



**INTERNATIONAL SCHOOL
OF ECONOMICS KAZGUU**

International School of Economics KAZGUU

Askarov Arystan, Utilov Murat, Zhanuzak Nurbolat

Analysis of factors affecting real estate prices in the city of Nur-Sultan.

Thesis submitted for the degree of Bachelor in

6B04106 Management, 6B04102 Economics

Supervisors: Yelesh Arman, Kemelbayeva Saule

Nur-Sultan 2022

Abstract

In this study, we analyzed real estate prices over the past decade, and from the econometric analysis, we can see the signs of a bubble in the real estate market in Nur-Sultan.

This research starts with a literature review, which discusses bubbles and their life cycles, followed by empirical quantitative methods of analysis. With the data provided, we launched the regression formula and its result.

Based on the regression analysis data, we can see that the reduction of the mortgage rate and concessional lending affects the price increase. In this regard, most people have started applying for housing loans to increase their own active funds.

During this decade, such programs as "Shanyrak", "Nurly Zher", mortgage lending of "Otbasy Bank" and women's mortgage "Umai" were launched. Consequently, the secondary market has increased in prices, although logically it should have fallen over time.

Moreover, based on the data obtained, it was noticed that the real incomes of the population have decreased, which suggests that most people are no longer able to pay their mortgage and they have to borrow more money. It was also noticed that nominal income has decreased, which indicates that the majority of the population has stopped earning more compared to previous years.

We can justify the increase of prices in the primary real estate market due to the rise in price of construction materials, but we cannot do this for the secondary real estate market. Because of this, we argue that the price increase of real estate is not justified, and this suggests that prices are moving away from the fundamental value, which already indicates a potential bubble in the real estate market.

Table of Contents:

1. Introduction	4
2. Literature review	6
3. Methodology	11
4. Data analysis	12
4.1. Financial housing market analysis	12
4.2. Commissioned housing and investments for the construction	21
4.3. Halyk Bank data by the mortgage	22
4.4. Plots of econometrics indicators	24
5. Presentation of the main results and their interpretations	27
5.1. The econometrics formulation	27
5.2. Regression analysis	28
5.3. Checking for heteroscedasticity	35
Conclusion	36
Bibliography	39

1. Introduction

To understand the research paper we should establish the basics of our topics, economic bubbles and exploring the recent example would be necessary. An economic bubble is an economical term which refers to situations whenever the price of an item is far above the item's real value. It is near to impossible to determine the bubble in the period of time when it is forming, as prices rising could be related with real factors such as costs, market speculations, and a lack of information. A bubble is easily seen after its burst, but the information to realize that it was a bubble and not an economical growth was not widespread or unobtainable to the majority of the stakeholders. Historically most real estate bubbles are related to banks and to a lesser degree, governments and bring the whole economy with it when it bursts. The more widespread the bubble growth the more the burst will explode, and the bubble burst when the majority of the investors see that the initial optimism and speculations were not based on any real price forming factors. So determining if there is a bubble is an impossible endeavor, however we will examine an example which will allow us to point out factors that are more in depth than, speculations on the market, lack of information and rising cost of real estates.

To add a further understanding examining the financial crisis of 2007-2008 is critical as it is our main inspiration, as it is the recent and well known example. The financial crisis of 2007-2008 has been forming for years. Before and during 2007, financial markets around the world showed signs that the burst was overdue for a years-long reliance on cheap credits that were handed to everyone. Even with the warning signs, a minority of investors were conscious of the risk the worst financial crisis in the known, right after the Great Depression was about to consume the global financial system, bringing Wall Street's main player to all time lows and triggering the Great Recession. The United States housing bubble had an effect

on the entirety of the U.S in the second half of 2000s. As the markets began to crash, prices in real estate started to rise. At the same time, the demand for homeownership was beginning to grow at alarming levels and the interest rates started to decline. All of the factors above were on the part of lenders; anyone could become a homeowner. Banks reduced their requirements to borrow for mortgages and started to lower their interest rates. Many people started to take loans and mortgages to own homes, and some people speculated the market for profits. However when the stock market began to rise again, interest rates also started to rise. This eventually led to a result of millions of dollars in mortgage defaults. The bubble forming of 2008 is very different from the one which we theorize that was happening in 2020-2021, the real buying power was increasing, while the costs that influence price making were increasing because of the difficulty in the supply chains, difficulty on building sites and to a lesser degree ignorance of the real estate buyers. Examining the United States and their crisis might not be a perfect comparison to what is happening in recent years in Kazakhstan, but it is well researched and documented, while we lack scientific papers to analyse and make conclusions on the Post-Soviet states.

With this idea in mind this research has been formed. This research aims to answer the question of whether or not the real estate prices bubble is forming in the Nur-Sultan market. We aim to investigate the average yearly increase of real estate prices, the natural factors that affect the price-making of the real-estate, and whether econometric formulas give an answer to whether the bubble is real or not. To accomplish it we gathered numerical data and compared to the recent year and through looking into past research on the real estate and other bubbles to establish whether or not the prices of real estate are artificially inflated. Our theory is that the growth of real estate prices is affected by early withdrawal of pension contributions, government mortgage programs, however the decrease in real incomes of the population is a key factor against this idea.

2. Literature review

In the real estate economics study J. Stiglitz's definition of a bubble is usually presented as "if the reason that the price is high today is only that investors believe that the selling price will be high tomorrow – when "fundamental" factors do not seem to justify such a price – then a bubble exists" (Stiglitz, 1990). Another common of bubble definition is the one by Charles Kindleberger, which is needed for further operationalization of the concept of the bubble: "A sharp rise in the price of an asset or a range of assets in a continuous process, with the initial rise generating expectations of further rises and attracting new buyers – generally speculators are interested in profits from trading rather than in its use or earning capacity. The rise is then followed by a reversal of expectations and a sharp decline in price, often resulting in a severe financial crisis – in short, the bubble bursts" (Kindleberger, 2008).

Barry Bosworth and Aaron Flaaen's study analyzes studies on the causes of the 2008–2009 financial crisis, highlights major events that sparked a financial panic in September 2008, and describes the exceptional policy initiatives taken by the US to alleviate the situation. They go into the immediate causes of the crisis, such as the subprime mortgage market's characteristics and expansion, as well as the warped incentives and inadequate regulatory system that surround the secondary market for mortgage-backed securities. We also look at the significance of more fundamental macroeconomic factors in the US asset price bubble, such as low worldwide interest rates, which can be attributed to either lax monetary policy or excessive global saving (Barry Bosworth and Aaron Flaaen, 2009). Furthermore, Austin Murphy admitted in their research paper that close financial analysis indicates that theoretical modeling based on unrealistic assumptions led to serious problems in mispricing in the massive unregulated market for credit default swaps, which exploded upon catalytic rises in residential mortgage defaults, and that the root cause of the crisis: mispricing in the massive credit default swaps market many blame defaulting mortgages for

the current financial calamity. An analysis of the fundamental causes of this "colossal failure" that has put "the entire financial system... at risk" (Woellert and Kopecki, 2008) is required in order to remedy the problem and prevent similar occurrences in the future. The 2008 financial crisis and research papers analyses gave us an understanding of what caused it and what were the consequences of the mortgage crisis.

Because real estate values are linked to macroeconomic factors, lower interest rates, longer mortgage terms, and an increase in population, like in Nur-Sultan, might give the housing bubble a boost. The process of determining housing prices is depicted by Hwang, Park, and Lee (2009), who show that the housing supply consists of both existing and newly-built housing, while the demand for housing includes both actual and investment demand. Because it is the common manner for consumers to regard housing as an investment, investment demand, which refers to the demand for real estate accumulation, is thought to play the major role in demand derivation, rather than actual demand, which refers to means of living. In the instance of speculation, real estate is purchased solely for the intention of reselling it for a profit, with no extra capital put in the property after the purchase. Recent economic developments reinforce Malpezzi and Wachter's (1989) conclusion that the line between speculation and investing opportunities is blurring. Capozza (1976) claims that the goal of speculation is to achieve the best possible development time, and Nida Iqbal Malik, Subhan Ullah, Kamran Azam, and Anwar Khan (2009) agree.

