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DOI <https://doi.org/10.26661/2414-0287-2021-2-50-25>**ANALYSIS OF THE MORTGAGE LENDING MARKET OF UKRAINE
FOR THE PRESENCE OF SIGNS OF A PRICE BUBBLE FORMATION****Kozin I.V., Makarenko O.I.***Zaporizhzhia National University**Ukraine, 69600, Zaporizhzhia, Zhukovsky str., 66**ainc00@gmail.com, olenamak@gmail.com*

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Key words:

Ukraine, mortgage lending, real estate, fundamental price, price bubble.

The article is devoted to the study of the mortgage lending market in Ukraine in terms of the presence of signs of price bubble formation. The dynamics of the mortgage lending market in Ukraine is analyzed. Mortgage lending in Ukraine in 2019 increased 2.9 times compared to 2006, that is the demand for mortgage lending among non-financial corporations in Ukraine is growing in contrast to the demand for mortgage lending to households. Thus, until 2008 there was an increase in demand, 7.2 times compared to 2006, and then a gradual decrease. The mortgage market is a complex economic system, which is characterized by cyclical development. An inevitable component of any economic cycle is a crisis, so it is important to be able to identify and prevent processes that accelerate the onset of crisis economic phenomena. Research of the mortgage lending market of Ukraine on the presence of signs of price bubble formation should be carried out in four stages: determination of the fundamental price; comparison of actual and fundamental prices; analysis of the rate of change in real estate prices and the rate of change in mortgage lending; conclusions on the presence of a financial bubble in the mortgage market. It is proposed to determine the fundamental price of real estate, assuming that the current discount rate of the NBU affects the value of real estate in the next period, ie has a lag of one period. As a result of the research, it was concluded that in the market of mortgage lending in Ukraine for the period from 2003 to 2019, the formation of a financial bubble did not occur.

**АНАЛІЗ РИНКУ ІПОТЕЧНОГО КРЕДИТУВАННЯ УКРАЇНИ
НА НАЯВНІСТЬ ОЗНАК ФОРМУВАННЯ ЦІНОВОЇ БУЛЬБАШКИ****Козін І.В., Макаренко О.І.***Запорізький національний університет**Україна, 69600, м. Запоріжжя, вул. Жуковського, 66***Ключові слова:**

динаміка, іпотечне кредитування, нерухомість, фундаментальна ціна, цінова бульбашка.

Стаття присвячена дослідженню ринку іпотечного кредитування в Україні з точки зору наявності ознак формування цінової бульбашки. Проаналізовано динаміку ринку іпотечного кредитування України. Обсяги іпотечного кредитування в Україні у 2019 р. зросли у 2,9 рази у порівнянні з 2006 р., тобто, що попит на іпотечне кредитування серед нефінансових корпорацій в Україні зростає на відміну від попиту на іпотечне кредитування домашніх господарств. Так, до 2008 р. спостерігалось зростання попиту, у 7,2 рази у порівнянні з 2006 р., а потім поступове зменшення. Ринок іпотечного кредитування є складною економічною системою, якій притаманна циклічність розвитку. Невіддільним складником будь-якого економічного циклу є криза, тому важливо вміти визначати та попереджати процеси, які прискорюють настання кризових економічних явищ. Дослідження ринку іпотечного кредитування України щодо наявності ознак формування цінової бульбашки проводити у чотири етапи: визначення фундаментальної ціни; порівняння фактичної та фундаментальної цін; аналіз темпів зміни цін нерухомості та темпів зміни обсягів іпотечного кредитування; висновки щодо наявності фінансової бульбашки на ринку іпотечного кредитування. Фундаментальну ціну на нерухомість запропоновано визначати, з припущення, що поточна облікова ставка НБУ впливає на вартість нерухомості у наступному періоді, тобто має лаг один період. У результаті проведених досліджень дійшли висновку, що на ринку іпотечного кредитування України за період з 2003 р. по 2019 р. формування фінансової бульбашки не відбувалося.

