

**Publisher**<http://jssidoi.org/esc/home>**THE COVID-19 PANDEMIC AND THE REAL ESTATE MARKET IN THE CZECH REPUBLIC****Tomáš Krulický¹, Tereza Proboštová², Iva Lorencová³**^{1,2,3} *Institute of Technology and Business in České Budějovice, School of Expertness and Valuation, Okružní 517/10, 370 01 České Budějovice, Czech Republic**E-mails: ¹krulicky@znalcivste.cz ; ²33101@mail.vstecb.cz ; ³lorencova@mail.vstecb.cz**Received 15 December 2023; accepted 20 April 2024; published 30 June 2024*

Abstract. This paper aims to identify the critical factors that influence price changes in the real estate market before, during, and after the outbreak of the COVID-19 pandemic for the period 2016-2022. The first part of the contribution deals with the literature search that examines the issue in different parts of the world. Furthermore, methods of solving the problem were chosen. Time series and correlation analysis methods were chosen for this work. The data used was selected from the areas of developments in real housing price indices, developments in real property prices, from the real index, the index of the growth rate of completed apartments in Prague, real estate price indices for territorial comparison, residential construction of family and apartment buildings, construction production, unemployment rate, rate inflation, GDP development, interest rate, and construction index. The results showed that the correlation coefficient between inflation and the price of real estate in the years 2019-2022 was around 0.8. Furthermore, the correlation coefficient between GDP and the price of sold apartments in the same period was 0.63. The relationship between GDP and construction production also plays a significant role, where the correlation coefficient was 0.69. The correlation coefficient between construction output and the interest rate was 0.4. If you can focus on the real estate market as it grew, so did the asking prices. In the first quarter before the outbreak of the COVID-19 pandemic, the average selling price was around CZK 57,900 per m². At the end of the last quarter of 2022, prices reached an average of CZK 93,300 per m².

Keywords: Covid 19; real estate; prices; market analysis

Reference to this paper should be made as follows: Krulický, T., Proboštová, T., Lorencová, I. 2024. The COVID-19 pandemic and the real estate market in the Czech Republic. *Entrepreneurship and Sustainability Issues*, 11(4), 154-171. [http://doi.org/10.9770/jesi.2024.11.4\(10\)](http://doi.org/10.9770/jesi.2024.11.4(10))

JEL Classifications: R31, R21, R23**1. Introduction**

Real estate markets have grown rapidly in recent years. Not only the sale prices but also the rental of real estate have increased. The global impact on the real estate market was the pandemic situation of COVID-19, which reflects the market both in the short term and in the long term (Wachter & Acolin, 2022; Tkacova & Gavurova, 2023). One of the effects of the pandemic was an increase in demand for housing associated first with pandemic public health measures such as social distancing and quarantine, then the adoption of working from home (Althoff et al., 2022; Navickas et al., 2022). A lasting effect of the pandemic situation may be some expansion of telecommuting that will persist even after the pandemic situation ends (Bailey et al., 2018; Grondys et al., 2021; Bloom et al., 2021; Davis et al., 2021; Gamber et al., 2023). Why did pandemic situations cause real estate prices to rise rapidly? A dramatic swing in uncertainty about health, macroeconomics (Gavurova et al. 2020, 2023; Kramarova et al., 2022; Valaskova et al., 2023), and social circumstances could predict a sharp decline in the housing markets (Brueckner & Sayantani, 2023). However, house prices rose by 10% in real terms

in 2020 and 15% the following year. The demand for housing was affected by several factors that were related to the pandemic (Kmetz et al., 2022). While unemployment rose, mortgage interest rates fell (Goodman & Zhu, 2023; Belas et al. 2022). During the pandemic, demand for urban housing shifted away from urban centres and toward lower-density suburban areas (Gupta et al., 2022; Gavurova et al., 2022; Ramani & Bloom, 2021).

House prices and rents grew faster outside city centres (Gupta et al., 2022). From a long-term view of real estate prices in the Czech Republic, it can be seen that prices are constantly rising (*The Real Estate Market in the Czech Republic Is Reviving*, n.d.). In the years 1998–2019, according to data from the Czech Statistical Office, apartment prices rose an average of 4.25 times. During this period, the market experienced three significant peaks. Growth peaks were always interrupted by certain negative events. The first negative event that affected the whole world was in 2008, a financial crisis that was also reflected in the mortgage market crisis (*CBA Hypomonitor*, n.d.). By the end of 2009, according to available statistics from the Czech Statistical Office, apartment prices fell by 18.1%, and family house prices fell by 4.6%. This crisis lasted for approximately three years. Before the outbreak of the COVID-19 pandemic in the Czech Republic, the average purchase price of an apartment per square meter reached approximately 39 thousand crowns, and the purchase price of family houses exceeded 34 thousand crowns per square meter (Štěpánek, 2023). Two years later, the price of apartments per square meter rose to 54,000 Czech crowns, and the prices of family houses rose to 43,000 crowns per square meter (*Market News | Transaction Price Map*, n.d.).

This dynamic volume of real estate is behind even a far more developed country than the Czech Republic. In the Czech Republic, the overvaluation reached around 15-20% at the beginning of 2022 (*The Real Estate Market in the Czech Republic Is Reviving*, n.d.). This work aims to analyze the real estate market before the outbreak of the COVID-19 pandemic, mainly in the Czech Republic, during the pandemic, and subsequently after it. What are the most important factors driving price changes in the real estate market, pre-pandemic 2016-2020, pandemic 2022, and post-pandemic? What properties were prevalent during this time, and what will be prevalent now? The mortgage market is also connected to the real estate market and how the mortgage market developed during this difficult time. When will it be appropriate to get a mortgage for your own home? How the price of apartments, family houses, and residential buildings has developed since 2016. This article will be beneficial for those interested in the real estate field, mainly for developers, new builders, investors, and interested parties who are thinking about the future purchase of real estate.

The following research questions are set about the objective:

RQ1: Which factors had the most fundamental influence on the real estate market in the Czech Republic during the pandemic situation that affected the whole world in 2019?

RQ2: What can be expected in terms of real estate prices after the end of the pandemic in the real estate market in the Czech Republic?

2. Literature Review

The literature review deals with the most fundamental factors influencing the real estate market. The most important factors include interest rates on mortgage loans, the performance of the economy, gross domestic product, unemployment, developments in the construction industry, inflation, and many other factors. Attention is also paid to the methods of solving the investigated problem within the current research framework. The research looks at these factors from the perspectives of different countries, whether the American or Chinese markets. In these countries, we focus on what they researched in that country, what methods they used, and what conclusions they reached.

2.1 Perspectives on real estate markets in other countries

Here, the countries where they researched the real estate market, what methods they used, and what results they came to will be discussed.

2.1.1 Chinese market

China's real estate market has expanded and developed rapidly since the 1990s. This market has become a fundamental pillar of the Chinese economy (Liu, 2022). Pirogova and Temnova (2021) studied the driving force of the coordinated growth of the real estate market under the conditions of digitization. Another experiment, where the main goal was to investigate the impact of cross-border labour mobility on real estate price trends, was conducted (Dumeignil, 2022). Compared to other more developed countries such as Europe or the United States, China's real estate market started relatively late, and its development was not perfect, and real estate prices show obvious volatility (X. Li & Zhang, 2021).