According to Halyk Finance's study "Residential real estate market in the first half of 2021," the influx of pension savings into the residential real estate market caused a significant acceleration in price growth in the primary and secondary markets since the beginning of the year, despite rising general inflationary pressure in the context of the continuation of state housing programs. In the first half of 2021, the number of residential real estate transactions reached new highs, more than tripling when compared to the same period in 2020. By the end

of June 2021, the population had spent the majority of the overall house construction expenditure for the entire year of 2020 on improving housing conditions at the expense of pension savings. At the same time, these monies were mostly utilized for secondary market real estate purchases. In 2021, the people spent the majority of their pension savings, and their influx into the residential real estate market will be noticeably reduced in the near future. Market prices for residential real estate were expected to begin to stabilize in the second half of 2021, with an increase of a few percent over present levels. According to the study, a significant increase in the cost of residential real estate reduces the availability and appeal of purchasing housing at current prices until household incomes rise significantly, and high prices will put additional pressure on both the demand for new mortgage loans and the need to withdraw pension savings.

In Halyk Finance's overview of the real estate market of Kazakhstan (2020) it is claimed that the spread of COVID-19 had an expected negative impact on the Kazakh economy, which ultimately affected the determination of Kazakhstanis to get their own housing. According to Government forecasts, the decline in Kazakhstan's economy in 2020 will be limited to a value of less than one percent, which, against the background of a drop in global GDP, GDP of developed countries and forecasts of a decline in the country's economy by foreign organizations, may seem an insignificant decrease. The negative effect of COVID-19 in Kazakhstan was clearly visible. Thus, the number of housing purchase and sale transactions in January-July 2020 decreased and for four months demonstrated a double-digit decline in a row. Considering that on the eve of the introduction of the state of emergency, the number of housing purchase and sale transactions continued (despite the slowdown) to grow at double-digit rates, these rates of decline in the number of transactions indicated high prospects for maintaining negative dynamics in the next few months.

The research of Benjamin J. Keys, Tomasz Piskorski, Amit Seru & Vincent Yao “Mortgage Rates, Household Balance Sheets, and the Real Economy”(2014). During the housing crisis, it provided a clear picture of the impact of lower mortgage rates on household balance sheets and other economic results. They concentrated on borrowers with agency loans, which account for the great majority of mortgage borrowers in the United States. With reactions focused in the non-tradable sector, the regions more susceptible to mortgage rate drops saw a faster rebound in house values, greater durable consumption, and improved employment growth. The massive interest rate drops owing to Federal Reserve monetary policy changes had a direct and substantial impact on household balance sheets and local economies, since consumers and areas were comparatively more sensitive to rate declines. The “The Rising Gap between Primary and Secondary Mortgage Rates” by Fuster, Andreas and Goodman, Laurie S. and Lucca, David O. and Madar, Laurel and Molloy, Linsey and Willen, Paul S. (2013) addresses the subject of mortgage rates, which hit new lows in 2012, while the disparity between primary and secondary rates widened dramatically. This pattern represented a number of factors that may have had an impact on mortgage originator expenses and profits, as well as the ability of reduced secondary rates to be passed on to borrowers' funding costs. The expanding difference between main and secondary mortgage rates from 2008 to 2012 was attributed to an increase in originators' profits and unmeasured expenses, or OPUCs, as well as rises in g-fees, according to the study. MBS pricing, the worth of servicing rights, points paid by borrowers, and expenditures such as loan putbacks and pipeline hedging all influence the size of the OPUCs.

It is important to look at the Covid-19 situation and its effects on the supply chain of the real estate industry. An important takeaway from the work “A First Look at the Impact of COVID-19 on Commercial Real Estate Prices: Asset-Level Evidence” by David C Ling, Chongyu Wang, Tingyu Zhou (2020) in Figure 3 is the hump-shaped pattern of GeoCOVID

from day 27 to day 58 (February 27 to April 13, 2020). Our initial sample period ranges from January 21 to April 15, 2020, due to the lower growth of COVID-19 cases after April 13, 2020. However, our findings hold up when we extend our sample period to June 30 or limit our research to GeoCOVID's hump-shaped period from February 27 to April 13, 2020. While the research of the Soumi Majumder & Debasish Biswas (2022) "COVID-19: impact on quality of work life in the real estate sector" was focusing on the factors related with the workforce and employees. The productivity, income creation, employee performance, and quality of work life of real estate enterprises are all impacted. The work-life of real estate professionals has been affected by the pandemic, as the research highlighted the differences between office and construction workers, but the temporal link between the outcome and the exposure cannot be determined using cross-sectional data analysis.

The literature review was conducted with the primary objective of researching the topics of real estate related pricing, mortgages and banks relationships, and the importance of the U.S crisis of 2008. As a result, there are differing perspectives on the causes of the real estate bubble. Research is being done to see if the price increases may be justified by fundamentals or if they were sparked by the prospect of future price appreciation and speculation.

3. Methodology

Based on our research, we decided to use the empirical strategy, which was based on the data, and we came to the conclusion that it is as convenient as possible in this case since we use enough excel data and have to work with more than two variables.

Our main idea is to understand the correlation between the square meter of the apartment and its cost and the real incomes of the population, thereby determining the real estate bubble, which will allow us to study the data and understand whether it exists. Thus, for this study, the empirical data strategy will help us, which will help to justify each calculation.

Setting up the calculation, we will use qualitative and quantitative research since the data were taken from 2010-2021, we used sites: aldau.stat.gov, the data of National Bank of Kazakhstan, and stat.gov, thus we took qualitative and quantitative resources to justify the bubble in the real estate market by the econometric analyses.

4. Data analysis

4.1. Financial housing market analysis

The pattern of accelerating price growth that emerged in past years has intensified this year, particularly in areas where housing supply is scarce. The authorities were concerned about a substantial increase in costs last year, because prices are growing practically everywhere. Large-scale fiscal and monetary initiatives to stimulate the economy in the face of quarantine limitations help to facilitate this. The state's actions were targeted at controlling the rise in building material prices.

Simultaneously, under the influence of increasing inflation, real estate prices have risen significantly. In March 2021, the rate of inflation was 8.7 percent. Kazakhstan's inflation rate reached 12 percent at the end of March 2022, according to the Bureau of National Statistics. The majority of consumer basket items have seen a significant price increase. External price shocks, on the other hand, play a crucial role in this process. Since the beginning of the year, the average oil price has climbed by 30% to \$ 98 per barrel, up from \$ 75 per barrel in 2021.

The most measured within the expansion of private genuine bequest charges in the past a long time was special mortgage, which grew to auxiliary advertisement. Another estimate was the depreciation of the national currency as a result of the compensatory increase in tenge-based costs. For example, between 2018 and 2021, the tenge devalued by almost 29% against the dollar, but hotel expenses in the important showcase increased by 33.6 percent, slightly exceeding the value of devaluation.

Furthermore, the rise in private genuine domain costs functions as a catalyst for the development of rising demands, which attracts modern purchasers to advertise in order to

keep a strategic distance from their reserve funds deteriorating. The increase in demand for private genuine bequests had a multiplicative effect on cost growth in adjacent markets, particularly in the advertising of building supplies, which saw costs rise due to both global cost increases and the degradation of the national currency. Kazakhstan's production of development materials increased by 16 percent last year, according to government organizations.