Statement of the problem

The relevance of consumer lending is growing every year, due to the desire of individuals to increase living standards, because it is a bank consumer loan provides consumer needs with the necessary financial resources. Mortgage lending is a type of consumer lending. The situation on the mortgage lending market in Ukraine is changing with the reduction of the NBU discount rate, because mortgage loans are becoming more affordable for the population, and the demand for them is growing. Thus, according to the National Bank of Ukraine [1], the volume of mortgage lending to non-financial corporations in Ukraine is increasing, if at the end of 2006 mortgage loans in the national currency amounted to UAH 10,507 million, then at the end of 2019. the amount of issued mortgage loans amounted to UAH 152,323 million, ie it increased 14.5 times. If we consider the same dynamics in terms of the dollar equivalent, the volume of mortgage lending in Ukraine at the end of 2006 amounted to 1910.4 million dollars. US dollars, and at the end of 2019 5440.1 million dollars. US, which is 2.9 times more than in 2006. Thus, we can conclude that the demand for mortgage lending among non-financial corporations in Ukraine is growing in contrast to the demand for mortgage lending to households. Thus, until 2008 there was an increase in demand, 7.2 times compared to 2006, and then a gradual decrease.

Thus, the mortgage market is a complex economic system, which is characterized by cyclical development. An inevitable component of any economic cycle is a crisis, so it is important to be able to identify and prevent processes that accelerate the onset of crisis economic phenomena. One of the factors that signals the existence of crisis economic processes is the emergence of "bubbles". "Bubble" in the scientific literature has the following names: economic, market, financial, price, speculative, exchange and others. In domestic and foreign scientific literature, these definitions are often identified and used as synonyms. An economic bubble or price bubble in the general sense is a trade in assets, in large amounts, at a price that is significantly different from the fundamental (fair) price of assets [2]. The fundamental (fair) price of an asset is the price that reflects the available information about the asset and its properties [3]. But market participants do not have information on such a price, in most cases. The fundamental price is not probabilistic and is objective in nature, unlike the market price. The market price of an asset may be higher or lower than the fundamental price, because due to the asymmetry (limitation) of information, the market may overestimate or underestimate its price.

The phenomenon of bubbles in financial markets has been an important topic of economic research in recent decades. Interest in this phenomenon became even greater when the financial bubbles that burst in the summer of 2008 triggered the mechanism of the global financial crisis. Researchers have focused on why bubbles appear in the economy, how they can be identified, what signs or indicators can be used to determine the presence of the process of formation and development of bubbles, how bubbles are associated with the financial crisis, and others.

Like any process, the price bubble goes through certain stages of development. The American economist H. Minsky identified five stages of bubble development: substitution, boom, euphoria, profit, panic [4]. The financial bubble is the result of a set of factors that, together with time, lead to a significant increase in prices for goods or assets. There is no reason to believe that the appearance of the bubble was due to a specific reason. It is always a set of factors, but scientists believe that there are factors that activate the accumulated over time, but unrealized potential.

As JM Keynes wrote: "During a boom, the overall assessment of the degree of risk on the part of both the debtor and the creditor, as a rule, becomes extremely and unreasonably low" [5]. As a result, market participants are actively moving to external financing of investments. As a result, most participants are able to repay interest on debts from their cash receipts, but not the debt itself, and then they are forced to take out new loans to avoid bankruptcy.

H. Minsky called this situation speculative financing [6]. If the situation begins to deteriorate (rising interest rates, falling cash flows, etc.), there is a "Ponzi scheme", the participant cannot pay even interest on the loan. There is only one way out of this situation by increasing the amount of debt to repay old loans. And if the boom phase is characterized by speculative financing, the recession phase is the Ponzi scheme. This is due to the fact that over time, participants will either not be able to obtain new loans, or because of the general lack of financial resources in the economy, or because of too high a risk for the lender. If participants try to sell their assets, it will lead to an overall reduction in price and demand for them and a reduction in investment, which in turn will lead to an economic crisis.

From the above we can conclude that: first, financial crises can be caused not only by adverse changes in the expectations of economic agents, but also the inability of most market participants to repay their debt, and secondly, this hypothesis is called not just "hypothesis of financial fragility", is a characteristic of the fact that during the business cycle the financial system becomes increasingly fragile [7].

