Analyzing the regional impact: A comprehensive study of covid-19 on the real estate market in Kazakhstan

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Abstract

The purpose of the research is to determine the impact of the COVID-19 pandemic and macroeconomic factors on the real estate prices in the regions of Kazakhstan during the period between 2010 and 2022. Feasible Generalized Least Square (FGLS) model was implemented to assess determinants of real-estate market performance. This study analyzes the performance of the real estate market in Kazakhstan not on a country level but on a more deep, regional level. The findings show that COVID-19, as well as macroeconomic variables, had a significant impact on real-estate market prices. COVID-19 negatively affected real estate prices in Kazakhstani regions, whereas the effect of macroeconomic variables was positive. Factors such as household income, gross regional product, inflation, unemployment, and time dummy contributed to the increase in prices of real estate.

Keywords: Real Estate Market; COVID-19; Apartment Price; Gross Regional Product, Household Income; Inflation,

1. Introduction

The COVID-19 pandemic, which started at the beginning of 2020, became a turning point in modern human history. Its consequences have affected all economic industries, starting from middle and small businesses and ending up with multi-billion corporations and whole countries. The real estate market is another sphere that was heavily affected by COVID-19 and is crucial for the population. Purchasing real estate is a top priority for the population, because not only is the accommodation is basic need of humanity, but also a perspective investment with the intent to sell in the future. The real estate market is an important economic sector of Kazakhstan as well. There are huge prospects for the real estate market because of the young and rapidly expanding population, and prosperous land area which is not yet inhabited. The current research is intended to analyze the effect of the COVID-19 pandemic and macroeconomic variables on real estate prices in Kazakhstan on a regional basis. Macroeconomic variables include gross regional product (GRP), average household income, inflation, unemployment, and COVID-19 crisis dummy variables (2020 and 2021) as explanatory variables. The paper consists of several sections, which are a Literature Review, Data and Methodology, Empirical Results, and Conclusion.

2. Literature Review

Real estate market determinants appear to be of high interest to scholars, who analyzed apartment price dynamics. Before 2020, the key determinants for the price of real estate were real estate characteristics (size, district, room number, etc.) and macroeconomic variables. If real estate characteristics were suitable only for apartment prices on an individual level, macroeconomic variables were implemented to analyze the real estate market as a whole, either on a regional or country level. Research on real estate prices that was done after 2020 started to include a new influential factor, the COVID variable, which captures the effect of the COVID-19 pandemic, along with macroeconomic variables.

The main indicator for research analysis on real estate market performance is the average apartment price, which is used as the dependent variable.

Average apartment price: Most scholars identified average apartment price as the dependent variable for research. The effect of various factors on the real estate market is expressed as a change in price (Del Giudice, V., De Paola, P., & Del Giudice, F. P., 2020; Kaynak, S., Ekinci, A., & Kaya, H. F., 2021; Tian, C., Peng, X., & Zhang, X., 2021). Studies that were conducted after 2020 include macroeconomic variables, such as inflation rate, unemployment rate, and time dummy variables.

Inflation rate: One of the most important factors that determine not the only price of real estate, but the price of all goods in the economy is the inflation rate. Moreover, the inflation rate is directly affecting mortgage interest rates, which is a considerable part of the real estate market system. Kaynak et.al. (2021) included the inflation rate in the research as an explanatory variable to assess how apartment prices and mortgage loans were exposed to a change in the inflation rate, resulting from the COVID-19 pandemic.

Unemployment rate: The unemployment rate is another variable that has a substantial effect on the real estate market performance according to scholars. After the start of COVID-19, the effect of the unemployment rate on the price of apartments has become more transparent. According to Del Guidice et.al., (2020), there was a huge drop in unemployment after the start of the pandemic, which might have a serious effect on the performance of the real estate market.

Time dummy variables: Time dummy variables are also widely used by scholars in the analysis of the COVID-19 effect on the real estate market. Time dummy variables are used as a proxy variable for crisis, that resulted as a consequence of quarantine measures contra the pandemic. Time dummy variables capture time-specific effects in assessing real estate market performance (Del Giudice et al., 2020; McCord, M., Lo, D., McCord, J., Davis, P., Haran, M., & Turley, P., 2022).

COVID: The variable COVID is the main measure of COVID-19's effect in assessing real estate market prices. After 2020, it is considered as the main explanatory variable to observe the impact of COVID-19 on the real estate market under ceteris paribus, which means other variables are held fixed. According to various scholars, COVID-19 has a negative effect on real estate market prices (Chu, X., Lu, C., & Tsang, D., 2021; Del Guidice et.al., 2020; Kaynak et.al., 2021; Wen, Y., Fang, L., & Li, Q., 2022).

 All research that is done on this topic is done after 2020 and has the same tendency: average apartment price is negatively affected by COVID-19. The tendency is the same for both developed (Italy, United States, United Kingdom) and developing (Turkey, China) countries. Various methodologies used by scholars, such as OLS, Fixed, and Random Effect models, also lead to the same conclusion, where the effect of COVID-19 on the real estate market is negative.

There has been no such study implemented yet on the Kazakhstani real estate market since the start of the pandemic. Moreover, current research is intended to analyze the Kazakhstani real estate market not on a country level, but on a regional level, which is more detailed and complex. In addition to other scholars, this paper intends to include additional macroeconomic variables into the model and implement regression analysis using Feasible Generalized Least Squares methods, which takes possible issues such as multicollinearity, autocorrelation, and heteroskedasticity into consideration.