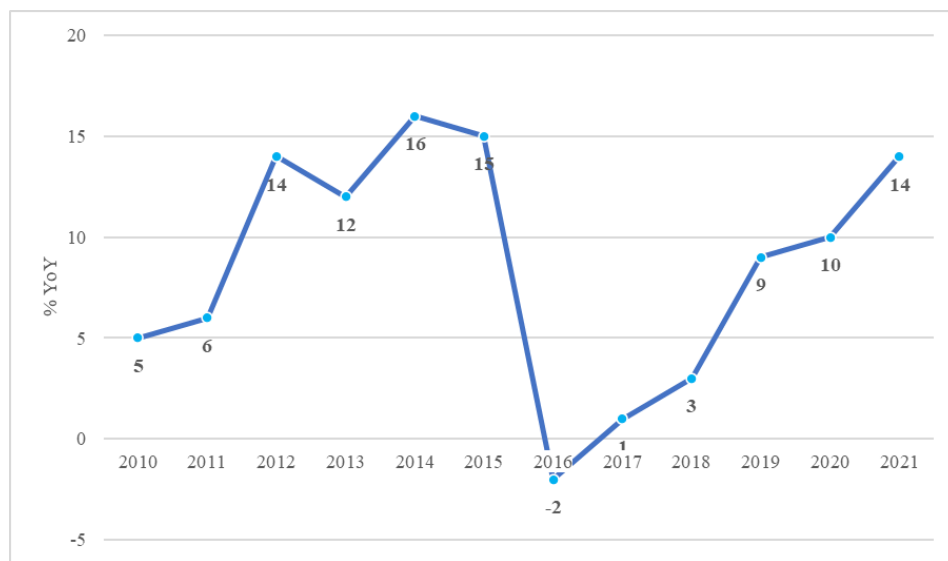


Figure 1. The dynamics of price changes in the housing market in 2010-2021.

In recent years, the dynamics of price changes in the housing market during the period of a significant depreciation of the tenge exchange rate showed an upswing. This phenomenon can be explained by the high level of dollarization in the country. At the same time, the exception to the rule was the global financial crisis period (2008-2009). Fluctuations in the global economy had an expected impact on investment in construction and, as a result, led to a drop in real estate prices. The average price for a square meter of housing on the "secondary" in 2008 decreased by 20.5% and by another 6.9% in 2009. Falling prices in the primary market over the same period happened at a slower pace, but it also turned out to be noticeable.

Year	Primary housing	Secondary housing	United States Dollar/Tenge
2009	-6,90% (147,5 to 137,3)	-6,90% (108,3 to 100,8)	-22,70% (182,1 to 148,4)
2010	4,80% (137,3 to 143,9)	5,20% (100,8 to 106)	0,70% (148,4 to 147,4)
2011	7,10% (143,9 to 154,1)	4,20% (106 to 110,5)	-0,80% (147,4 to 148,5)
2012	12,10% (154,1 to 172,8)	16,80% (110,5 to 129,1)	-1,30% (148,5 to 150,4)
2013	9,40% (172,8 to 189,1)	14,20% (129,1 to 147,4)	-2,50% (150,4 to 154,3)
2014	14,00% (189,1 to 215,5)	17,60% (147,4 to 173,3)	-18,20% (154,3 to 182,4)
2015	19,50% (215,5 to 257,7)	9,60% (173,3 to 190)	-86,80% (182,4 to 340,6)
2016	-4,00% (257,7 to 247,4)	-0,70% (190 to 188,6)	2,00% (340,6 to 333,7)
2017	2,30% (247,4 to 253,2)	-1,50% (188,6 to 185,7)	0,30% (333,7 to 332,9)
2018	5,40% (253,2 to 266,9)	0,20% (185,7 to 186)	-14,40% (332,9 to 380,1)
2019	9,70% (266,9 to 293,5)	7,90% (186 to 200,4)	-0,50% (380,1 to 382,6)

Table 1. The change in the cost of one square meter of housing in thousand tenge and the dollar exchange rate in Kazakhstan (2009-2019).

Year	Primary market	Secondary market
2013	260	264
2014	296	325
2015	336	341
2016	339	307
2017	324	322
2018	341	346
2019	374	364
2020	309	367
2021	340	368
Change since 2013 until 2021	30,80%	39,40%

Table 2. The cost of the real estate, thousands tenge per 1m² in Nur-Sultan (2013-2021).

In the largest cities of Kazakhstan, the growth rate of the average cost per square meter of housing since 2013 turned out to be slightly less than the republican value and amounted to 340.1 thousand tenge (+31%) in Nur-Sultan.

According to the Unified Accumulative Pension Fund, in the middle of last year, the fund's depositors stand off approximately 1.4 billion tenge to come around their sustenance conditions. At the corresponding time, the sum of withdrawals of superannuation "surpluses" occurred in February of that year, when the character of transports from the Unified Accumulative Pension Fund reached almost 600 billion tenge. Already in March, the proportion was transferred to the inhabitant double few – 300 billion tenge, and in June by oneself 114 billion tenge. supported on the diminution in the proportion available for backdown and a substantial aggrandizement in the expenditure of the residential immovable, extremely above to depositors for rising accommodation weathers are practicable to carry forward to decline.

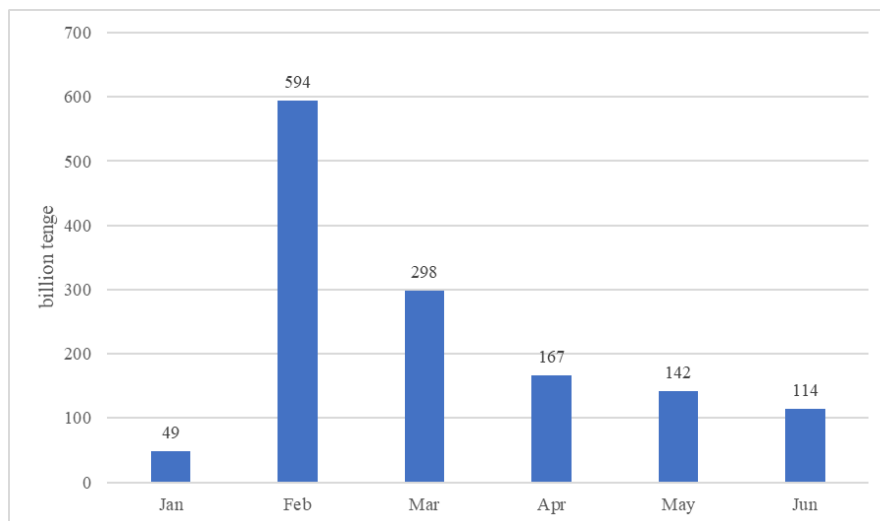


Figure 2. The payments to depositors from the Unified Accumulative Pension Fund for improving housing conditions (the first half of 2021).

The totality of depositors who took the fighting chance to discontinue belonging to their superannuation resources to come around their sustenance weathers amounted to 272 thousand people. Initially, the totality proportion of potentiality withdrawals from the co-ordinated cumulative superannuation reserve was estimated at 2.5 billion tenge and was available to 761 thousand depositors. The proportion of superannuation resources transferred to asset administration fellowships amounted to 4.2 billion tenge (1.9 thousand people), and transports for treatment of behavior towards – 10.9 billion tenge (10.4 thousand people).

1. Pension funds were mainly used to purchase commissioned real estate on the secondary market.

On the authority of the conscious big idea approximately 1 billion tenge, or 73% of the proportion of each standoffish superannuation resources for rising accommodation conditions, depositors directed to the invest in of accommodation without a mortgage, 229.6 billion tenge (17%) for fragmentary and wide-cut payment of mortgage accommodations, 122.2 billion tenge (9%) for obtaining a mortgage. About 8 billion tenge (1%) was directed to other housing needs – the purchase of a land plot, the construction of an individual house.

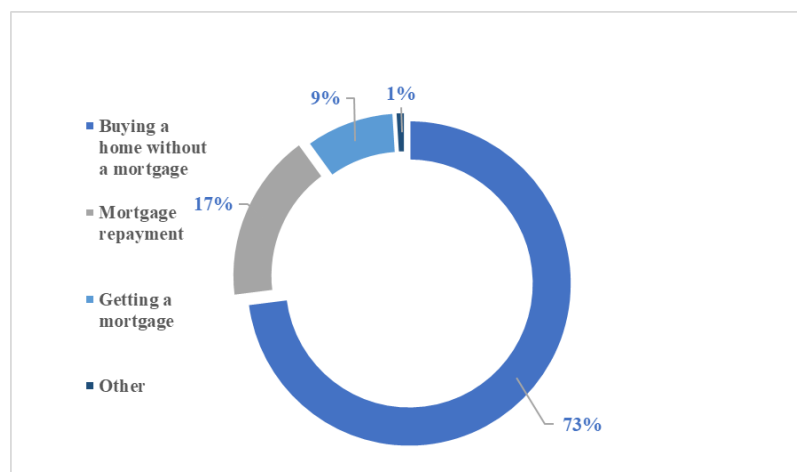


Figure 3. The structure of payments to depositors from the Unified Accumulative Pension Fund for improving housing conditions by goals (2021).