China's real estate market has also been affected by the COVID-19 pandemic situation (Li et al., 2018). In his article, Liu (2022) tries to analyze the real estate market in China using statistical data of the real estate market, and at the same time, the author analyzes the factors affecting the price of real estate (Liu, 2022). It introduces the so-called multiple linear regression model, then uses the method of least squares to solve the model's unknown parameters, and finally constructs a model to predict house prices and the real estate market analysis.

The result of this study, which Liu (2022) dealt with, summarizes the factors affecting the price of real estate, using a method that includes four main factors, namely: the amount monthly income of residents, the disposable income of residents, the expenditure of residents on housing, and the completed area of real estate. The results showed that there was a positive correlation between the level of monthly income of residents and the price of real estate, and there was also a positive correlation between disposable income and the price of real estate. A negative correlation arose between the finished area and the price of the real estate field (Liu, 2022).

2.1.2 American market

Due to the pandemic situation in the United States of America, large companies require their employees to work remotely from home (Aladangady, 2017). This shift has impacted commercial space markets, where companies have begun to question the need to own large commercial spaces (Bayer et al., 2021). This trend of people working remotely from home impacts investors in real estate markets (Beltratti & Morana, 2010; Black et al., 2006).

In his work, Chong uses stock market data to estimate the loss of commercial real estate values caused by the COVID-19 pandemic using a simple method. His work analyses traded REITs, which provide statistical estimates of the decline in commercial real estate values in the United States of America. It also uses commercial stock valuation models that use key economic factors to value stocks, evaluating the economic impact on commercial real estate values. In his work, Chong found that real estate markets likely would have seen a significantly larger decline if not for the extreme monetary and fiscal policies implemented during the early months of the pandemic.

2.1.3 Indian market

The pandemic, which brought the whole world to a standstill, unsettled various sectors of the economy and the real estate market. Due to a shortage of construction materials and labour in India, sales and purchases of industrial and residential properties have been affected. Furthermore, Indian real estate was dealing with the demonetization in November 2016 and other changes that were affected by this pandemic, whether it was construction development or real estate transactions.

In his work, Sanchaniya, (2021) discusses the pre-pandemic real estate market and the impact of COVID-19 on the real estate market and discusses the risks and prospects facing various participants in the real estate market, whether they are mortgage holders, builders, or the real estate workforce. JLL (2020) reports the global implications of COVID-19 in real estate. Furthermore, according to FICCI, (2020), 2019 was a challenging year for the real estate market, which, even as a result of the pandemic situation, is facing a lack of financing in this

sector. Another research that dealt with the invention of the risk factor of COVID-19 was used to assess companies' susceptibility.

An article written by Gujral, (2020) commercial real estate should be able to respond to the coronavirus. Some studies (Tanrıvermiş, 2020; Uchegara et al., 2020) share the same opinion about the impact of the coronavirus on the Indian real estate market. This pandemic has had a disproportionate impact on Indian real estate. In the first months, the epidemic suspended construction and significantly reduced the interest of potential buyers in real estate. In his work, (Sanchaniya, 2021) concluded that the market value of real estate increased during the Covid-19 era. Home values fell as the supply of housing fell, reducing government revenue. Furthermore, due to the decrease in demand and the increase in bargaining power in the market with a short supply, locations with a lower growth rate began to be sought.

2.1.4 Vietnamese market

In recent years, Vietnam's economy has become the region's most dynamic economy. Along with the country's development, it played a big role in the construction and real estate industry, representing 6% of the GDP (Minh et al., 2021). As a result of the prolonged pandemic situation, investors have not invested in real estate markets. Thus, there was a sharp drop in demand in the housing market. Most countries believe that the real estate market can significantly support the positive impact on the economy. The author HA (2021) deals with the factors affecting the price of real estate during a pandemic situation; the author uses the following methods: correlation matrix analysis and regression model. The results of the research show that the area of the house, the number of beds, and the location of the plot have a positive effect on the price of the property. The distance of the plot from the centre of the district harms the price of real estate, which means that the further the plot is from the centre, the lower its price.

2.1.5 European market

In this section, attention will be focused on the following countries: Slovenia, Greece, France, Poland, and Norway. In his work, Grum and Govekar (2016) deal with factors influencing the price of real estate. He uses a multiple linear regression model for his work, where the author finds out with the help of monitored macroeconomic indicators: the unemployment rate, the current account of the country's stock index, gross domestic product, and industrial production. Furthermore, Grum & Govekar (2016) came to the following conclusions in his work: there are statistically significant correlations between residential real estate prices and some macroeconomic indicators. In these countries, France, Greece, Norway, and Poland, it has been proven that the price of real estate is statistically significantly related to unemployment. Regarding Slovenia, a mutual statistical relationship can be shown between the stock index and the price of real estate. The linear regression model in this study says that the higher the unemployment rate, the lower the price for residential property. The greatest impact on unemployment was recorded in Poland, while Greece had the smallest impact.

From the scientific questions asked, this problem can be solved using the following methods:

- a) Analysis of the development of time series according to the static office,
- b) Analysis of the development of the hedonic price index,
- c) Correlation analysis,
- d) Econometric analysis,
- e) Panel regression analysis.

According to the considered methods, two methods were chosen, namely the time series method and correlation analysis.

3. Methodological Approach

A procedure was chosen to process this work, which consisted of using professional resources, time series analysis, comparison, analysis, and synthesis.

Expert sources were used from professional scientific articles, statistics, empirical formulas, and secondary data of experts. The primary purpose of this method was to obtain an overview of the issue, both in the Czech Republic and abroad. The literature search focused on the factors that influence the real estate market. In particular, these are the factors of interest rates, mortgage loans, gross domestic product, unemployment, developments in the construction industry, and inflation.

A time series can be understood as a sequence of indicator values, measured in certain time intervals. These intervals are usually equidistant and can therefore be written as follows:

Line graphs are mainly used for displaying time series and their initial analysis, where time variables are recorded on the horizontal axis and the values of the time series indicator are displayed on the vertical axis. Another important chart is the so-called dot chart. When working with time series, it is necessary to define their characteristics. Averages can be included among the first characteristics. In time series you can meet simple arithmetic averages, weighted arithmetic averages, and weighted chronological averages.

The simple arithmetic mean is calculated:

$$y = \frac{\sum_{t=1}^n y_t}{n}; \quad (1)$$

The weighted arithmetic mean is given by where v_t is the weight of the indicator y_t at time t ;

$$y = \frac{\sum_{t=1}^n v_t y_t}{\sum_{t=1}^n v_t} \quad (2)$$

Weighted chronological average: where d_n is the length of time intervals.

$$y = \frac{\frac{y_1 + y_2}{2} d_2 + \frac{y_2 + y_3}{2} d_3 + \dots + \frac{y_{n-1} + y_n}{2} d_n}{d_2 + d_3 + \dots + d_n} \quad (3)$$

Another important characteristic is variance and standard deviation. The variance is the arithmetic mean of the square of the deviations from the arithmetic mean:

$$s_y^2 = \frac{1}{n-1} \sum_{t=1}^n (y_t - y)^2 \quad (4)$$

The standard deviation is given by the square root of the variance:

$$s_y = \sqrt{s_y^2} = x = \sqrt{\frac{1}{n-1} \sum_{t=1}^n (y_t - y)^2} \quad (5)$$

Correlation expresses the relative degree of dependence in the mutual development of two-time series, e.g., y_t and x_t is given by the relation:

$$s_{x_y} = \frac{\sum_{t=1}^n (x_t - x) \cdot (y_t - y)}{s_x \cdot s_y} \quad (6)$$

$y_1, y_2, \dots, y_n$ where y denotes the analyzed indicator
 $t=1$ where t is a time variable
 n is the total number of observations.

