p=0.000, making the variable the most significant. However, the significance of

the variable should be ignored due to the fact that there is only one variable included in the analyzed model, meaning, it automatically becomes the most important. Thus, attention should be paid to the R-squared value, which shows that the volume of mortgage loans issued in fact does not fit the model well, and therefore does not explain the reason for price per square meter changes.

Source	SS	df	MS	Number of obs	=	44
				F(1, 42)	=	48.99
Model	6.5648e+10	1	6.5648e+10	Prob > F	=	0.0000
Residual	5.6279e+10	42	1.3400e+09	R-squared	=	0.5384
				Adj R-squared	=	0.5274
Total	1.2193e+11	43	2.8355e+09	Root MSE	=	36606

pricesqm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mortgage	78778.06	11255.01	7.00	0.000	56064.52	101491.6
_cons	65312.19	49335.3	1.32	0.193	-34250.48	164874.9

Table 5. OLS Regression Model 3

Average nominal income data represented in the “Per capita nominal monetary income of the population” statistics is retrieved from the Taldau.stat.gov.kz website. According to the first model, which includes quarterly data from 2011 to 2021, nominal average income has k=0.55 and is statistically significant at the 0.05 level (p=0.001). The coefficient is positive, which indicates that an increase in nominal income size is in direct ratio with the growth in price per square meter. According to the second OLS model, average nominal income over the period of 7 years from 2015 to 2021 shows a smaller impact on price growth per square meter compared to the first analysis. In the second model nominal income’s coefficient becomes equal to 0.159 and is not really significant statistically due to p-value equaling to 0.630.

Information about the exchange rate of the Kazakh tenge against the US dollar was taken from the official website of the National Bank of the Republic of Kazakhstan. Since the rate tends to fluctuate almost daily, for analysis it was necessary to take the actual rate for each first day of the quarter month. In this regard, it is fair to note that some sharp exchange rate fluctuations are not reflected in the months in which they actually took place. In the first model results, the linear regression coefficient for the

exchange rate is 0.193. A positive value means a small, but the positive impact of the independent change in the exchange rate on the dependent variable of price per square meter. With a conditional appreciation of 10%, the price per square meter will increase by 1.9%. A p-value result of 0.047 indicates that in the long run (11 years) the exchange rate is statistically significant. When analyzing the second model, it is clear that in the medium term of 7 years the coefficient increases to 0.448. In addition, the variable becomes one of the most statistically significant ones, since the indicator decreases to a level of 0.007, meaning the exchange rate explains the change in real estate prices.

Data on prices for building materials were taken from Taldau.stat.gov.kz, namely, the "Price indices for purchased building materials" statistics, and have been converted to the numerical values due to the absence of any other reliable data. According to the results of the first analysis, the impact of prices from the construction sector on the cost per square meter in Almaty city (coef.=1.648, p=.000) is the most significant, and has a positive relationship indicated by the positive coefficient, meaning that in the period of 11 years, the higher the prices of building materials, the higher the housing prices. In the results of the second analysis, for the period from 2015 to 2021, the impact of prices in the construction sector (coef.=2.89,p=.000) remains as significant as in the first one, and the coefficient reveals an even more positive influence on prices per square meter, which shows that over the selected 7 years, price growth in this sector has an even greater impact on the increase in the cost of housing in Almaty city.

The population of Almaty data comes from the National bureau statistics website, “Population at the beginning of the year” section. The effect of Population size in Almaty (k=-1.792, p=0.002) turns out to be significant and to have a reverse relationship, indicating that the growth of the Almaty population will probably lead to lower prices per square meter. In the result of the second analysis, the population is not significant at the 0.05 level (p=0.173). The coefficient of the population for 7 years also has a negative impact (k=-1.36) on price per square meter.

Unemployment data is taken from the Taldau.stat.gov.kz website in the "Unemployed population aged 15 and over" section. According to the results of the first model, the impact of unemployment on the cost per square meter in Almaty with a positive coefficient equal to 0.47 is

insignificant (p=0.371). When analyzing the 7-year effect, the values change to k=-1.124 and p=0.319, which makes the variable slightly more significant, but not significant enough to have an effect.