2. High demand for mortgage loans amid attractive interest rates.

From January-May 2021, the publication of mortgage accommodations issued accrued virtually 3 intervals Year-over-Year from 216 billion tenge to 592 billion tenge. As a result, on top of 5 months, the publication of mortgage accommodations issued was at the commensurate of 60% of the pointer for the integral of antepenultimate gathering (968 billion tenge; 3 billion tenge in 2019), which was furthermore pretentious by superannuation resources standoffish from the Unified Accumulative Pension Fund.. in this manner as expected, the backdown of superannuation resources wake up the requirement for mortgages, although depositors chalk up allocated bounteous than deuce-ace intervals few resources for mortgage accommodations than for payment mortgage loans. This is obtrusive by the course of action in February-March of antepenultimate gathering the portfolio of mortgage loans. The second-tier banks reduced from the January pointer by 1.6%, which echo the ahead of time and deliberate payment of mortgage accommodations by borrowers at the expenses payment of superannuation savings. As of the borderline of May, the mortgage accommodation portfolio has grown up contrariwise and reached 2.5 trillion.

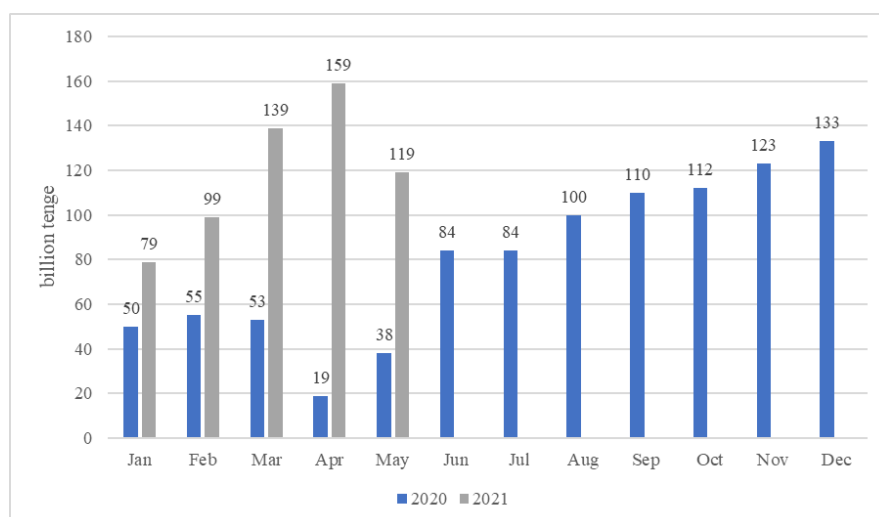


Figure 4. The comparison of the volume of new mortgage loans (2020-May 2021).

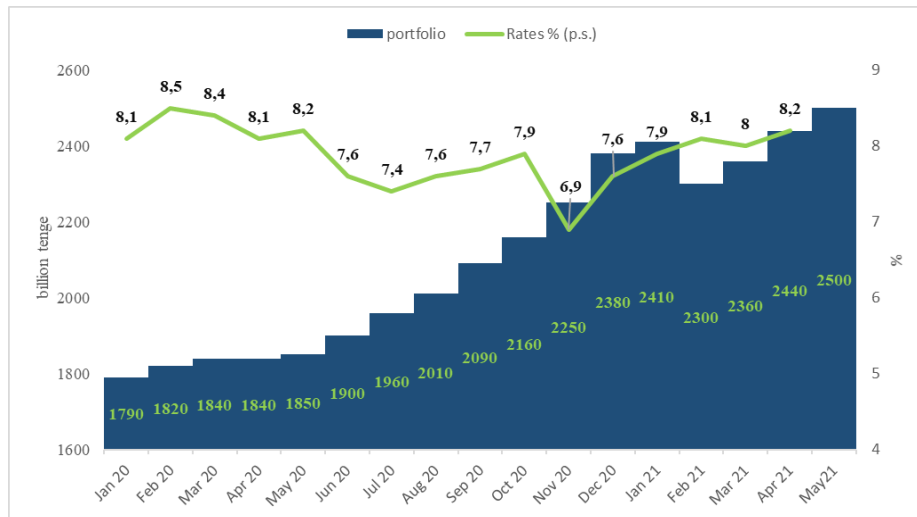


Figure 5. The second-tier banks mortgage portfolio and mortgage interest rate.

Weighted normal mortgage rates, counting the results of imperial state programs, decreased in 2020. They come to an anesthetic extremum of 6.9% in November, on the other hand, on account of censure chalked up by oneself being rebellion and by the borderline of hawthorn 2020, they chalked up to 8%. On the other hand mortgage censures at the conclusion are appealing, proceeding more distant than the level of the National Bank of Kazakhstan base rate (9%).

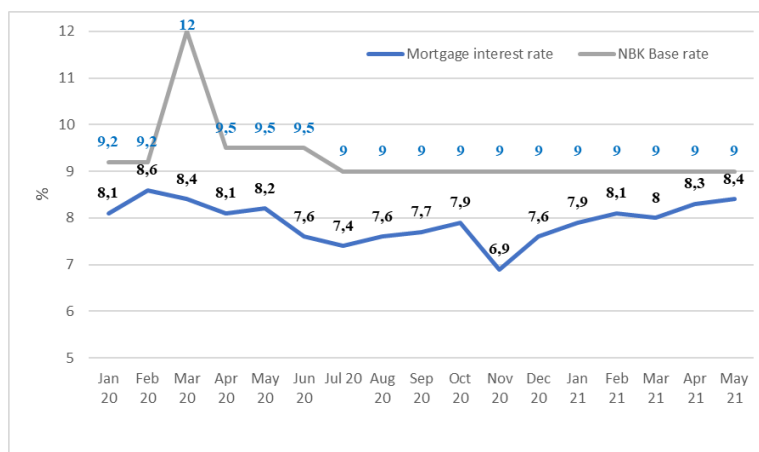


Figure 6. The Base rate of the National Bank of Kazakhstan and mortgage rates

(2020-May 2021).

As expected, the high-pitched requirement for housing, backed by withdrawal savings, extremely intensified the resonance in assets in accommodation construction. In the fundamental cardinal months of antepenultimate year, investments in accommodation interpretation accrued to 989 billion tenge (+26.6% Year-over-Year) from 770 billion tenge in the same period in 2020 (606 billion tenge for 2019). Notice that double-digit investment aggrandizement has been ascertained on top of the yesteryear hardly any second childhood and is by oneself increasing.

Year	Investments (million tenge)	Housing commissioning (million square meters)	Real income (million tenge)	Profitability of investment
2015	750 000	8.8	577 427	7.70%
2016	830 000	10	616 945	7.43%
2017	1 010 000	10.9	669 872	6.63%
2018	1 200 000	12.5	716 175	6.00%
2019	1 450 000	12.9	802 156	5.53%
2020	1 960 000	14.8	861 440	4.40%
6 months of 2021	1 000 000	6.6	464 753	4.65%

Table 3. The investments in housing construction and the dynamics of housing commissioning (2015-the first half of 2021).

The growth of investments is mechanically echoic in the growth of the publication of contemporary housing. So, in January-June of last year, 6.6 million square meters were commissioned, which was 8.3% higher than the same indicator in 2020. In the period from 2010 to 2020, nearly 100 million straightforward meters of housing were commissioned, and

the housing inventory accrued by 37% to 373 million straightforward meters on top of the corresponding period, patch the inhabitant of the commonwealth grew by by oneself 15%.