Analysis of latest research and publications

The main methods of detecting bubbles study this phenomenon through the prism of a single science. Most research belongs to economists. Among the latest works are the studies of R. Schiller, P. Krugman, J. Stiglitz, D. Sornette, H. Minsky and many others. Psychologists and sociologists have addressed the issue of financial bubbles, including the works of C. McKay, G. Tard, B. Baruch, M. Clark, J. Cato, S. Moskovichi and others.

Peculiarities of economic development in the event of crises, the impact of crisis phenomena on the emergence and formation of price bubbles in the financial and real sectors have been studied by many foreign and domestic scientists, such as D. Sornette, O. Baranovsky, S. Thor, G. Fetisov, O. Shapovalov and others. Scientists, studying the stages of birth and flaking of the bubble, identify the factors that cause the creation and inflation of speculative mechanisms: the rapid growth of asset values; growth of business and economic activity; stable growth of money and credit supply; herd, irrational behavior of individual

market participants; imperfect regulation of the market and market relations; financial liberalization; dissemination of financial innovations; lack of information about the object, etc. [8; 9; 10].

According to J. Stiglitz [11], an important problem in the formation of bubbles is to determine the “fundamental” value of assets. If asset prices do not reflect the fundamentals well, and if these deviated asset prices have a significant impact on resource allocation, economists' confidence in the efficient allocation of investment resources in the market is at least weakened. According to J. Stiglitz, the problem of determining the basic value of an asset that will be held for an extended period of time consists of three parts: first, the problem of estimating the profit received over time (rent for land, dividends on stock); second, the problem of estimating the final value that the asset will have at the end of the period; and third, the problem of deciding on the discount rates that will be used to translate future profits into current values. If investors' expectations change in such a way that they believe that in the future they will be able to sell the asset at a higher price than expected, then the current price of the asset will increase. J. Stiglitz notes that if the reason the price of an asset is high today is simply that investors believe that the sale price of the asset will be high tomorrow when “fundamental” factors do not “justify” such a price, then the bubble already exists.

Many scientists are working to develop effective methods for predicting, identifying, measuring bubbles. Sharing the point of view on the need for an interdisciplinary approach, we can note the controversial idea of the possibility of creating a single theory of financial bubbles, because the process of formation and development of bubbles has a synergistic effect on many economic, social, psychological factors.

The scientific discussion on the interpretation of the sources of bubbles becomes especially acute. Some economists link the existence of economic bubbles with inflation [12; 13], others believe that there is a certain fundamental value of each asset, which is why bubbles are nothing more than an increase in this value [2].

The researchers looked at the development of bubbles, the relationship between the process of bubbles and the onset of crises in the economy, methods of identifying bubbles. Despite the significant number of scientific developments, the issue of identification of bubbles remains relevant. The urgency of this issue is due to the fact that the economic environment is constantly changing, there are other factors that trigger the process of bubble formation, the need to take into account many components requires the use of various mathematical methods and approaches.

Goals formulation

The purpose of the article is to analyze the presence of signs of a price bubble in the mortgage lending market of Ukraine, provided the formation of a rational bubble.

Presentation of the main research material

Before examining the mortgage lending market in Ukraine for signs of financial bubble formation, we provide a brief overview of the origin and formation of the 2007 mortgage bubble in the United States.

A characteristic feature of the US mortgage bubble is the emergence of “cheap money” due to lower interest rates and easier access to credit for borrowers who previously could not get a loan (for example, the unemployed, low-income borrowers and bad credit history). In the United States, separate special purpose subsidiaries were created, on the balance of which the mortgaged property was transferred, the idea was to redistribute risks, but in fact, the risks only accumulated. By issuing mortgage bonds, subsidiaries sold them and received money for long-term loans. The buyers of the bonds were investment funds or state mortgage companies. The growing demand for housing has led to the fact that many private companies have entered the mortgage market. The availability of mortgages, rising house prices in the United States by almost 20% annually, have made the mortgage market attractive to Americans. Banking competition intensified, as a result of which the amount of the down payment decreased and the term of the loan increased. Which led to the fact that Americans began to take even more loans. However, when housing prices stopped, many borrowers stopped repaying loans and went bankrupt. Thus, the insufficient assessment of American banks' own risks of consumer lending led to the emergence of the global financial crisis.