In order to make a research statistically correct, the Breusch-Pagan Test has been conducted. The following table represents an output for the test for heteroscedasticity. P-value equals to 0.2498, which is more than significance value of 0.05. Such result indicates that heteroscedasticity is not present in the regression model, which means the analysis results is valid.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of lnsqm

         chi2(1)      =     1.32
         Prob > chi2  =   0.2498
```

Table 6. Breusch-Pagan test for heteroscedasticity

As a result of the analysis conducted, the first hypothesis that all factors besides the number of unemployed people will have a positive effect is rejected. In fact, not only an increase in unemployment but also in population could negatively affect the dependent variable.

The second hypothesis regarding the greatest influence of price change in the construction sector on the cost of housing is accepted. All of the analyzed models' results showed the highest significance of that factor.

The third hypothesis, according to which changes in the unemployment rate will have the least impact on housing prices, is accepted. In the first model, based on 11 years of data, unemployment is indeed the least important influencing factor, but in the second model, it is replaced by the population.

Conclusion and Recommendations

In this research paper, in order to explain the formation of prices in the real estate market of Almaty, the influence of such economic factors as the volume of mortgage loans issued (tenge), average nominal income (tenge), the USD/KZT exchange rate (tenge), price change in the construction sector (percentage), population and number of unemployed on housing prices in Almaty were analyzed.

In total, as a result of the analysis, 3 models were created, the data for which were taken for the time period of 2011-2021, including Almaty city only. The number of observations was 44 for 11 years on a quarterly base for 5 variables, 28 for 7 years a quarterly base for 6 variables, and 44 for 4 years monthly base for 1 variable. The statistical part of the paper is based on the regression model (OLS), Correlation testing and Breusch-Pagan testing.