Correlation values approaching the limit value of -1 indicate that the two observed time series have opposite directions in their time development. Values approaching +1 mean that time values develop almost identically in terms of the same directions and movements and thus show the same relative rate about each other. In the time series analysis, either quarterly data from 2016-2022 or annual data will be used. This period was chosen for the given issue. Data that was tracked:

- Development of real housing price index, available from *OECD*.
- Development of real property prices in *OECD*; countries, available from *OECD*;
- Real index, real offer prices of apartments in the Czech Republic, available from the price map;
- Index of the growth rate of realized new apartments and family houses, available from the Czech Statistical Office;
- Index of the growth rate of completed apartments in Prague, available from the Czech Statistical Office;
- Real estate price index for the territorial comparison of the Czech Republic, available from the Czech Statistical Office;
- Residential construction of apartment and family houses, available from the Czech Civil Registry Office,
- Residential construction according to the number of rooms, available from the Czech Statistical Office;
- Completed apartments according to the main supporting structure, available according to the Czech Statistical Office;
- Single-family homes by construction type;
- Construction production, published at the Czech Statistical Office;
- Unemployment rate in the Czech Republic, available from the Czech National Bank;
- Inflation rate quarterly, published by the Czech National Bank;
- Development of GDP in the territory of the Czech Republic, accessible by the Czech National Bank;
- Annual and quarterly housing loan interest rates are available from Hypnomonitor.
- Index of building construction.

Comparison was used as part of the work, attention was paid to comparing the state of real estate prices in the monitored period, namely before the outbreak of the Covid-19 pandemic and during the pandemic. The work can also be found with other information about the development of real estate prices, not only during this period. The comparison was chosen to compare the development of real estate prices and identify what changes, growth, or decline could have occurred during this period.

Another investigated quantity was the correlation of two quantities using the Excel tool. The relationship between the two quantities was determined. To calculate the correlation coefficient, a method was chosen that includes the CORREL function, which is written using two matrices. In this respect, matrices are variables that examine given quantities. The first quantity (x) is a set of values representing the average prices for offered apartments in Prague. The second variable(s) is inflation, which is one key factor affecting the price of real estate. The time horizon is given from 01.01.2019 - 31.12.2022. Using the CORREL function, the correlation coefficient is calculated, which determines the mutual relationship of these quantities.

4 Results

The pandemic situation that occurred in 2019 caused a large reduction in consumption, an increase in unemployment, which reached up to 15% in some countries, and a decrease in income for many households. These influences then affect the macroeconomic situation and also the real estate market) (Giudice et al., 2020). If you can look at the Czech Republic, during the pandemic situation, the gross domestic product fell significantly while inflation gradually increased. A certain correlation can be seen between GDP and inflation. The correlation between GDP and inflation can be seen in Figure 1.

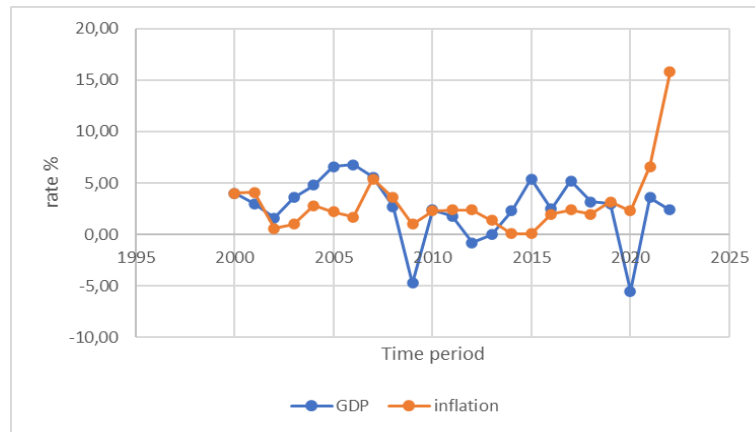


Figure 1. Correlation of GDP and inflation.

Source: own processing taken from the CNB.

The gross domestic product was 3% in 2019, the following year the loss was clear, and the gross domestic product fell to -5.5%. Which only confirms the pandemic situation. The inflation rate was around 2-3% in the years before the pandemic. In 2019, the inflation rate increased slightly to 3.2%; a large increase in inflation occurred in 2021, when the inflation rate was 6.6% in the last examined year; therefore, in 2022, inflation amounted to 15.8%. A certain correlation can be seen between these two factors that influence the price of real estate. The largest correlation coefficient came from the years 2019–2022. When the correlation coefficient was 0.42. If you look at the data from 2000 to 2022, you don't see much correlation here; the correlation coefficient came out to be 0.08.

Another important role in the area of GDP is the relationship between construction production. There is, again, a high correlation in this relationship, where the correlation coefficient is 0.69. This correlation originated from the period 2015-2022. How GDP and construction output developed can be seen in Figure 2.

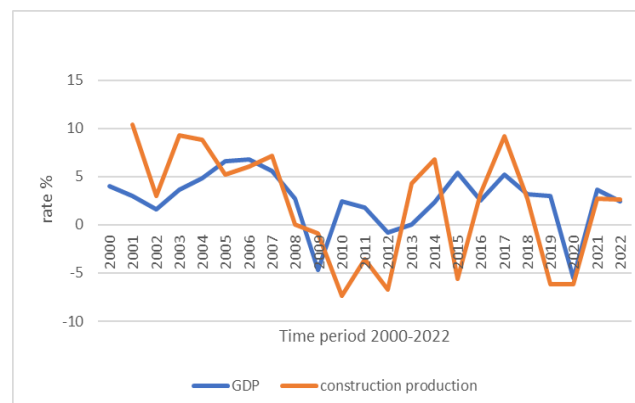


Figure 2. Correlation between GDP and construction output.

Source: own processing, taken from the CNB.

The real estate market is largely influenced by construction production; during the pandemic situation, construction production was very limited as there was not enough labour, and there were suspensions of contracts at this time, which led to the fact that construction production decreased. The correlation coefficient, in this case, was 0.69. This could already be considered a high degree of correlation. A certain correlation can be seen between construction output and interest rates. The construction output and interest rate development can be seen in Figure 3.

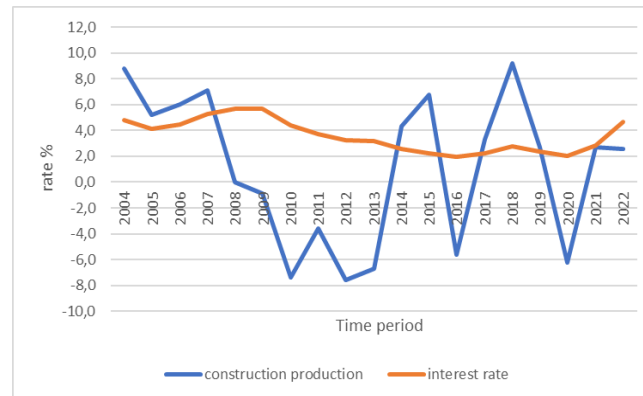


Figure 3. Correlation between construction output and interest rates during 2004-2022.