The mortgage crisis in the United States has affected the development of mortgage markets around the world, there is a problem of borrowing in international markets. Western banks have begun curtailing lending programs for developing countries.

As to Ukraine, due to the poorly developed mortgage lending at that time, the mortgage crisis did not have a strong impact on the Ukrainian mortgage market. According to analytical studies of the Ukrainian National Mortgage Association [14], less than 2% of Ukrainians buy real estate on credit. In 2007, mortgage lending to non-financial corporations and households accounted for less than 17% of GDP, while in the United States and the United Kingdom this figure exceeds 70% [15]. The dynamics of mortgage lending to non-financial corporations and households as a percentage of GDP [16] for the period from 2006 to 2019 is presented in Fig. 1.

As we can see, in 2008 the volume of mortgage lending to non-financial corporations and households in Ukraine was the highest from 2006 to 2019 and amounted to 22.5% of GDP. Then there is a steady decline in this indicator. However, this situation is explained by the fact that since 2009 GDP in actual prices has grown from 5% to 20% annually, and the volume of mortgage lending to non-financial corporations and households has not changed from year to year and remains at an average of 180 million UAH. Thus, the volume of mortgage lending in Ukraine compared to countries with developed mortgage lending markets is not so large.

The financial bubble in the mortgage lending market will be considered a rapid rise in real estate prices, due to high demand and the availability of mortgage loans. Deviations from the basic price by more than 15% will be considered a rapid increase in real estate prices.

The study of the mortgage lending market of Ukraine on the presence of signs of financial bubble formation will be conducted in four stages (Fig. 2).

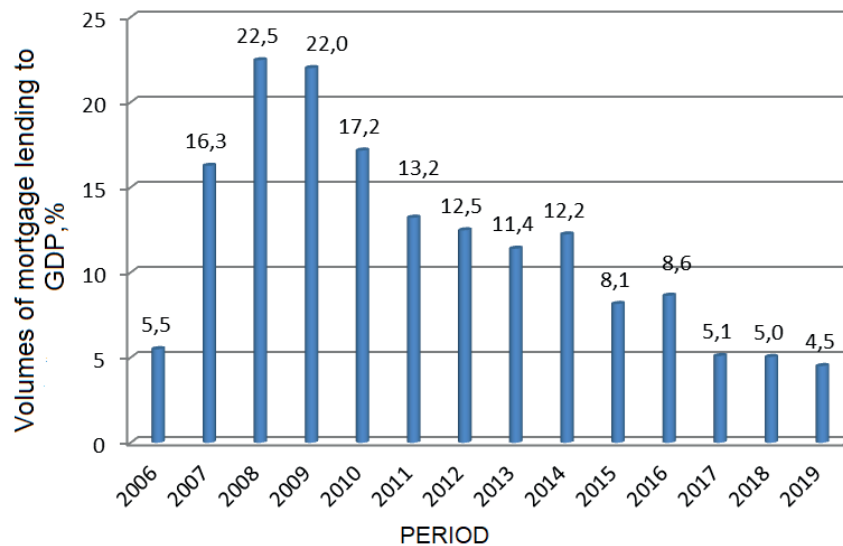


Figure 1 – Dynamics of mortgage lending to non-financial corporations and households in Ukraine as a percentage of GDP (2006–2019)

Source: calculated on the basis of [1; 16].