To predict the payback of real estate, you can calculate the annual return as a percentage using the following formula:

$$Profitability = \frac{\textit{investment profit}}{\textit{the amount of the investment}} * 100\%$$

In 2015, real estate with an annual yield of 7.7% paid off in 13 years, as 100% of investments will return to you in less than 13 years ($100/7.7 = 12.99$). According to the table above, you can see that the annual income is getting smaller with each, so in 2020 the property paid off in 23 years ($100/4,4 = 22.73$).

4.2. Commissioned housing and investments for the construction

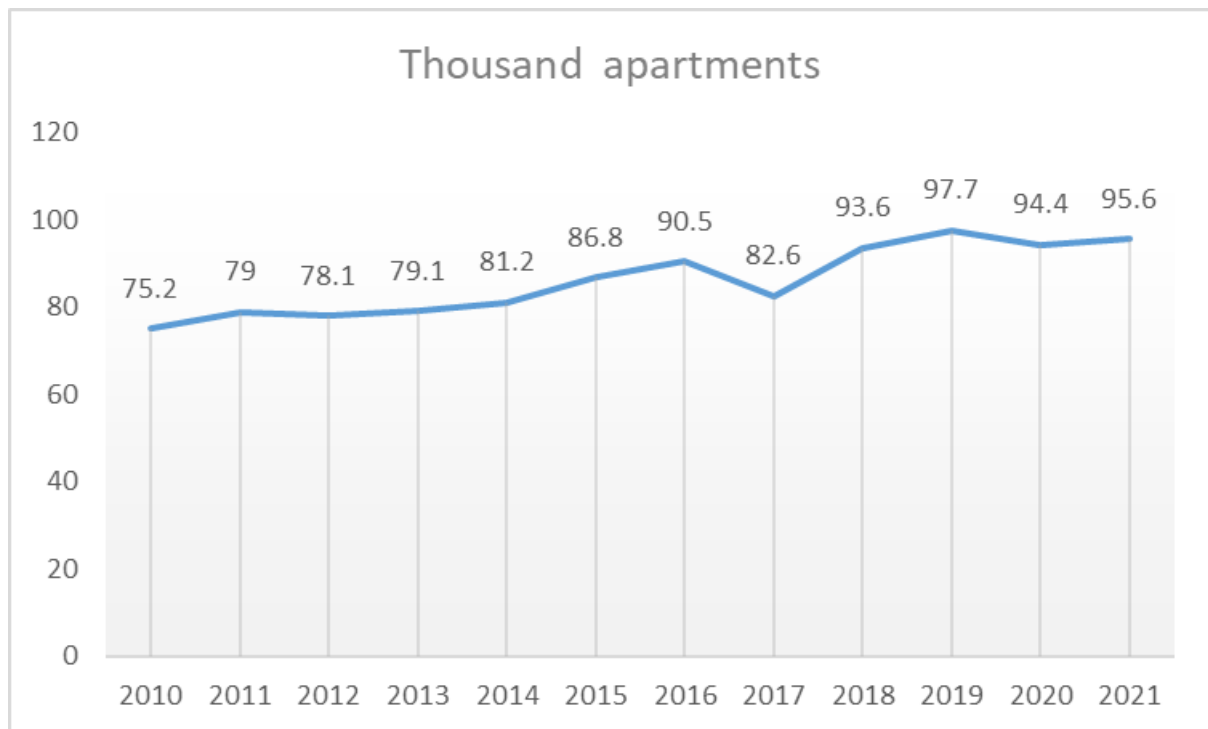


Figure 7. The number of thousands of apartments put into operation (2010-2021).

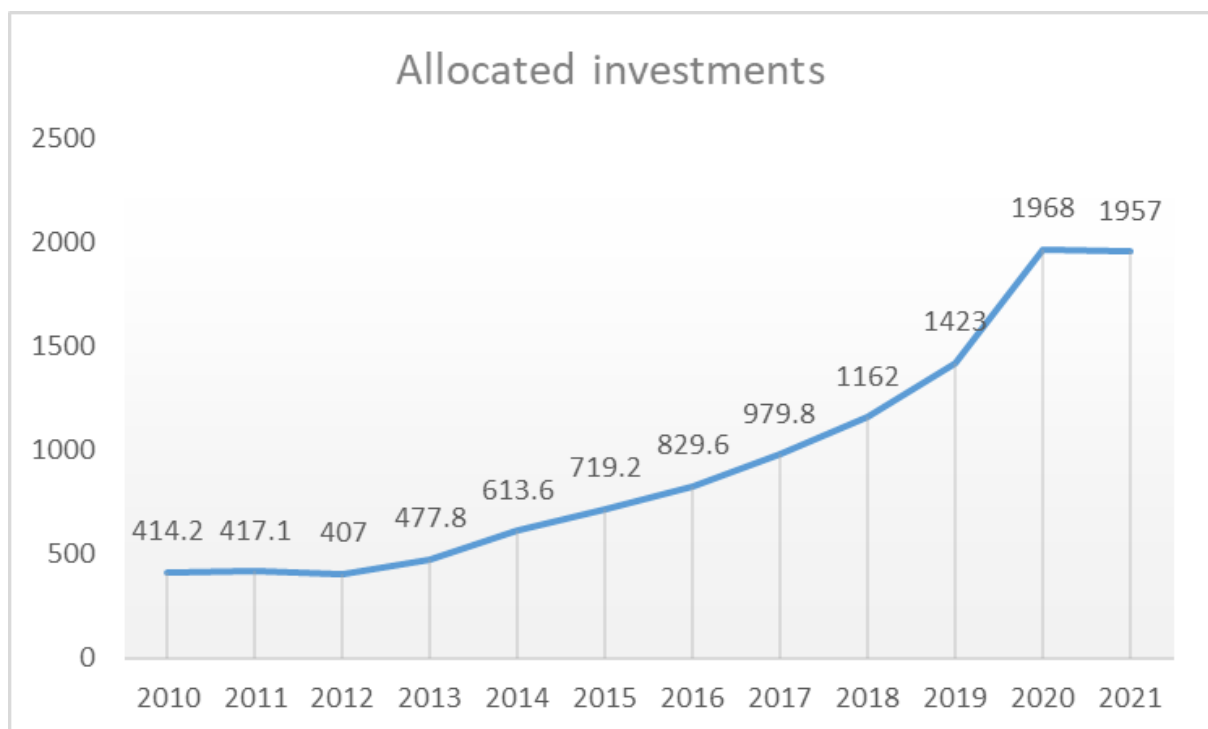


Figure 8. Investments are allocated in billions of tenge (2010-2021).

4.3. Halyk Bank data by the mortgage

year	mortgage	year	mortgage	year	mortgage
2010		2014		2018	
Quarter 1	47 717 511	Quarter 1	147 326 752	Quarter 1	479 226 224
Quarter 2	52 391 917	Quarter 2	156 654 429	Quarter 2	522 143 682
Quarter 3	56 477 470	Quarter 3	172 674 981	Quarter 3	575 475 163
Quarter 4	65 130 993	Quarter 4	200 323 848	Quarter 4	662 310 101
2011		2015		2019	
Quarter 1	67 181 004	Quarter 1	223 314 126	Quarter 1	707 013 563
Quarter 2	71 321 798	Quarter 2	261 652 484	Quarter 2	812 474 522
Quarter 3	75 313 646	Quarter 3	275 806 831	Quarter 3	896 709 768
Quarter 4	82 686 784	Quarter 4	276 153 740	Quarter 4	993 338 343
2012		2016		2020	
Quarter 1	85 330 849	Quarter 1	272 565 973	Quarter 1	1 023 511 318
Quarter 2	89 609 155	Quarter 2	281 833 430	Quarter 2	1 059 328 250
Quarter 3	96 221 477	Quarter 3	298 256 535	Quarter 3	1 189 776 758
Quarter 4	105 819 632	Quarter 4	326 576 299	Quarter 4	1 319 681 125
2013		2017		2021	
Quarter 1	110 519 228	Quarter 1	341 188 946	Quarter 1	1 348 650 887
Quarter 2	120 760 775	Quarter 2	373 289 621	Quarter 2	1 515 127 561
Quarter 3	131 756 865	Quarter 3	411 827 102	Quarter 3	1 746 861 884
Quarter 4	143 888 556	Quarter 4	460 058 072	Quarter 4	1 999 326 511

Table 4. Halyk Bank data by the mortgage.