Source: own processing, taken from the CNB.

Construction output before the outbreak of the pandemic reached around 3%; during the pandemic, construction output fell to -6%. After the pandemic ended, construction production rose again and reached values similar to those before the pandemic. Interest rates have been around 2.22% since 2015; in 2021, the interest rate was just under 2%, so there was a great demand for a mortgage loan for housing. The year 2022 saw an increase in interest rates to 4.68%. During the pandemic, most of the population decided to protect their savings against inflation and invest in real estate. The beginning of 2022 brought an increase in mortgage interest rates, which reduced the demand for housing. If one can look at a certain correlation between construction production and the interest rate can be determined in the ranges of medium values, the range of these values is 0.4-0.7. The largest correlation coefficient calculated using the CORREL function was found in the data between 2019-2022, when the correlation coefficient was 0.53. Another high correlation coefficient that came out of the calculation occurred between 2016-2022; here, the correlation coefficient is slightly smaller and reaches a value of 0.4.

Another correlation that came out with a high value is given between the interest rate and inflation. The correlation coefficient, which measured data from 2015-2022, was 0.94. The interest rate and inflation development can be seen in Figure 4.

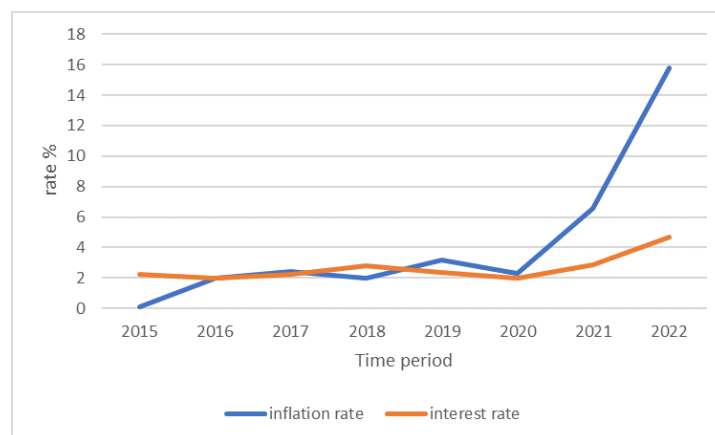


Figure 4. Correlation between inflation and interest rates in 2015-2022.

Source: own processing.

The increase in real estate prices did not correspond to the original estimates of the impact of the pandemic situation. At first, the entire economy was expected to collapse; fortunately, that did not happen. Further, property prices were expected to reach a price ceiling, but property prices continued to rise and rise. In 2021, a slowdown in real estate price growth was expected; on the contrary, in 2022, it was proven that the prices of

new apartments in Prague increased by almost a quarter (Svoboda, 2022). Figure 5 shows the price indices of new apartments.

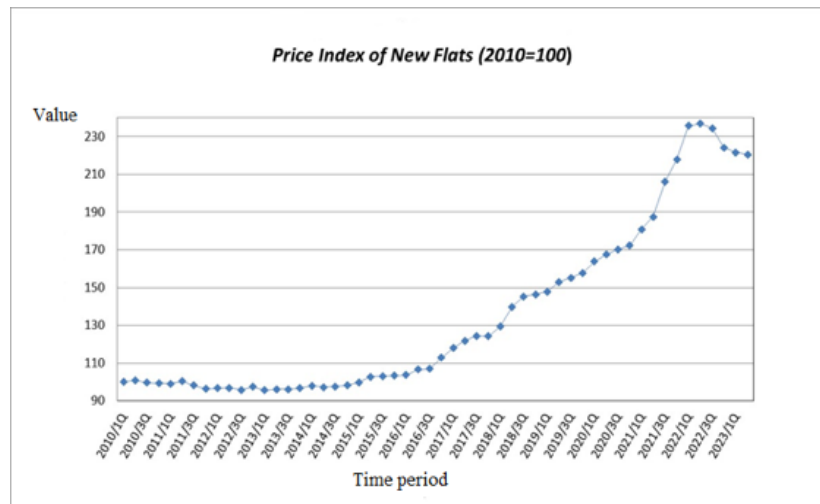


Figure 5. Price index of new apartments quarterly in 2010-2022.

Source: own processing, taken from the Czech Statistical Office.

As can be seen from the picture, during the pandemic, the housing price index increased rapidly; this growth lasted until 2022; in the first quarter of this year, there was a slight decrease.

Price changes in the real estate market are monitored in the Czech Republic by the Czech Statistical Office. In the thesis, the results can be presented during the years 2010-2023. The indicator of the average offer price index of apartments, which is recorded in Table 1, can be seen in the increase. In 2010, the average bid price index was 100; if we look at the year 2022, we can see a value of 216.8, which is a 141% increase if we focus on the set period from 2016-2022. In 2016, the average offer price index for apartments was 117.6; in 2022, it was already the mentioned 216.8, which is once as much. Table 1 shows how the average indices of offer flats developed.

Table 1. Indices of apartment prices in the Czech Republic

	Average indices (2010 = 100) offer prices of apartments			average growth rate offer prices of apartments		
year	Czech republic	CR out of Prague	Prague	Czech republic	CR out of Prague	Praha Prague
2010	100.0	100.0	100.0	99.2	99.6	98.8
2011	95.1	96.6	93.6	98.7	98.7	98.6
2012	96.1	92.5	99.6	100.8	99.1	102.3
2013	97.2	91.3	103.1	100.5	100.1	100.9
2014	100.7	93.0	108.5	100.7	100.1	101.3
2015	106.9	97.7	116.1	102.3	102.5	102.1
2016	117.6	107.1	128.2	102.4	102.1	102.7
2017	130.7	112.1	149.2	103.0	101.2	104.4
2018	144.6	121.9	167.2	102.1	102.0	102.1
2019	153.2	131.0	175.3	101.4	102.2	100.7
2020	164.3	144.3	184.2	101.9	102.6	101.3
2021	179.7	163.7	195.6	103.0	103.9	102.2
2022	216.8	205.0	228.6	104.3	104.7	104.0
2023	217.8	204.0	231.6	98.7	98.6	98.8

Source: own processing, taken from the Czech Statistical Office

The so-called Real index of the Czech Republic can be used to compare the development of prices during the pandemic situation in the territory of the Czech Republic. The Real Index of the Czech Republic indicates the change in the average price of realized apartment sales compared to the previous period in regional cities. Data on this index is published by the price map on Deloitte. Figures 6 and 7 below show how the situation developed during the pandemic.



Figure 6. Price map of realized apartment sales in the Czech Republic, in the first quarter of 2019.