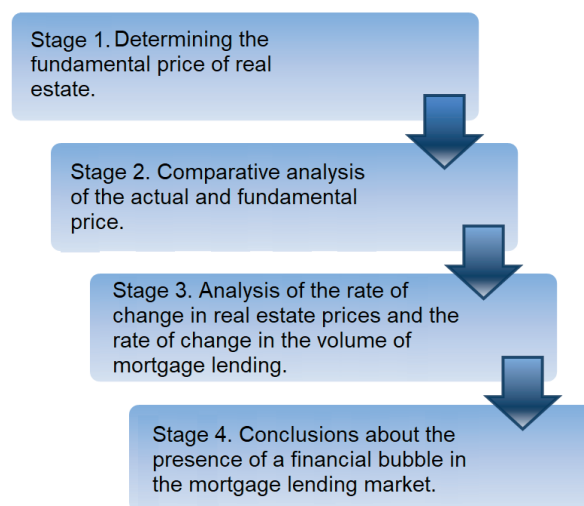


Figure 2 – Stages of research of the mortgage lending market of Ukraine for the presence of signs of financial bubble formation

At the first stage of the study of the mortgage lending market of Ukraine on the presence of signs of financial bubble formation, we determine the fundamental price of real estate, considering the simplest case that the rational bubble changes deterministically over time.

It is proposed to determine the fundamental price of real estate, assuming that the current discount rate of the NBU affects the value of real estate in the next period, ie has a lag of one period. Given this assumption, the fundamental price is determined by the equation:

$$p_{t+1}^* = (1 + d_t) \cdot p_t^*, \tag{1}$$

where p_t^* – fundamental price of real estate in time period t ; p_{t+1}^* – fundamental price of real estate in time period $t+1$; d_t – NBU discount rate in time period t .

We will assume that the first value of the fundamental price p_1^* is equal to the first actual value of the price.

Since the official statistics on the value of real estate in Ukraine began to be collected in 2015, and such statistics are provided by real estate companies or consulting companies, the study used information from the real estate market of Kyiv and statistics from the consulting company SV Development [17]. The company has been operating in the real estate market since 2003 and provides real estate appraisal and sales services, conducts marketing research and real estate market analysis. The company's specialists develop and draw up business plans for investment projects, etc.

To study the mortgage lending market, it was assumed that the real estate market in Kyiv reflects the general trends in the real estate market of Ukraine. The input data for estimating the fundamental price of real estate and calculated for (1) the value of the fundamental price are presented in table 1.

Table 1 – Input data for estimating the fundamental price of real estate and calculated values of the fundamental price (Kyiv)

| Period | Average price per 1 sq.m, USD [18] | NBU discount rate, % [19] | Fundamental price per 1 sq.m., USD |
|------------|------------------------------------|---------------------------|------------------------------------|
| 01.01.2003 | 568 | 7 | 568,00 |
| 01.01.2004 | 969 | 7,5 | 607,76 |
| 01.01.2005 | 1800 | 9,5 | 653,34 |
| 01.01.2006 | 1804 | 9,5 | 715,41 |
| 01.01.2007 | 3281 | 8 | 783,37 |
| 01.01.2008 | 2594 | 12 | 846,04 |
| 01.01.2009 | 1535 | 10,25 | 947,57 |
| 01.01.2010 | 1810 | 9,5 | 1044,69 |
| 01.01.2011 | 1828 | 7,75 | 1143,94 |
| 01.01.2012 | 1857 | 7,5 | 1232,60 |
| 01.01.2013 | 1967 | 7 | 1325,04 |
| 01.01.2014 | 1208 | 14 | 1417,79 |
| 01.01.2015 | 1180 | 22 | 1616,28 |
| 01.01.2016 | 1169 | 18 | 1971,87 |
| 01.01.2017 | 1091 | 13,5 | 2326,80 |
| 01.01.2018 | 1030 | 17,5 | 2640,92 |
| 01.01.2019 | 1061 | 6 | 3103,08 |

Here is an example of calculating the basic price by formula (1). The first value of the fundamental price p_1^* is equal to the first actual value of the price, that is $p_1^* = 568$. The second value of the fundamental price is determined as follows: $p_2^* = (1 + 0,07) \cdot 568 = 607,76$. The third value of the fundamental price is determined as follows: $p_3^* = (1 + 0,075) \cdot 607,76 = 653,34$. The following values are defined in a similar way.

In fig. 3 presents the dynamics of the average and fundamental price per 1 sq.m., USD.

In the second stage of the study of the mortgage lending market of Ukraine on the presence of signs of financial bubble formation, we compare the average and fundamental price.