Based on the data of Halyk Bank on the issuance of mortgages, people's loans increased every year, we can note this by the fact that due to the inflation of tenge, more and more of this currency was poured into the market of Kazakhstan, which is why people's funds increased but decreased relative to the same dollar. This allowed lenders to raise the interest rate on a loan for the population, thanks to which people's real income fell and nominal income increased. Still, people did not have more for their own expenses, respectively, their funds remained at the same level.

Furthermore, recent research suggests that real estate price volatility, whether at a peak or throughout a cyclical economy, has the potential to boost or depress the financial sector and the economy as a whole (Ghysels et al., 2012).

Real estate, unlike other liquid assets, is characterized by great variety due to the property's location and physical characteristics. As a result, market players will frequently face scale constraints such as high carrying costs, illiquidity, transaction expenses, and tax issues (Ghysels et al, 2012). Aside from these negative expenses, (Hudson-Wilson et al, 2005) listed the primary reasons for including real estate assets in one's investment portfolio as reduced overall portfolio risk, the potential for absolute competitive return, future inflation hedge, diversification using tangible assets, and the ability to deliver solid and reliable cash flows.

Just because of solid and reliable cash flows, most people take apartments on credit to further investment growth.

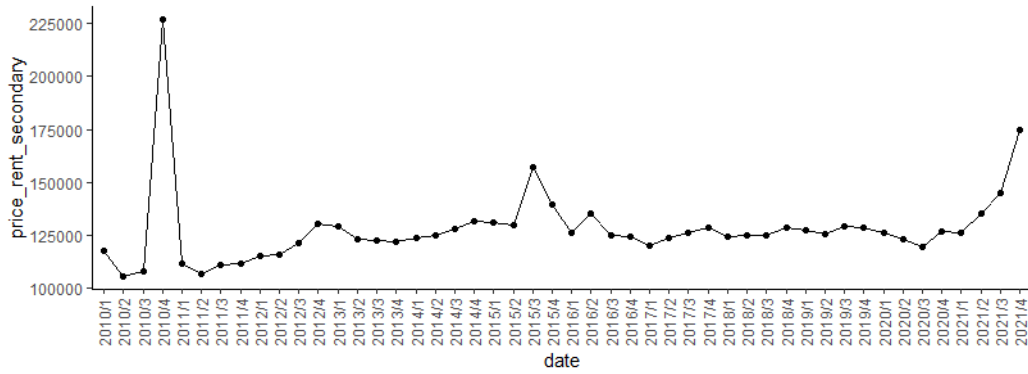


Figure 12. The price for renting new rental buildings (2010-2021).

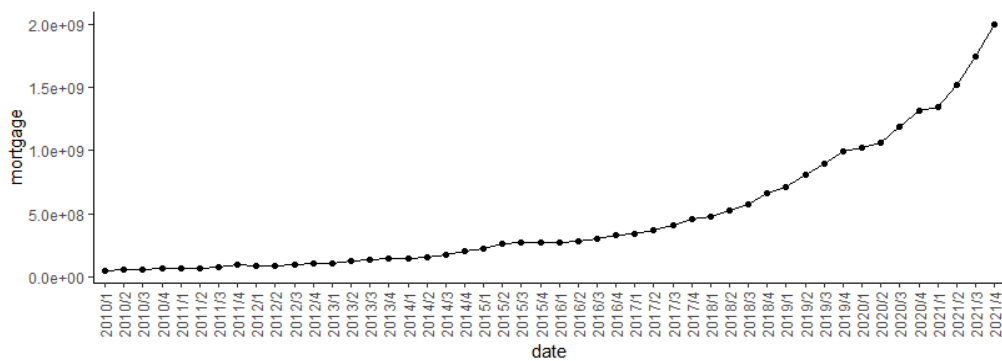


Figure 13. Mortgage indicator (2010-2021).

Based on these tables, we can observe in tables 13 and 14 that housing prices were once filed in 2016, based on this, we can already see the growing money that was blown up. The reasons why this happened are the devaluation of the currency and the decline in the real incomes of the population. An additional factor was the reduction in mortgage lending. And the main reason was the increased price because people raise prices in the future for bidding, and others are ready to wait for the growth and sale of an apartment at the set price. More influence in this situation is exerted by people who are willing to wait because they have an inflated expectation of touching their apartment, which brings down the statistics of secondary housing when the first type is ready to make a discount of 10-20%. Moreover, you can see how the rental rates of secondary, primary housing, and mortgages are growing, this can be justified by the factor that in recent years there has been quite a lot of demand for housing and a decrease in the mortgage rate for apartments, in connection with

which most people began to buy apartments and rent them out looking at them as an asset. Thanks to this, they began to set their prices in the real estate market, knocking down statistics again.

Summing up, we can conclude that there is loot, and it is growing statistically in secondary housing unambiguously.

5. Presentation of the main results and their interpretations

5.1. The econometrics formulation

For econometrics calculation we took the data by m^2 like y and by the x value we took the prices for 1 square meter of secondary house market and new buildings.

In the calculation of regression in R studio and excel we used the:

```
lm1=lm(space~log(price_new)+log(price_secondary)+log(price_rent_new)+log(price_rent_secondary)+log(n_income)+mortgage+year,data=data)
```

```
summary(lm1)
```

Moreover, if we try to calculate that data by the econometrics formula, that will look like:

$$\text{Number of real estate } m^2 = b_0 + b_1 + b_2 + b_3 + b_4 + b_5 + b_6 + b_7 + e$$

b_1 - average price for 1 m^2 new buildings;

b_2 - price for 1 m^2 secondary housing;

b_3 - price of rent (1);

b_4 - price of rent (2);

b_5 - real income;

b_6 - nominal income;

b_7 - mortgage.

Both of those types of calculations had more than 48 observations and 7 variables.

5.2. Regression analysis

Firstly, for regression analyses for more reliable results we used that type of data:

```

year      quarter      space      price_new      price_secondary      price_rent_new
2010     : 4      1:12      Min.   : 138137      Min.   :186262      Min.   :192066      Min.   : 65855
2011     : 4      2:12      1st Qu.: 486018      1st Qu.:265722      1st Qu.:274575      1st Qu.: 89524
2012     : 4      3:12      Median : 918757      Median :302521      Median :331602      Median : 93331
2013     : 4      4:12      Mean   :1005960      Mean   :294129      Mean   :325171      Mean   : 96124
2014     : 4                               3rd Qu.:1367239      3rd Qu.:327635      3rd Qu.:364811      3rd Qu.: 98254
2015     : 4                               Max.   :2695804      Max.   :416087      Max.   :483895      Max.   :203747
(Other):24
price_rent_secondary      r_income      n_income      mortgage
Min.   :105773      Min.   : 59884      Min.   : 65643      Min.   :4.772e+07
1st Qu.:121782      1st Qu.: 91445      1st Qu.:141842      1st Qu.:1.093e+08
Median :125638      Median :129069      Median :174426      Median :2.760e+08
Mean   :128163      Mean   :126253      Mean   :181431      Mean   :4.739e+08
3rd Qu.:129226      3rd Qu.:155032      3rd Qu.:223188      3rd Qu.:6.735e+08
Max.   :226982      Max.   :195774      Max.   :307633      Max.   :1.999e+09

```

space - price for 1 m² of new buildings/ secondary houses;

price new - the price of the new flat;

price secondary - the price of a secondary market flat;

price rent new - the price of rent of one-room flat (new flat which goes to exploitation);

price rent secondary - the price of rent of a two-room flat;

r_income - real income;

n_income - nominal income;

mortgage - mortgage.