Source: Deloitte.2019

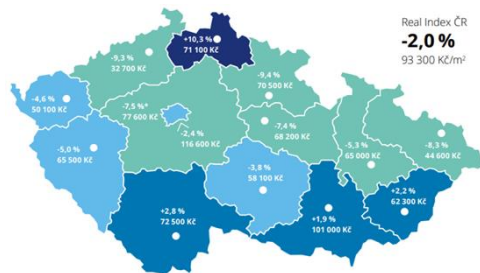


Figure 7. Price map of completed apartment sales in the Czech Republic, at the end of the fourth quarter of 2022

Source: Deloitte.2022

As can be seen from the price maps, average selling prices in the Czech Republic increased by thirty-five thousand four hundred Czech crowns over three years. For a better understanding of how the average price of realized apartment sales in the Czech Republic developed, you can see by region in Figure 8. In each region, the price of apartments for sale is influenced by various factors. The highest sales prices can be seen in the capital, further in the South Moravian region. The lowest values are in the Ústí Region and the Moravian-Silesian Region. How the real index developed worldwide can be seen in Figure 9.

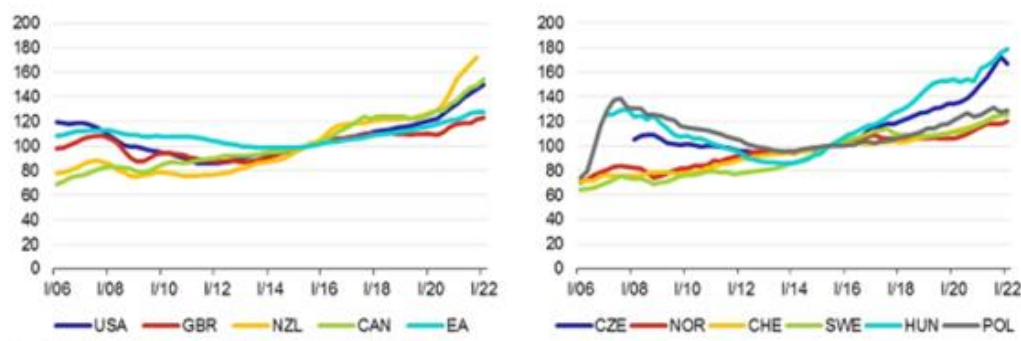


Figure 8. Development of the real housing price index in the world.

Source: taken from OECD.

As can be seen from the figure, the real index grew not only in the Czech Republic but also in other countries. The biggest increase can be seen in the Netherlands and Hungary.

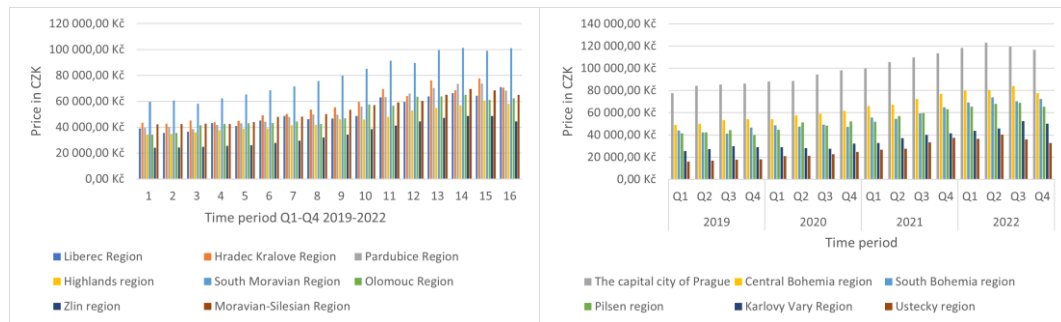


Figure 9. Actual prices of sold apartments in the Czech Republic in 2019-2022.

Source: own processing, taken from Deloitte.

Another correlation arose from the relationship between the prices of apartments for sale in Prague in 2019-2022 and one of the most important factors that influence the price of real estate, namely inflation. Using the CORELL function, it is possible to obtain a correlation coefficient, the calculated value of which tells the mutual relationship between the two quantities. The correlation coefficient belongs to these intervals $\langle -1;1 \rangle$. The calculated correlation coefficient from these values was 0.80. The closer the calculated value is to +1 or -1, the stronger the dependence on the behavior of both quantities in real time. How such a representation looks like can be seen in Figure 10.

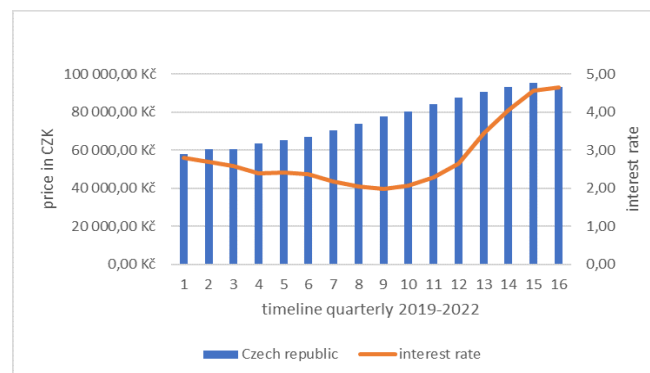


Figure 10. Correlation of inflation and property prices in 2019-2022.

Source: own processing.

It is clear from the figure that the increase in inflation started in 2021 and the most significant increase was recorded at the end of the 2022 period. The correlation between inflation and the real estate market during COVID-19 is minimal, while the effects of the pandemic on the growth of real estate prices are apparent. Empirical studies also prove the correlation between real estate prices and the inflation rate. An empirical study by Laurinavičius et al. (2022) confirms that the inflation rate is one of the macroeconomic indicators that affect the price of real estate, especially if unemployment is lower and GDP is higher.

Another correlation that is related to the real estate market is between GDP and real estate prices. This correlation has a high degree of positivity, confirmed by Li et al. (2018) his work. The similar existence of influence between real estate price and the gross domestic product is confirmed by empirical studies (Chan & Woo, 2013; Vogiazas & Alexiou, 2017; Laurinavičius et al., 2022). The correlation in this work took data from 2019-2022. The correlation coefficient was 0.30. Figure 11 shows how GDP and real estate prices look like.

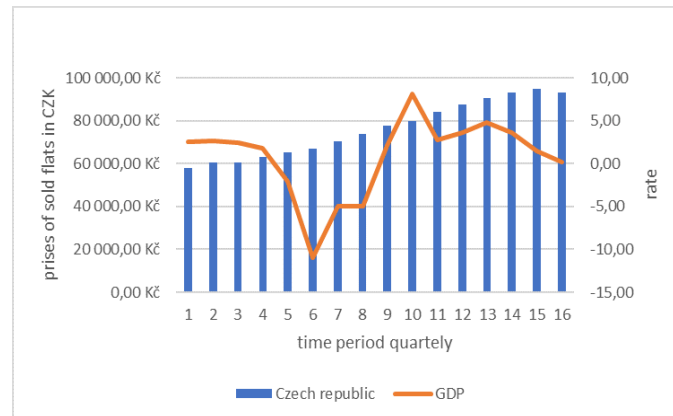


Figure 11. Correlation of GDP and housing prices in 2019-2022.

Source: own processing.

Several empirical studies show another correlation between the interest rate and real estate prices. In his work, (Yiu, 2021) quantifies the correlation, stating that just a 1% drop in interest rates causes a 1.5% increase in property prices. A drop in the real interest rate will significantly increase the real estate price in real terms. The development of interest rates can also be affected by Covid 19, which has just been confirmed. Our correlation was based on the period 2019-2022 every quarter. The correlation coefficient was 0.63. Figure 12 shows this relationship.