As you can see, the fundamental price, calculated taking into account changes in the discount rate of the NBU is gradually increasing, and the trend of changes in the average real estate price is quite different. That is, it increases until 2007, decreases in the crisis year of 2008, this trend continues in 2009. In the period from 2010 to 2013 there is an increase in real estate prices by 30% compared to 2009. The period from 2014 by 2019 is characterized by a decrease in the average real estate price compared to 2013 by almost 50% from 1967 USD per 1 sq. m. in 2013 to 1061 USD per 1 sq m in 2019.

At the third stage of the study of the mortgage lending market of Ukraine on the presence of signs of financial bubble formation, we will analyze the rate of change in

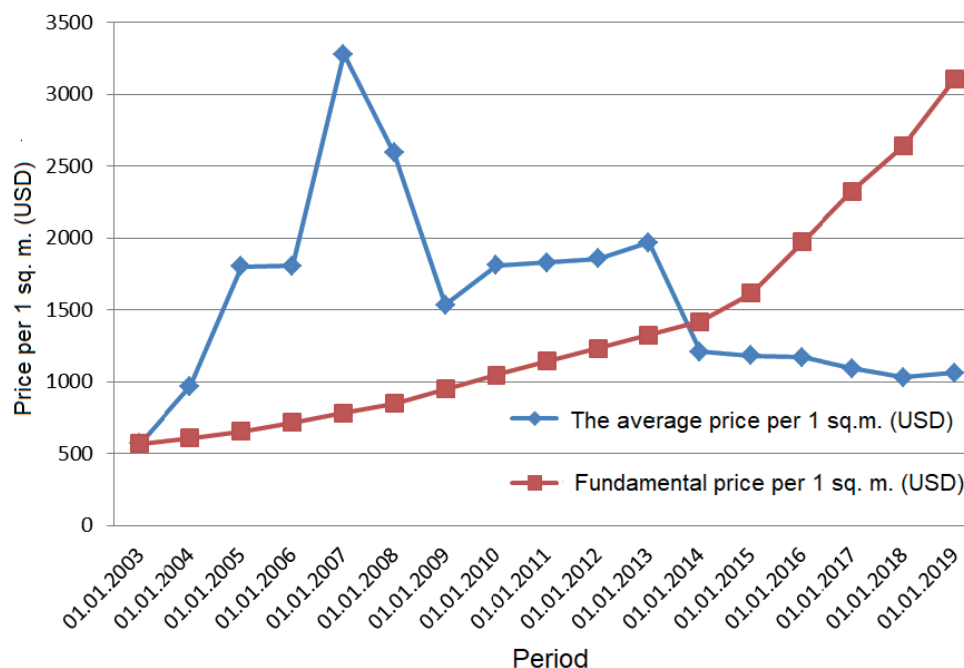


Figure 3 – Average and fundamental price for 1 sq. m. (USD), Kyiv, 2003–2019

prices and the rate of change in the volume of mortgage lending. The problem of comparing the rate of change of these indicators is that the NBU provides information on the volume of mortgage lending since 2006, until this period the information was provided by the volume of consumer lending. Thus, the comparison of the rate of change can be carried out only in 2007. The calculated rate of change in the average real estate price per 1 sq.m. (USD) and the rate of change in mortgage lending to non-financial corporations and households for the period from 2007 to 2019 are presented in Fig. 4.

As we can see, the rate of change in the average real estate price per 1 sq.m. (USD) and the rate of change in mortgage lending to non-financial corporations and households have similar trends. However, the events of 2008 and 2014 affected the mortgage market differently. Thus, the reduction in mortgage lending in 2010 by 11% compared to 2009 was accompanied by an increase in real estate prices by 18%. A similar situation was observed in the period from 2014 to 2015. The opposite situation was observed in the period from 2013 to 2014, ie an increase in mortgage lending by 16% in 2014 compared to 2013 was accompanied by a decrease in property prices in 2014 by almost 39% compared to 2013.

At the fourth stage of the study of Ukraine, we will try to draw a conclusion about the presence of signs of price bubble formation.