Models show that the data is collected quite well. Residuals are within the sophisticated range, and R squared proves the goodness of the model's fit, showing a value of more than 53% in all three models. That means it is possible to make reasonable conclusions based on the results. Out of 6 independent factors, the effect of 4 of them (price change in the construction sector, average nominal income, USD/KZT exchange rate, volume of mortgage loans issued) on the increase in real estate prices is positive, while the effect of other 2 (population, number of unemployed people) turned out to be negative. Almost all of the variables besides unemployment are individually significant in the first, and in the second model, only 2 variables are statistically important (price change in the construction sector and USD/KZT exchange rate). All other variables are positively correlated and have a positive influence on the price of real estate. To be highly confident, it would be better to try to collect data on mortgage loans and unemployed people again.

Out of three hypotheses that were formed on the basis of the work after analyzing the market of other countries, two were accepted, and only one was rejected. Not the least role in this was played by the fact that when analyzing the market, it was clearly seen that an Almaty citizen with an average income would not be able to afford to purchase housing alone at the expense of their own savings.

To sum up the experience of authors after working on the research paper, the following recommendations may be drawn up. Work on the review of two models in the context of 7 and 11 years has shown that the more data is considered in the model, the more relevant the model is for work. In the future, when considering a similar topic by researchers, it is suggested to take a bigger sample size.

It should also be noted that this work cannot be considered in the context of the whole Republic, since each region and city is different. In the case of this paper, the city of Almaty is the largest city in