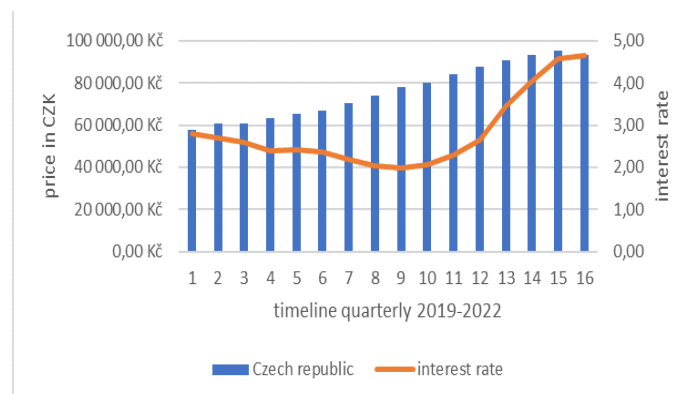


Figure 12. Correlation between property price and interest rate in 2019-2022.

Source: own processing.

Factors that can affect the real estate market are presented in time series. Overall, how these factors develop over time can be seen in Figure 11.

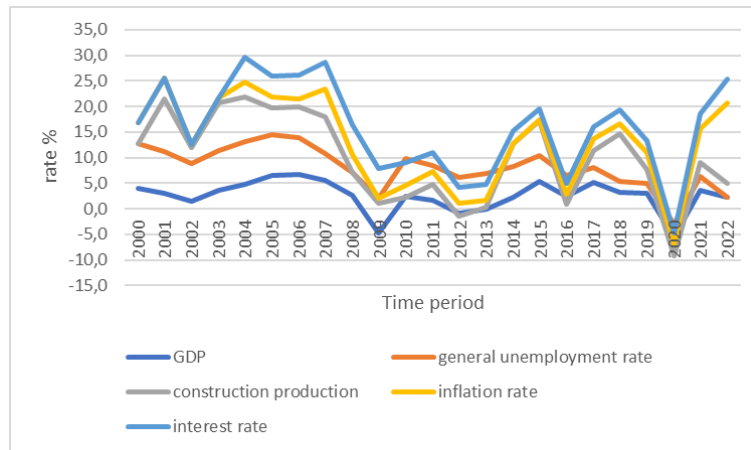


Figure 11. Factors affecting the real estate market from 2000-2022.

Source: own processing, taken from the Czech Statistical Office, hypomonitor.

If we focus on the time area from 2016-2022, the following can be seen: In 2016, there was a big break in the following factors: interest rates, inflation rate, and construction output. There was a slight decrease in unemployment and gross domestic product. For which there was a big break in 2016, they subsequently grew and reached around 20%; they maintained this growth until 2019, when the big break occurred. This is where the pandemic situation comes in. This situation affected all factors and the real estate market itself. It can be assumed that factors such as the interest rate and inflation rate will continue to rise until the end of 2023. From 2024, these factors should decrease, and thus, the real estate market should revive.

5 Discussion of results

The COVID-19 pandemic has significantly impacted the real estate market globally. This hypothesis was only confirmed. In most cases, property prices have risen as a result of the pandemic. If the pandemic situation had not occurred, it is not clear whether the increase in real estate prices would have increased. Prices would probably continue to rise in the Czech market as there is a lack of real estate. As for other countries, there is no clear prediction. The pandemic created the conditions for determining real estate prices, not only determining the state of supply and demand but also determining a number of factors. Real estate prices in the Czech Republic and other countries were different during the pandemic than before the pandemic. This hypothesis was not confirmed. This trend towards real estate growth started even before the pandemic situation. In the Czech Republic, there has been a continuous increase in real estate prices in all regions in recent years. The largest increases were recorded in regions with a high number of inhabitants, whether it was Central Bohemia, South Moravia, or South Bohemia. As empirical and statistical patterns show, this rise in house prices continued during the pandemic. The research questions posed can now be answered.

Which factors had the most fundamental influence on the real estate market in the Czech Republic during the pandemic situation that affected the whole world in 2019?

As part of the work, it is impossible to determine the price of real estate using one factor; several different combinations of factors contribute to the price of real estate. The following factors emerge from the work: development of mortgage loans, development of gross domestic product, costs associated with building materials, unemployment, inflation, and construction production. Furthermore, this work should have considered many factors, such as the type of apartment, region, size of the village, household income, education, and others. During the pandemic, it was necessary to define the most important factors that impacted the real estate market in the Czech Republic. These factors were selected from secondary data and their analyses. Based on various experts, it has been concluded that the key factors that have caused real estate growth include mortgage interest rates, gross domestic product, and inflation.

What can be expected in terms of real estate prices after the end of the pandemic situation on the real estate market in the Czech Republic?

None of us can accurately say what the real estate market will bring in the coming years. The likely development of the real estate market will vary depending on the location and type of property. The situation in the Czech Republic is not simple; as energy prices continue to rise, so do mortgage interest rates. Therefore, the development of the mortgage market will be crucial; if interest rates fall, there will be more demand for housing, and the real estate market will revive again.

6 Conclusion

This work dealt with the impact of the COVID-19 pandemic situation on the real estate market. As is known, the real estate market is a very significant element in every economy, and it is usually associated with the country's economic development. The real estate market is very important for businesses and citizens. Because the real estate market still faces supply and demand. This information is important for the possible sale or purchase of the real estate or whether it is appropriate to obtain a possible loan, so it is necessary to monitor price changes. It is also essential to monitor the so-called price bubbles the real estate market deals with. If a buyer were to purchase a property before this price bubble burst, they would be exposing themselves to huge risks of losing their investment in the purchased property. This work examined how the real estate market developed, the price changes associated with the real estate market, and how the pandemic affected the real estate market. Professional and empirical sources confirmed that COVID-19 affected the real estate market. If there is a global crisis, whether it is the mentioned pandemic, there is usually a drop in real estate prices; in this case, there was no price drop. The pandemic created an unprecedented situation in which conditions were created, and the price of real estate could continue to rise even though the economy was experiencing a crisis.

The main objective of the work was to identify the most important factors that influence price changes in the real estate market. And that in the periods before the pandemic, i.e., from 2016 to the 2020-2022 pandemic. The following essential factors emerge from the work: GDP, inflation, construction output, and mortgage interest rates. A comparison was made between these factors; it is clear that their effect on the real estate market is long-term, and each factor influenced the real estate market even before the pandemic outbreak. For a long time, it was possible to observe a decrease in mortgage loan rates worldwide; after the pandemic outbreak, this interest rate decreased even more, thanks to which the demand for real estate purchases increased. As a result, real estate prices increased. Before the outbreak of the pandemic, there was economic growth, which was also reflected in the rise in real estate prices.

By working out the work, it confirmed that COVID-19 had an effect on the real estate market on a global scale. This consequence caused prices to rise rather than fall. The real estate market recovered relatively quickly from the pandemic, and a continuing real estate price growth trend was noted. Therefore, it is necessary to monitor critical factors in the future. According to these factors, the buyer can track well when the right time to buy is so that losses are as low as possible.