Signs of the formation of a price bubble in the mortgage lending market, we will consider:

- exponentially increasing deviation of real estate prices from basic values;
- the growth of real estate prices due to the growth of mortgage lending volume;

– increase in demand for real estate due to the growth of mortgage lending volume.

Thus, the analysis of the average and fundamental price for 1 sq.m. allowed us to conclude that in the period from 2003 to 2008 there was an exponentially increasing deviation of real estate prices from fundamental values. This period is characterized by the formation of the mortgage lending market and rather strict conditions for mortgage lending. However, after 2008, the opposite trend was observed: a sharp decline in the average price and a gradual increase in the fundamental price. Therefore, this assumption in the time interval from 2003 to 2019 is not fulfilled. Therefore, we conclude that the increase in real estate prices is not due to an increase in mortgage lending.

Another sign of the formation of a price bubble in the mortgage market is the growth of demand for real estate due to the growth of mortgage lending. A correlation coefficient was calculated to analyze the relationship between demand and mortgage lending. Demand for real estate was estimated by the indicator “Number of transactions of purchase and sale of apartments and individual houses in Ukraine, pcs.”. The correlation coefficient between the number of purchase and sale agreements of apartments and individual houses in Ukraine and the volume of mortgage lending to non-financial corporations and households is equal to 0.43. Which indicates a weak feedback, ie an increase in lending leads to a reduction in the number of transactions. In our opinion, such a conclusion is not economically justified, because world practice shows that “credit money” contributes to sales growth. Therefore, we believe that the volume of mortgage lending in Ukraine does not affect the number of transactions of purchase and sale of apartments and individual houses.

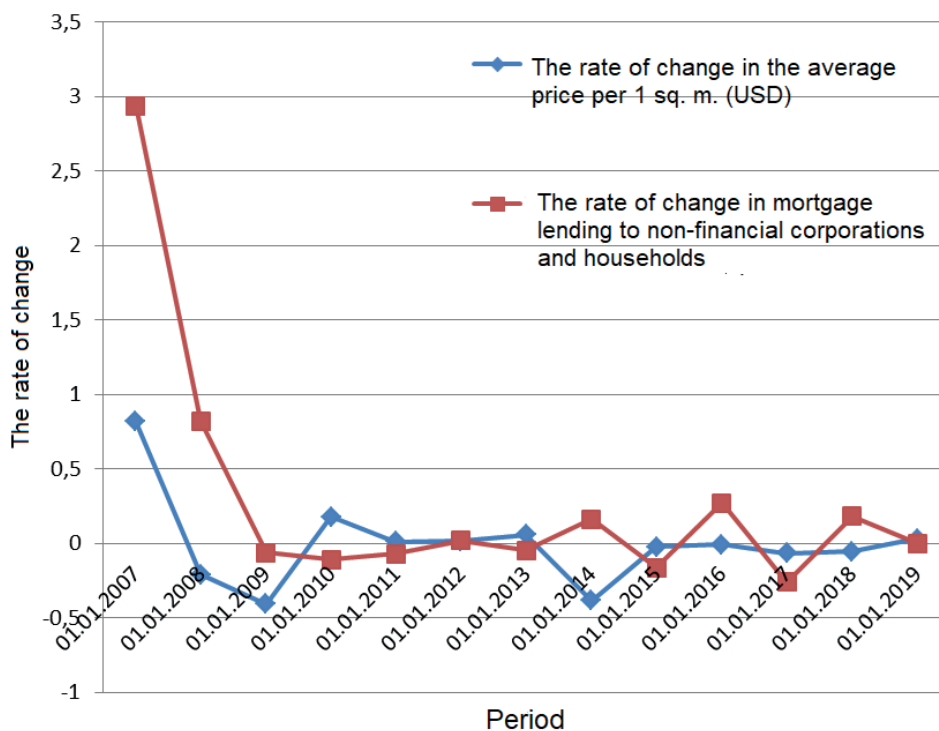


Figure 4 – The rate of change in the average real estate price per 1 sq. m. (USD) and the rate of change in mortgage lending to non-financial corporations and households, 2007–2019

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