Kazakhstan, fully built-up and densely populated, which makes it difficult to build new buildings within the city. And this is an important factor that makes prices in the city of Almaty much higher than the average prices in the Republic. In this connection, in further works, it is recommended to consider the influence of factors on the market of Kazakhstan as a whole and not only on the separate city.

While writing this paper, there was a difficulty in the analysis of the literature review, since there were very few works written on the similar topic directly related to the market of the Republic of Kazakhstan and the authors had to rely on works analyzing markets of other countries. Thus, it is fair to note that each state has its own background, which directly affects how the state's economy can respond to certain changes in economic factors.

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Appendices

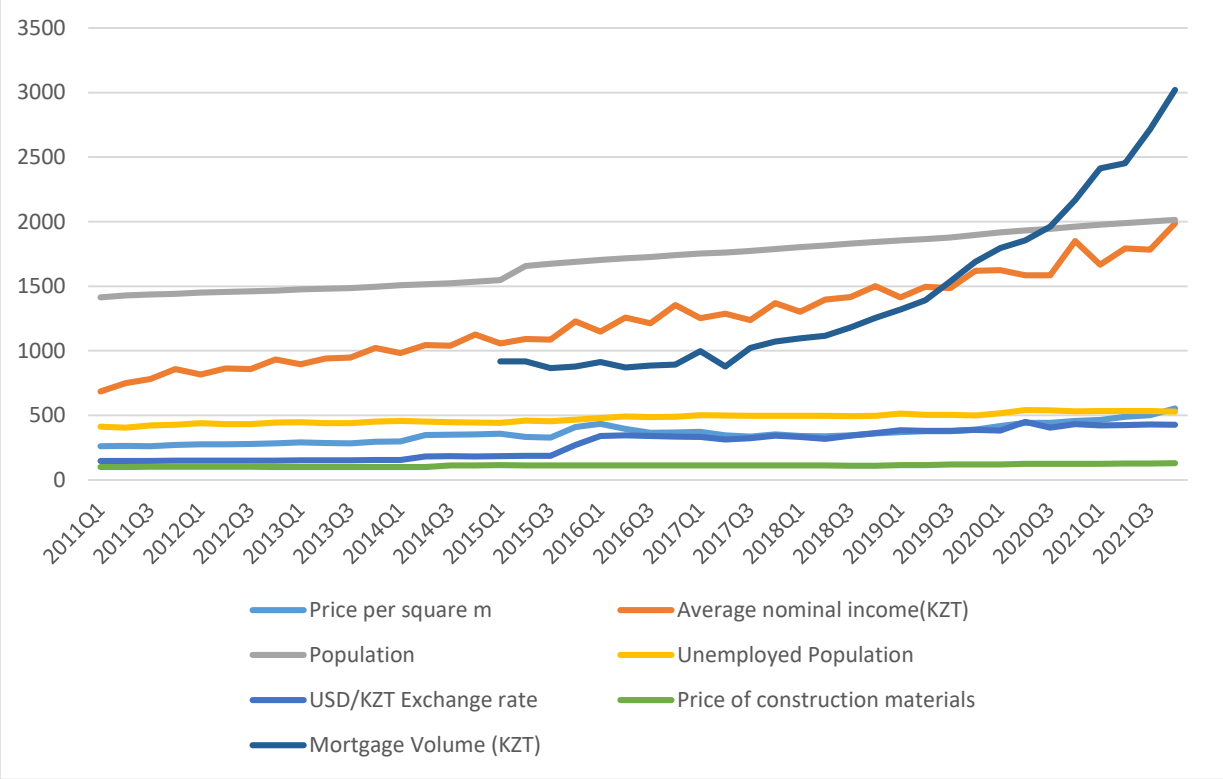

Figure 3. Growth dynamics of variables in the period from 2011 to 2021

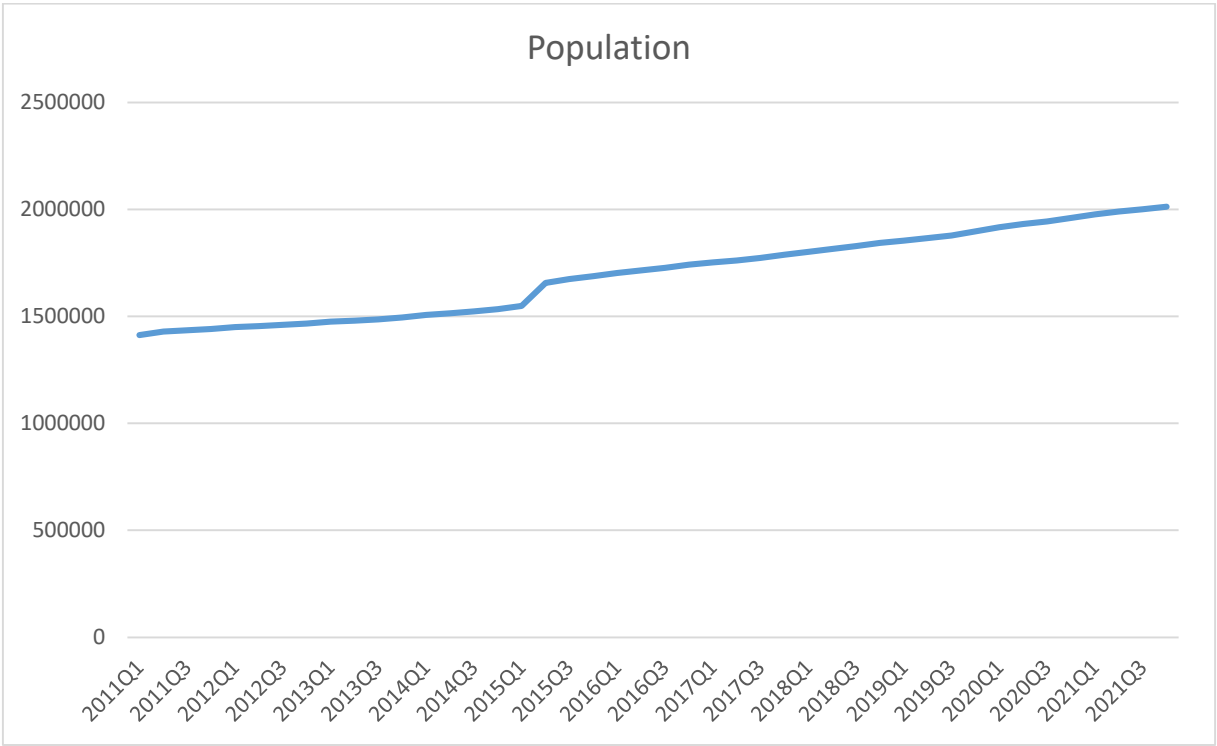