References

- Aladangady, A. (2017). Housing Wealth and Consumption: Evidence from Geographically-Linked Microdata. *American Economic Review*, 107(11), 3415-3446. <https://doi.org/10.1257/aer.20150491>
- Althoff, L., Eckert, F., Ganapati, S., & Walsh, C. (2022). The Geography of Remote Work. *Regional Science And Urban Economics*, 93, 103770. <https://doi.org/10.1016/j.regsciurbeco.2022.103770>
- Bailey, M., Cao, R., Kuchler, T., & Stroebel, J. (2018). The Economic Effects of Social Networks: Evidence from the Housing Market. *Journal of Political Economy*, 126(6), 2224-2276. <https://doi.org/10.1086/700073>

Bayer, P., Mangum, K., & Roberts, J. W. (2021). Speculative Fever: Investor Contagion in the Housing Bubble. *American Economic Review*, 111(2), 609-651. <https://doi.org/10.1257/aer.20171611>

Belas, J., Gavurova, B., Dvorsky, J., Cepel, M., & Durana, P. (2022). The impact of the COVID-19 pandemic on selected areas of a management system in SMEs. *Economic Research-Ekonomska Istraživanja*, 35(1), 3754-3777. <https://doi.org/10.1080/1331677x.2021.2004187>

Beltratti, A., & Morana, C. (2010). International house prices and macroeconomic fluctuations. *Journal of Banking & Finance*, 34(3), 533-545. <https://doi.org/10.1016/j.jbankfin.2009.08.020>

Black, A., Fraser, P., & Hoesli, M. (2006). House Prices, Fundamentals and Bubbles. *Journal of Business Finance & Accounting*, 33(9-10), 1535-1555. <https://doi.org/10.1111/j.1468-5957.2006.00638.x>

Bloom, N., Davis, S. J., & Zhestkova, Y. (2021). COVID-19 Shifted Patent Applications Toward Technologies that Support Working from Home (SSRN Scholarly Paper 3695191). <https://doi.org/10.2139/ssrn.3695191>

Brueckner, J. K., & Sayantani, S. (2023). Intercity impacts of work-from-home with both remote and non-remote workers. *Journal of Housing Economics*, 59, 101910. <https://doi.org/10.1016/j.jhe.2022.101910>

CBA Hypomonitor: Interest rate fell to 5.54%. (n.d.). Retrieved March 14, 2024, from <https://www.cbamonitor.cz/actuality/cba-hypomonitor-hourly-rate-dropped-to-554>

Chan, H. L., & Woo, K. Y. (2013). Studying the Dynamic Relationships between Residential Property Prices, Stock Prices, and GDP: Lessons from Hong Kong. *Journal of Housing Research*, 22(1), 75-89. <https://doi.org/10.1080/10835547.2013.12092068>

COVID Promo. (n.d.). Retrieved March 12, 2024, from <http://ceros.mckinsey.com/coronavirus-promo>

COVID-19 Global Real Estate Implications. (2020, April 19). <https://www.jll.co.uk/en/trends-and-insights/research/covid-19-global-real-estate-implications>

Czechia Economic Snapshot—OECD. (n.d.). Retrieved March 11, 2024, from <https://www.oecd.org/economy/czechia-economic-snapshot/>

Davis, M., Ghent, A., & Gregory, J. (2021). The Work-from-Home Technology Boon and its Consequences (SSRN Scholarly Paper 3785795). <https://papers.ssrn.com/abstract=3785795>

Deloitte Real Index Q4 2022. (n.d.). <https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/real-estate/Real-index-4Q-2022-ENG.pdf>

Deloitte Real Index Q1 2019. (n.d.). <https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/real-estate/EN%20Real%20index%201Q%202019.pdf>

Dumeignil, C. (2022). The Impact of Cross-border Labor Mobility on Real Estate Price Trends: A Natural Experiment. *International Regional Science Review*, 45(1), 108–132. <https://doi.org/10.1177/0160017621989394>

Gamber, W., Graham, J., & Yadav, A. (2023). Stuck at home: Housing demand during the COVID-19 pandemic. *Journal of Housing Economics*, 59, 101908. <https://doi.org/10.1016/j.jhe.2022.101908>

Gavurova, B., Ivankova, V., & Rigelsky, M. (2020). Relationships between perceived stress, depression and alcohol use disorders in university students during the COVID-19 pandemic: a socio-economic dimension. *International Journal of Environmental Research And Public Health*, 17(23), 8853. <https://doi.org/10.3390/ijerph17238853>

Gavurova, B., Kelemen, M., & Polishchuk, V. (2022). Expert model of risk assessment for the selected components of smart city concept: From safe time to pandemics as COVID-19. *Socio-economic Planning Sciences*, 82, 101253. <https://doi.org/10.1016/j.seps.2022.101253>

Gavurova, B., Skare, M., Belas, J., Rigelsky, M., & Ivankova, V. (2023). The relationship between destination image and destination safety during technological and social changes COVID-19 pandemic. *Technological Forecasting and Social Change*, 191, 122488. <https://doi.org/10.1016/j.techfore.2023.122488>

Giudice, V., Paola, P., & Del Giudice, F. P. (2020). COVID-19 Infects Real Estate Markets: Short and Mid-Run Effects on Housing Prices in Campania Region (Italy). *Social Sciences*, 9, 114. <https://doi.org/10.3390/socsci9070114>

Goodman, L., & Zhu, J. (2023). Single borrowers versus coborrowers in the pandemic: Mortgage forbearance take-up and performance.

Grondys, K., Slusarczyk, O., Hussain, H.I., & Androniceanu, A. (2021). Risk Assessment of the SME Sector Operations during the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, 18(8), Article Number: 4183. <https://doi.org/10.3390/ijerph18084183>

Grum, B., & Govekar, D. K. (2016). Influence of Macroeconomic Factors on Prices of Real Estate in Various Cultural Environments: Case of Slovenia, Greece, France, Poland and Norway. *Procedia Economics and Finance*, 39, 597–604. [https://doi.org/10.1016/S2212-5671\(16\)30304-5](https://doi.org/10.1016/S2212-5671(16)30304-5)

Gupta, A., Mittal, V., Peeters, J., & Van Nieuwerburgh, S. (2022). Flattening the curve: Pandemic-Induced revaluation of urban real estate. *Journal of Financial Economics*, 146(2), 594-636. <https://doi.org/10.1016/j.jfineco.2021.10.008>

HA, N. H. P. (2021). Factors Affecting Real Estate Prices During the COVID-19 Pandemic: An Empirical Study in Vietnam. *The Journal of Asian Finance, Economics and Business*, 8(10), 159-164. <https://doi.org/10.13106/JAFEB.2021.VOL8.NO10.0159>

Index cen bytových nemovitostí—1. Čtvrtletí 2020. (n.d.). Index Cen Bytových Nemovitostí - 1. Čtvrtletí 2020. Retrieved March 12, 2024, from <https://www.czso.cz/csu/czso/index-cen-bytovych-nemovitosti-1-ctvrtleti-2020>

Kam letos zamíří ceny nemovitostí? Realitní trh 2023 očima expertů. (n.d.). Finmag.cz. Retrieved February 29, 2024, from <https://www.finmag.cz/finance/439360-kam-letos-zamiri-ceny-nemovitosti-realitni-trh-2023-ocima-expertu>