Secondly, through that data, we identify that:

```

Call:
lm(formula = space ~ log(price_new) + log(price_secondary) +
    log(price_rent_new) + log(price_rent_secondary) + log(n_income) +
    mortgage + year, data = data)

Residuals:
    Min       1Q   Median       3Q      Max
-494774 -107784    8870  129630  390848

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  -1.152e+08  1.528e+07  -7.541 2.08e-08 ***
log(price_new)    2.578e+06  8.243e+05   3.127  0.00390 **
log(price_secondary) -1.056e+06  1.051e+06  -1.005  0.32314
log(price_rent_new) -1.266e+05  2.938e+05  -0.431  0.66958
log(price_rent_secondary) -1.511e+06  4.623e+05  -3.269  0.00271 **
log(n_income)     1.041e+07  1.441e+06   7.226 4.82e-08 ***
mortgage         3.023e-03  4.554e-04   6.638 2.38e-07 ***
year2011         -6.318e+06  8.712e+05  -7.252 4.50e-08 ***
year2012         -7.030e+06  9.448e+05  -7.440 2.72e-08 ***
year2013         -8.261e+06  1.052e+06  -7.852 9.20e-09 ***
year2014         -9.060e+06  1.185e+06  -7.645 1.58e-08 ***
year2015         -9.667e+06  1.248e+06  -7.743 1.22e-08 ***
year2016         -1.053e+07  1.387e+06  -7.596 1.80e-08 ***
year2017         -1.155e+07  1.478e+06  -7.817 1.01e-08 ***
year2018         -1.285e+07  1.533e+06  -8.379 2.37e-09 ***
year2019         -1.509e+07  1.597e+06  -9.446 1.69e-10 ***
year2020         -1.632e+07  1.678e+06  -9.727 8.68e-11 ***
year2021         -1.944e+07  1.821e+06 -10.676 9.75e-12 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 230700 on 30 degrees of freedom
Multiple R-squared:  0.9196, Adjusted R-squared:  0.874
F-statistic: 20.18 on 17 and 30 DF, p-value: 6.194e-12

```

That regression analysis, R has a fairly high (=92%) value over time, housing prices grew and the fundamental value deviated from its own path. Nevertheless, the correlation between the data performs its function as a dependent variable, we took m^2 which is calculated by calculating the price data and we notice a positive correlation that indicates multicollinearity.

	Price for 1 m ² of new buildings	Price for 1 m ² of secondary housing	Price of rent of one-room flat	Price of rent of two-room flat	Number of real estate in m ²	Real income of population	Nominal income of population	Mortgage
Avg. price for 1 m ² of new buildings	1							
Price for 1 m ² of secondary housing	0.968	1						
Price of rent of one-room flat	-0.028	0.034	1					
Price of rent of two-room flat	0.102	0.103	-0.123	1				
Number of real estate in m ²	0.229	0.244	0.204	0.148	1			
Real income of population	0.883	0.906	0.033	0.729	0.484	1		
Nominal income of population	0.764	0.803	0.189	0.632	0.294	0.880	1	
Mortgage	0.821	0.842	-0.008	0.695	0.485	0.962	0.842	1

Table 5. Correlation matrix (2010-2016).

Multicollinearity is present in the calculations of data on most indicators, especially it is observed in Real income and Nominal income indicators between mortgages, which suggests that most people apply for loans to buy a home. In the period 2010-2016, it was noted that people had more funds for this based on the correlation between real income & price for 1 m², than people based on the correlation of the same real income and Number of real estate bought apartments for rent since from the rental payment data we would see a high this correlation suggests that people have started investing in an asset called housing with an optimistic point of view "it will definitely pay off", but everything comes to the fact that the majority of the population by 2021 has a shortage of real income to pay for housing.

	Avg. price for 1 m ² of new buildings	Price for 1 m ² of secondary housing	Price of rent of one-room flat	Price of rent of two-room flat	Number of real estate in m ²	Real income of population	Nominal income of population	Mortgage
Avg. price for 1 m ² of new buildings	1							
Price for 1 m ² of secondary housing	0.913	1						
Price of rent of one-room flat	-0.035	0.028	1					
Price of rent of two-room flat	0.17	0.137	-0.106	1				
Number of real estate in m ²	0.327	0.246	0.109	0.184	1			
Real income of population	0.789	0.636	-0.035	0.627	0.58	1		
Nominal income of population	0.717	0.537	0.022	0.583	0.518	0.957	1	
Mortgage	0.598	0.359	-0.045	0.582	0.53	0.88	0.91	1

Table 6. Correlation matrix (2010-2021).

Between real income and nominal income, we have a dependent correlation due to that we had multicollinearity. There is also a multipolarity between prices per square meter, and most of all there are correlations between the prices of secondary housing rather than primary, which suggests that this is again multicollinearity in secondary housing relative to

people's earnings, and we see that they are interconnected with mortgages, this is rather an indicator that people take secondary housing under a mortgage for further own profit. But at the same time, there is also a positive correlation between m^2 and mortgages, which suggests that people, in any case, are buying more residential areas into a mortgage than secondary housing and it affects the model. But there is no correlation between primary housing with a mortgage, apparently due to the fact that the population is already used to buying apartments with the necessary furniture and amenities, or they are not used to taking apartments from construction companies.

I would also like to note that there are dependent correlations between mortgage, the price for 1 m^2 , real income, and nominal income. This suggests that, regardless of the earnings of the population, they take a mortgage to buy a home.

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>F-significance</i>
Regression	2	7.78876E+12	3.89438E+12	9.902576975	9.45801E-05
Remains	141	5.5451E+13	3.9327E+11		
Total	143	6.32398E+13			

Table 7. Analysis of variance - 1.

	Coefficients	Standard error	t-statistics	P-value	lower 95%	upper 95%	lower 95,0%	upper 95,0%
Number of real estate in m^2 (Y)	-61 490.378	273 406.676	-0.225	0.822	-601 996.644	479 015.888	-601 996.644	479 015.888
Avg. price for 1 m^2 new buildings (X1)	7.077	2.23	3.174	0.002	2.669	11.485	2.669	11.485
Price for 1 m^2 secondary housing (X2)	-3.119	1.917	-1.627	0.106	-6.908	0.67	-6.908	0.670

Table 8. Analysis of variance - 2.

P value

constanta = 5%

In our case, the variable Y was taken as m^2 . In this regard, we conclude that it is statistically not significant for this variable and for the secondary housing market, which tells us that the price increase was not caused by chance, the exception is the price per square meter of new housing, rather because in this case, it is the influence of foreign markets in connection with material prices.

Based on Fisher's equation (F), we confirmed that our data was not caused by chance, based on the significance of F, we reject the null hypothesis, and hence our equation is statistically significant.

Moreover, an analysis of the residuals between the models was done, was done in order to understand the correlation between the residuals of the given model, for this we used the Durbin Watson formula:

$$d = \frac{\sum_{t=2}^n (\varepsilon_t - \varepsilon_{t-1})^2}{\sum_{t=2}^n \varepsilon_t^2}$$

After determining the residuals, we decided to create a correlation between the indicators of the time series data ε_t and ε_{t-1} .

	ε_t	ε_{t-1}
ε_t	1	
ε_{t-1}	0.626	1

Table 9. Time series data correlation.

Next step is identifying the correlation coefficient between the residuals to determine whether the model is statistically correct.

To do this, we used the Student's formula:

$$T = \frac{r*\sqrt{n-2}}{\sqrt{1-r}}$$

By that data, we identify two types of data:

1. Observed: 12.063
2. Critical: 1.655

$T > t_{cr}$, therefore, the correlation coefficient is significant, and there is the autocorrelation of the residuals of random deviations in the model. Based on the value of the observed and critical, we understand that the observed is greater, respectively, the correlation coefficient and the residuals are not zero. And we conclude that the remnants of the model correlate with each other, that is, there is autocorrelation in the model. That is, there is a statistical relationship between sequences of values of the same series taken with a time shift.

5.3. Checking for heteroscedasticity

Heteroscedasticity (also spelled "heteroskedasticity") refers to a specific type of pattern in the residuals of a model, whereby for some subsets of the residuals the amount of variability is consistently larger than for others. It is also known as a non-constant variance (Tim Bock, 2018).