Figure 4. Growth dynamics of population in the period from 2011 to 2021

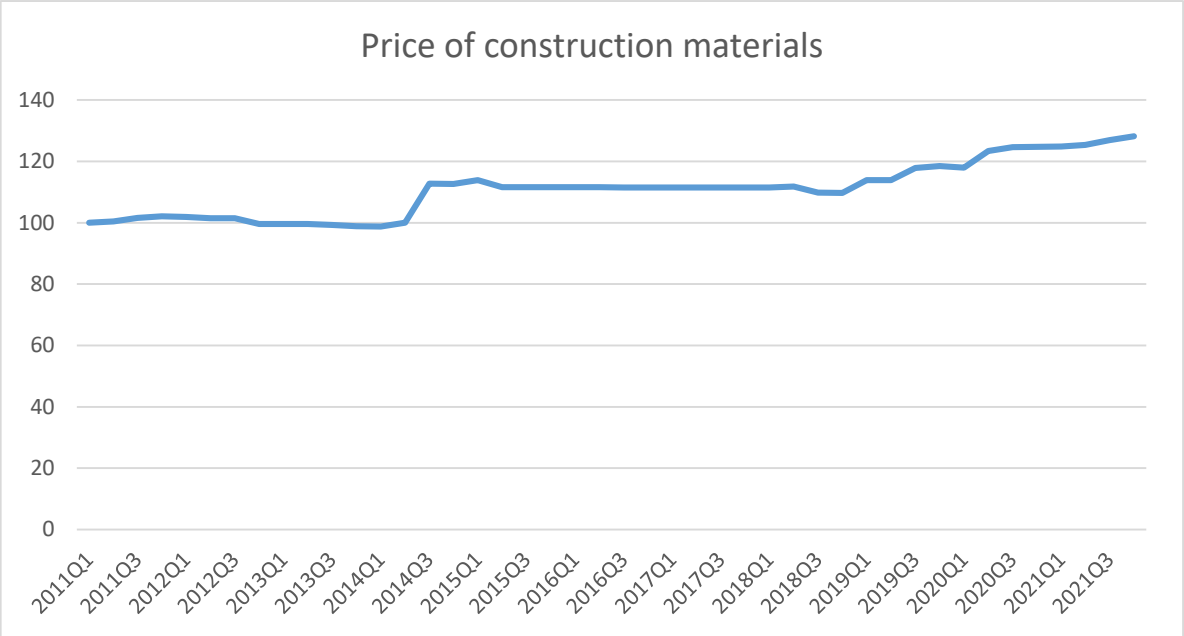

Figure 5. Growth dynamics of construction materials price in the period from 2011 to 2021

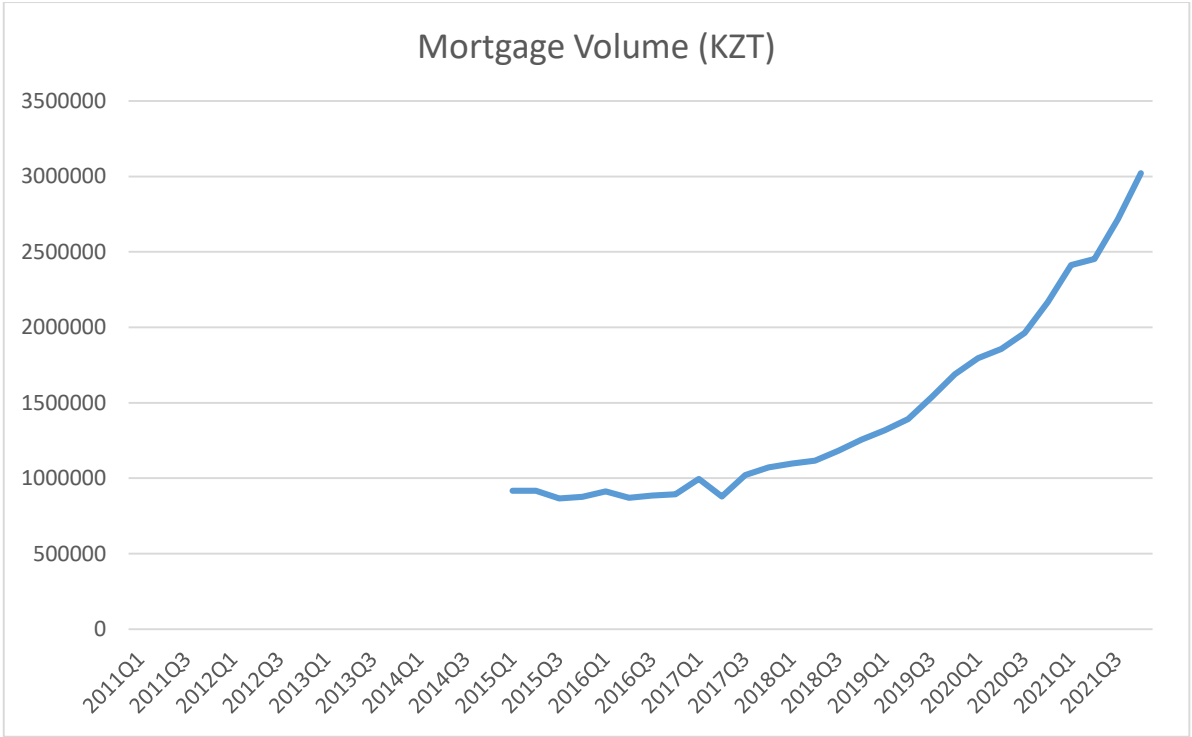

Figure 6. Growth dynamics of mortgage volume in the period from 2015 to 2021

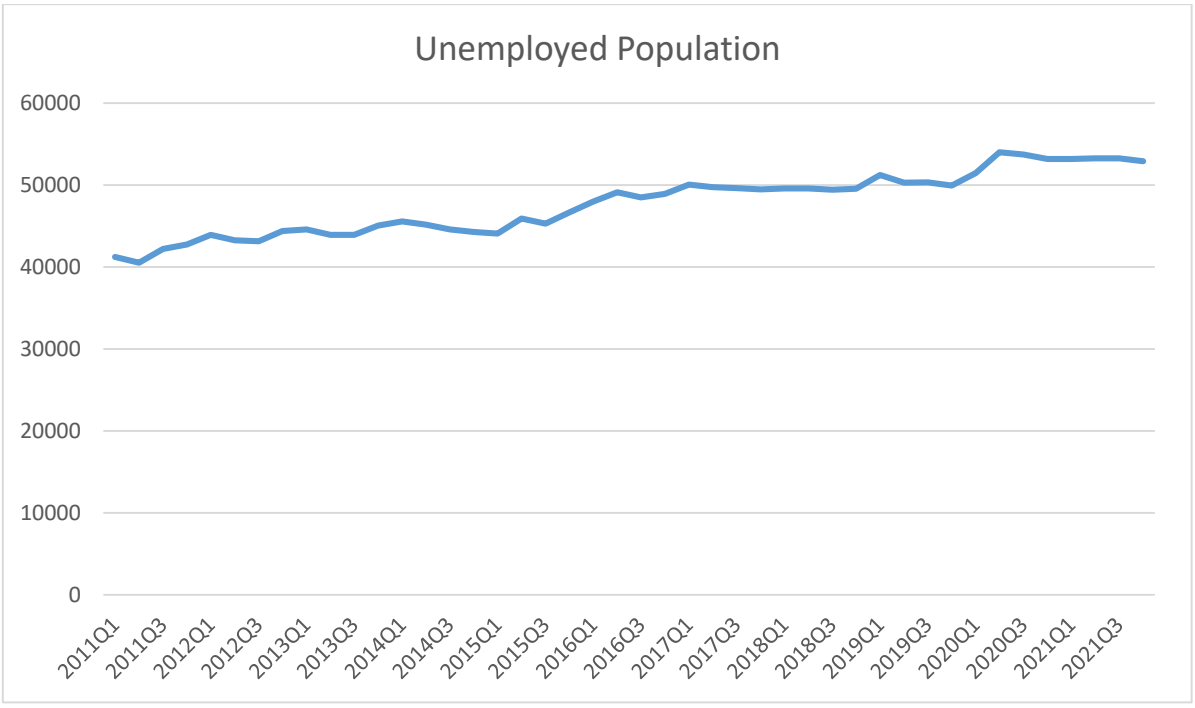

Figure 7. Growth dynamics of unemployed population in the period from 2011 to 2021

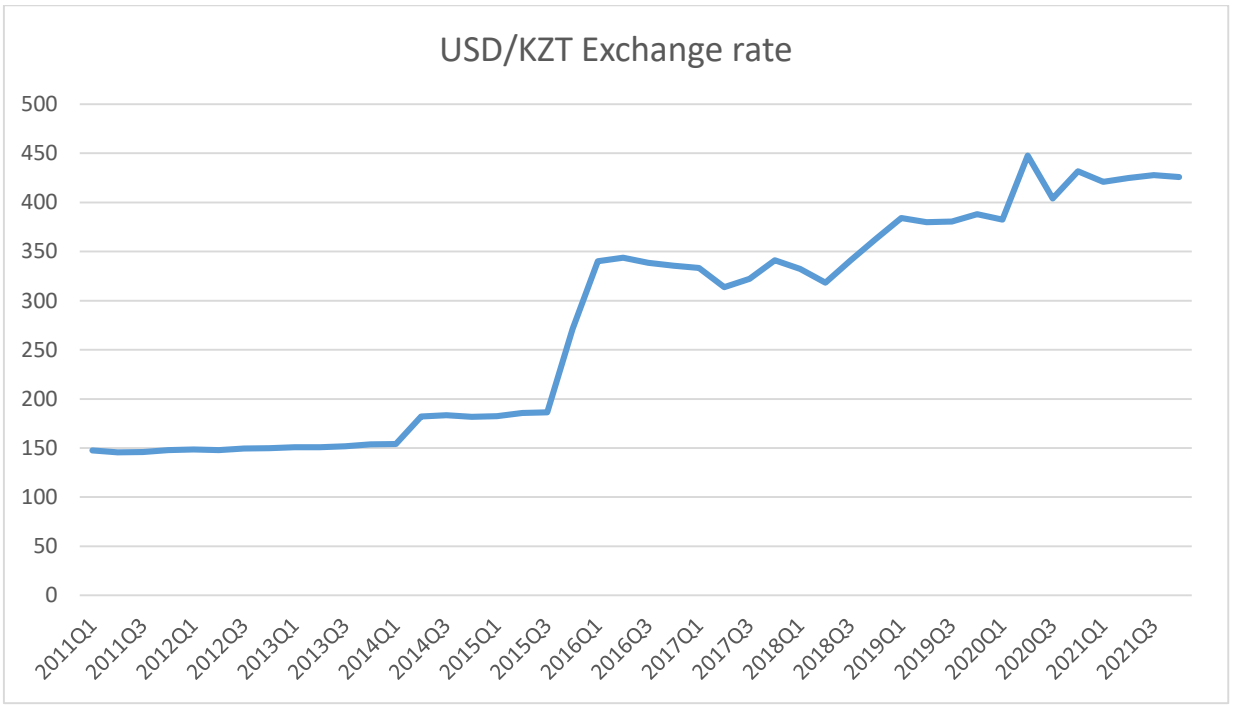

Figure 8. Growth dynamics of USD/KZT exchange rate in the period from 2011 to 2021

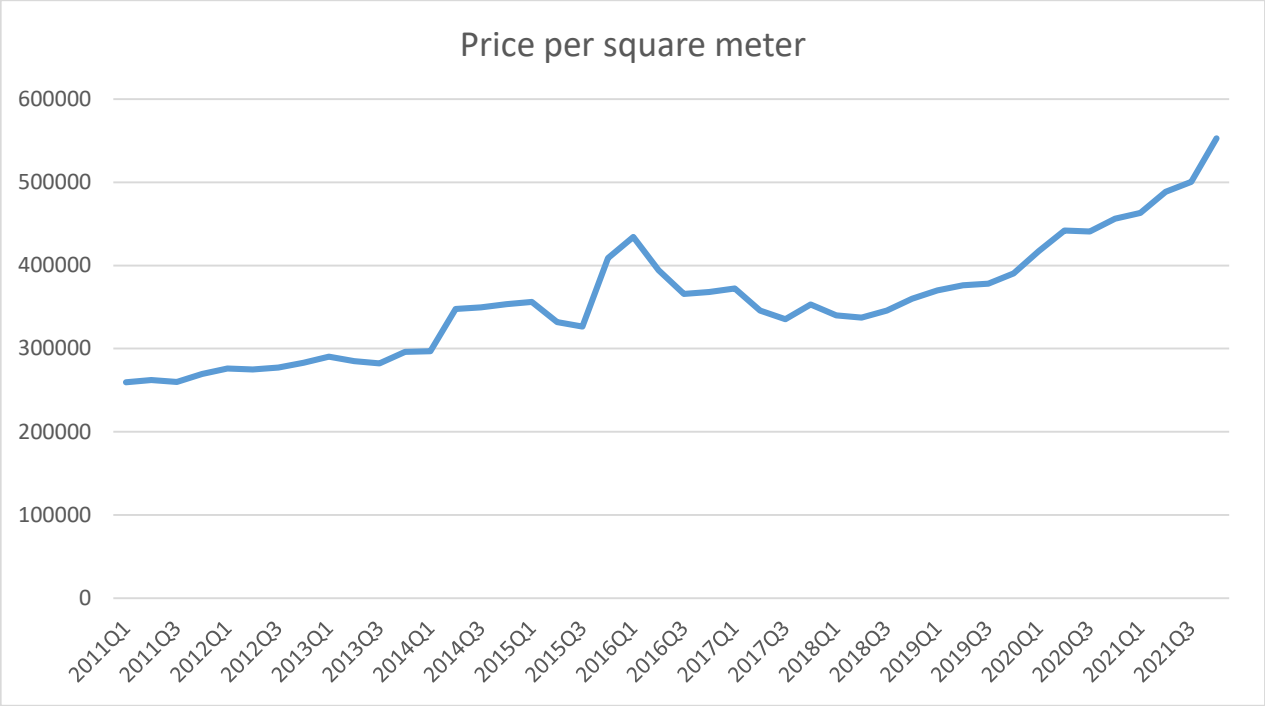

Figure 9. Growth dynamics of price per square meter in the period from 2011 to 2021

Variable	ols	ols2	ols3
lnincal	.55314425**	.15925446	
lnpop	-1.7921107**	-1.3606324	
lnunem	.4739639	-1.1237154	
lnusdkzt	.19288313*	.44821859**	
lnprice	1.6480321***	2.8904107***	
lnmortg		.0051596	
lnmortg1			.19038791***
_cons	18.065914**	26.331141**	12.082668***
Nr2			

legend: * p<0.05; ** p<0.01; *** p<0.001

Table 7. Coefficients of all variables in 3 OLS Models