Kmetz, A., Mondragon, J., & Wieland, J. F. (2022). Remote Work and Housing Demand. *FRBSF Economic Letter*, 2022(26), 1-5. <https://www.frbsf.org/wp-content/uploads/sites/4/el2022-26.pdf>

Kramarova, K., Švábová, L., & Gabrikova, B. (2022). Impacts of the Covid-19 crisis on unemployment in Slovakia: a statistically created counterfactual approach using the time series analysis. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 17(2), 343–389. <https://doi.org/10.24136/eq.2022.012>

Laurinavičius, A., Laurinavičius, A., & Laurinavičius, A. (2022). Macroeconomic variables influencing housing prices in Vilnius. *International Journal of Strategic Property Management*, 26(1), Article 1. <https://doi.org/10.3846/ijspm.2021.15961>

Li, X., & Zhang, C. (2021). Did the COVID-19 Pandemic Crisis Affect Housing Prices Evenly in the U.S.? *Sustainability*, 13(21), Article 21. <https://doi.org/10.3390/su132112277>

Li, Z., Razali, M. N., Gholipour Fereidouni, H., & Mohd. Adnan, Y. (2018). Macro-economic index effect on house prices in China. *International Journal of Housing Markets and Analysis*, 11(3), 453-475. <https://doi.org/10.1108/IJHMA-03-2017-0025>

Liu, G. (2022). Research on Prediction and Analysis of Real Estate Market Based on the Multiple Linear Regression Model. *Scientific Programming*, 2022, e5750354. <https://doi.org/10.1155/2022/5750354>

Market News | Transaction Price Map. (n.d.). Retrieved March 14, 2024, from https://www.cenovamapa.org/Default.aspx?menu=Home_MarketInfo&culture=en&s=798E3309F85D4BF55E45C271AC3A04ED2BC6D81B

Minh, N., Khan, M., & Bensemman, J. (2021). Corporate social responsibility in Vietnam: Systematic review of research and future directions. *Society and Business Review*, 17(1), 92-119. <https://doi.org/10.1108/SBR-09-2020-0114>

Navickas, V., Grecikova, A., Kordos, M., & Sramka, M. (2022). The Information and Communications Technologies Usage within the Covid-19 Pandemic Issue. *Transformations in Business & Economics*, Vol. 21, No 1 (55), pp.101-113

Pirogova, O., & Temnova, N. (2021). Dynamics of coworking growth in the real estate market under digitalization. *E3S Web of Conferences*, 244, 10052. <https://doi.org/10.1051/e3sconf/202124410052>

Ramani, A., & Bloom, N. (2021). The Donut Effect of Covid-19 on Cities. National Bureau of Economic Research. <https://www.nber.org/papers/w28876>

Sanchaniya, R. J. (2021). The Effect of Covid-19 on the Real Estate Industry in India. *Baltic Journal of Real Estate Economics and Construction Management*, 9(1), 122-129. <https://doi.org/10.2478/bjreecm-2021-0010>

Svoboda, P. (2022, March 9). Inflace ještě může s cenami nemovitostí (ne)pěkně zahýbat. *Hospodářské noviny* (HN.cz). <https://nazory.hn.cz/c1-67043760-inflace-jeste-muze-s-cenami-nemovitosti-ne-pekne-zahybat>

Tanrıvermiş, H. (2020). Possible impacts of COVID-19 outbreak on real estate sector and possible changes to adopt: A situation analysis and general assessment on Turkish perspective. *Journal of Urban Management*, 9(3), 263-269. <https://doi.org/10.1016/j.jum.2020.08.005>

The real estate market in the Czech Republic is reviving. (n.d.-a). Retrieved March 14, 2024, from <https://www.cbamonitor.cz/actuality/real-estate-market-in-the-czech-realm>

Tkacova, A., & Gavurova, B. (2023). Economic sentiment indicators and their prediction capabilities in business cycles of EU countries. *Oeconomia Copernicana*, 14(3), 977-1008. <https://doi.org/10.24136/oc.2023.029>

Uchegara, I., Hamma-Adama, M., Obiri, K. A., Jafarifar, N., & Moore, D. (2020). Impacts and risk management of COVID-19 pandemic on real estate supply chain. *International Journal of Real Estate Studies*, 14(Special Issue 1). <https://rgu-repository.worktribe.com/output/998637>

Valaskova, K., Gajdosikova, D., & Lazaroiu, G. (2023). Has the COVID-19 pandemic affected the corporate financial performance? A case study of Slovak enterprises. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 18(4), 1133-1178. <https://doi.org/10.24136/eq.2023.036>

Vogiazas, S., & Alexiou, C. (2017). Determinants of Housing Prices and Bubble Detection: Evidence from Seven Advanced Economies. *Atlantic Economic Journal*, 45(1), 119-131. <https://doi.org/10.1007/s11293-017-9531-0>

Wachter, S., & Acolin, A. (2022). Homeownership for the Long Run. *Journal of Comparative Urban Law and Policy*, 5(1), 274-296. <https://readingroom.law.gsu.edu/cgi/viewcontent.cgi?article=1098&context=jculp>

Yiu, C. Y. (2021). Why House Prices Increase in the COVID-19 Recession: A Five-Country Empirical Study on the Real Interest Rate Hypothesis. *Urban Science*, 5(4), Article 4. <https://doi.org/10.3390/urbansci5040077>

Data Availability Statement: More information and data can be found in the repository on Zenodo: <https://zenodo.org/record/51902#.ZGXyT6VBxPY>

Author Contributions: Conceptualization: Tomáš Krulický; methodology: Tomáš Krulický, Tereza Proboštová; data analysis: Tomáš Krulický, Tereza Proboštová, writing—original draft preparation: Tomáš Krulický, Tereza Proboštová, writing; review and editing: Tomáš Krulický, Tereza Proboštová, Iva Lorencová; visualization: Tomáš Krulický, Tereza Proboštová. All authors have read and agreed to the published version of the manuscript.

Tomáš KRULICKÝ works as the head of the department of expertise at the Institute of Expertise and Valuation at the Institute of Technology and Business in České Budějovice. In 2022, he spoke at the Economics, Management, Finance and Social Attributes of Economic Systems (EMFSA 2022) conference in Pula, then in 2019 at the "Globalisation and its socio-economic consequences 2019" conference in Rajecská Teplice, Slovakia, and others. In 2019, he participated in a one-week academic internship at ISAL Funchal, Madeira, Portugal. Publications in which he participated are, for example, Actual paid cost of equity capital in the accommodation and food services activities sector 2015-2019, Valuation of Goodwill Using Weighted Average Return on Assets: Assessment of Average Transport and Storage Enterprise in the Czech Republic and others.

ORCID ID: <https://orcid.org/0000-0002-0378-2699>

Tereza PROBOŠTOVÁ is junior researcher at the Institute of Technology and Business in České Budějovice. In 2023, she completed the master's program in Business Economics and is currently continuing the subsequent Expertise and Valuation program at the Institute of Technology and Business in České Budějovice. She focuses on issues in the economic and expert sector.

ORCID ID: <https://orcid.org/0009-0005-9447-5748>

Iva LORENCOVÁ is the Assistant Real Estate Appraisal Group The Institute of Technology and Business in České Budějovice. Her focus is on real estatetes and valuations.

ORCID ID: <https://orcid.org/0009-0009-7394-2668>

Copyright © 2024 by author(s) and VSI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access