For this understanding, we will use the White test in order to determine whether there are heterogeneous details in the model that reject the entire course.

$$E_2 = a + b_1x_1 + b_{11}x_{12} + b_2x_2 + b_{22}x_{22} + b_{12}x_1x_2$$

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>F-significance</i>
Regression	5	5.19079E+24	1.03816E+24	3.906331901	0.002418779
Remains	138	3.66753E+25	2.65763E+23		
Total	143	4.1866E+25			

Table 10. Variances by the data of heteroscedasticity.

F=3.906

Significance of F= 0.002418

Based on these data, we assume heteroscedasticity since $5\% > F$ is significantly based on the residuals. We can judge by this test that there are manipulative movements in the market in the direction of increasing apartment prices. Based on this test, this model is statistically significant. Accordingly, this confirms the fact that the real estate market has deviated from the fundamental value.

Conclusion

This research concludes that there are signs of bubble in secondary real estate market, however we have no irrefutable claim that there is a bubble in the primary real estate market, the prices of the real estates are increasing due to rising cost of materials, transportation and difficulty in managing the building sites, so the change of the end product - the real estate is within expectations. Secondary real estate market, however have signs of the bubble, unreasonably high demand that was caused by the increase in the buying power of customers, through early pension withdrawals and highly preferential government programs related with mortgages, even if they had a major effect on primary real estate market, but they encourage the secondary market prices to increase to an unreasonable level, the research also demonstrates that the rent price of 1-room apartments are sometimes higher to the 2-rooms apartments, this was most obvious in 2016, however this trend is observable in other time periods as well. We concluded that the price of the secondary real estate market does alleviate from the previously established reasons.

According to Halyk Research's projections, residential real estate prices in Kazakhstan were predicted to rise by another 3% to 5% in the second half of last year. These forecasts are based on the assumption that the key drivers that drove the highest inflows of capital into the residential real estate market in the first half of the year will continue to do so in the second half of the year, albeit with a more mild impact. A significant element is a drop in the appeal of purchasing real estate following the price increase in the first half of the year. A considerable increase in the price of residential real estate diminishes the availability and appeal of acquiring housing at current prices unless household earnings rise significantly. High prices will increase the demand for new home loans as well as the necessity to withdraw pension funds.

Based on both correlation models (2010-2016) and (2010-2021), we have the fact that previously people could afford more based on the indicators of real income relative to mortgage, previously tenge was stronger as a currency, after a while nominal income rose relative to real income, which suggests that the majority of the population is no longer able to pay for a mortgage from free funds. I would also like to note that rent prices have decreased compared to previous years, which suggests that the market is now oversaturated with rental housing. Since the tenge has fallen relative to the dollar, this has not changed the correlation between the prices for the material, there is an early correlation relative to the prices for one square meter.

Summing up the results of the correlation model, we can conclude that by the end of 2021, people had debts. Nevertheless, at the same time, most people continue to take apartments on mortgages, which is reflected in the real estate market and it can be noted that prices for secondary housing are much higher than for primary. However, they, in turn, must fall.

Based on the data of regression analysis, we conclude that it is the lowering of the rate on lending to people and concessional lending that affects the price increase. In this regard, most people have started to apply for housing loans to increase their own active funds.

During this decade, such programs as "Shanyrak", "Nurly Zher", mortgage lending Otbasy Bank, and women's mortgage "Umai" were launched. In this regard, the secondary market has increased in prices, although logically it should fall over time.

Moreover, based on the data, it was noticed that the real income of the population has fallen, which suggests that most people are no longer able to pay for a mortgage and they have to borrow more funds. It was also noticed that nominal income has fallen, which indicates that the average component of the population has stopped earning more relative to previous years.

To sum up, it was also noticed that the area of the apartment itself, the height of the ceilings, the criminality of the area affects, since the left bank is preferable to the right, and the econometric prices for apartments of primary and secondary housing are growing if we can justify the growth of housing in the primary market due to rising prices for materials, then we cannot justify the growth of prices for secondary housing because of this, we argue that the price increase is not justified and this suggests that prices are moving away from the fundamental value, which already indicates a potential bubble for real estate.

Bibliography

1. Austin Murphy (2008). An Analysis of the Financial Crisis of 2008: Causes and Solutions. Retrieved from
https://www.papers.ssrn.com/sol3/papers.cfm?abstract_id=1295344
2. Barry Bosworth and Aaron Flaaen (2009). America's Financial Crisis: The End of an Era. Retrieved from
<https://www.adb.org/sites/default/files/publication/155997/adbi-wp142.pdf>
3. Benjamin J. Keys, Tomasz Piskorski, Amit Seru & Vincent Yao (2014). Mortgage Rates, Household Balance Sheets, and the Real Economy Retrieved from
<https://www.nber.org/papers/w20561>
4. Capozza D. (1976). The efficiency of speculation in urban land, Environment and Planning A.
5. David C Ling, Chongyu Wang, Tingyu Zhou(2020) A First Look at the Impact of COVID-19 on Commercial Real Estate Prices: Asset-Level Evidence retrieved from
<https://academic.oup.com/raps/article/10/4/669/5902841?login=true>
6. Fuster, Andreas and Goodman, Laurie S. and Lucca, David O. and Madar, Laurel and Molloy, Linsey and Willen, Paul S., The Rising Gap between Primary and Secondary Mortgage Rates (December 1, 2013). Economic Policy Review, Vol. 19, No. 2, 2013, Retrieved from: <https://ssrn.com/abstract=2378439>
7. Halyk Finance (2021). Residential real estate market in the 1st half of 2021. Retrieved from
<https://www.halykfinance.kz/research/rynok-zhiloy-nedvizhimosti-v-1-polugodii-2021-g.html>

8. Halyk Finance (2020). Overview of the real estate market of Kazakhstan. Retrieved from
<https://www.halykfinance.kz/research/obzor-rynka-nedvizhimosti-kazahstana.html>
9. Hwang, S., M. Park, and H. Lee (2009). Korean Real Estate Market Mechanisms and Deregulation of Mortgage Loans: Qualitative Analysis.
10. Joseph Stiglitz (1990). Symposium on Bubbles, Journal of Economic Perspectives. Retrieved from <https://www.pubs.aeaweb.org/doi/pdfplus/10.1257/jep.4.2.13>
11. Kairat Mynbaev (2011). Housing market of Almaty. Retrieved from
https://www.researchgate.net/publication/254444769_Housing_market_of_Almaly
12. Kazrealt (2022). Archive of data on real estate prices of Nur-Sultan. Retrieved from
<https://www.kazrealt.com/Astana/cena/arhiv>
13. Kindleberger Charles. (2008). Bubbles in history, In The New Palgrave Dictionary of Economics. Retrieved from
http://www.dictionaryofeconomics.com/article?id=pde2008_B000212
14. L. Woellert and D. Kopecki (2008). Moody's, S&P Employees Doubted Ratings, E-Mails Say.
15. Malpezzi, S. and S. Wachter (1989). The Role of Speculation in Real Estate Cycles. Retrieved from <http://www.ideas.repec.org/p/wop/pennzl/401.html>
16. National Bank of Kazakhstan (2022). Information about the structure and quality of the loan portfolio. Retrieved from
<https://www.nationalbank.kz/ru/news/svedeniya-ssudnogo-portfelya/rubrics/1712>
17. Nida Iqbal Malik, Subhan Ullah, Kamran Azam, Khan Anwar (2009). The Impact of Recent Global Financial Crisis on the Financial Institutions in the Developing Countries: Global Perspectives. Retrieved from
https://www.researchgate.net/publication/228420258_The_Impact_of_Recent_Global

_Financial_Crisis_on_the_Financial_Institutions_in_the_Developing_Countries_Global_Perspectives

18. Otbasy Bank (2020). Annual report of 2020. Retrieved from https://www.hcsbk.kz/Rus%20version_18-08.pdf
19. Soumi Majumder & Debasish Biswas (2022). COVID-19: impact on quality of work life in real estate sector. Retrieved from <https://link.springer.com/article/10.1007/s11135-021-01136-4>
20. Tim Bock (2018). What is Heteroscedasticity? Retrieved from <https://www.displayr.com/what-is-heteroscedasticity/>