3. Data and Methodology

This paper investigates real-estate price determinants by observing the influence of the COVID-19 pandemic and macroeconomic variables (Table 2) on average real-estate prices in Kazakhstan on a regional basis using Feasible Generalized Least Squares (FGLS) method. The regions are 3 large cities (Astana, Almaty, and Shymkent) and 14 Kazakhstan administrative regions. The data is collected from the Bureau of National Statistics of the Republic of Kazakhstan for the period between 2010 and 2022. The estimated model looks as:

$Y = b_0 + b_1 LGRP + b_2 INF + b_3 UNEM + b_4 LINCOME + b_5 COVID + b_6 LPOP + b_7 2020 + b_8 2021 + e$ (1)

Y = average price of real estate expressed by PRICE

b_0 = constant parameter

b_{1-8} = model coefficient parameters

e = residual term

Table 1 - Summary and measurement of the variables

Symbol	Variables	Researchers
Dependent variable		
LPRICE	Logarithmic form of the average price of an apartment	Del Guidice et.al. (2020), Kaynak et.al. (2021), Tian et.al. (2021),
Independent variables		
COVID	COVID Dummy variable, which is =1 if the year is 2020,2021 or 2022, = 0 if otherwise	Chu et.al. (2021), Kaynak et.al. (2021), Wen et.al. (2021)
Macroeconomic variables		
LGRP	Logarithmic form of Gross Regional Product	Newly introduced variable to COVID-related research
INF	Annual inflation rate based on CPI	Kaynak et.al. (2021)
LINCOME	Logarithmic form of Average household income	Newly introduced variable to COVID-related research
UNEM	Annual unemployment rate	Del Guidice et.al. (2020)
2020 and 2021	Time Dummy Variables for years 2020 and 2021, where restrictions were implemented	Del Guidice et.al. (2020), McCord et.al. (2021)
LPOP	Logarithmic Form of Regional Population	Newly introduced variable to COVID-related research

Dependent variable: The average price of the apartment is a performance indicator for the real estate market. The price for an apartment is given by the ratio of tenge per area (meters square).

The change in average price for apartments indicates whether the COVID-19 pandemic has either a positive or negative effect on the real estate market. It is taken into logarithmic form to assess the change in price by percent.

COVID: COVID is the variable that is intended to capture the impact of COVID-19 on prices of the real estate. The effect is measured by several people who were diagnosed with COVID-19 to indicate the level of severity of the pandemic. COVID variable is also taken into logarithmic form to be able to measure the percentage-percentage effect.

Macroeconomic variables are presented in the model to measure external factors that might influence the prices of real estate.

Gross Regional Product: It is a variable that is an analog for GDP but for regions, not countries. It is a newly introduced variable to the research that has been done regarding the effect of COVID-19 on the real estate market. Research predicts that the variable of Gross Regional Product has a positive effect on the price of real estate. If the region generates more money than other regions, citizens of the region may be likely to be able to purchase real estate, which may raise its price.

Inflation rate: This variable corresponds to the annual inflation rate. Current research assumes that the higher the inflation rate, the higher the price of real estate, because during inflation there is a tendency of growth in price for basic human needs, including real estate. This prediction goes along with research done by Kaynak et.al. (2021), which indicates that the "positive effect of inflation on the real estate market is apparent and expected".

Average household income: This variable represents citizens' average monthly income for a particular year and region. It is assumed that the higher the average income in the region, the more likely that there are higher prices for real estate in comparison with other regions. Del Guidice et.al. (2020) approve the prediction, by indicating that there is a minor but positive effect of average household income on real estate prices.

Unemployment rate: The unemployment rate is another macroeconomic variable that indicates the percentage of people who do not work for more than 28 days. Del Guidice et.al. (2020) indicated that the inclusion of the unemployment rate into the model is crucial due to the effect of COVID-19 on the labor market. There was a huge drop in employment after the start of the pandemic, because of the reduction (the number of staff was reduced) and remote work (some spheres could not function remotely, and nor do its workers). According to the research done by Del Guidice et.al. (2020), an increase in unemployment is likely to decrease the price of real estate markets.

Time Dummy Variables: Two-time variables, for the years 2020 and 2021, are intended to capture time-specific effects that happened in those two years. Despite this, the model uses another dummy variable COVID to assess the effect of the pandemic on the real-estate market. However, other economic and political events in 2020 and 2021 might influence the change in average apartment prices.

Population: The population variable corresponds to the number of people who live in a particular region and a particular year. The model assumes that the more people live in the region, the higher the demand for apartments in this region. The higher the demand for apartments, the higher the price.

4. Empirical Results

Before doing regression analysis, several important tests need to be conducted. These tests are intended to test for the robustness of the model. They include:

- Stationarity test

- Multicollinearity test

- Autocorrelation test

- Heteroskedasticity test

- Endogeneity test

The model was declared as panel data because the dataset contains observations for 3 large cities and 14 regions of Kazakhstan for the period between 2010-2022. First of all, before including variables in the model, they are needed to be tested for stationarity. If a variable is non-stationary, it cannot be used in regression analysis, because it may significantly affect the results. Non-stationarity implies that variables can be volatile throughout time, which means that past observations cannot be used to represent future observations.

The main stationarity test is for the dependent variable. If the dependent variable is non-stationary, then the whole research is under question. As a result of the Hadri test for stationarity (figure 1), the dependent variable LPRICE is stationary, as the p-value is 0.000, which is less than a 1% significance level.

Figure 1 – Hadri Stationarity Test for variable LPRICE

```
. xtunitroot hadri LPRICE

Hadri LM test for LPRICE
_____

Ho: All panels are stationary            Number of panels =      17
Ha: Some panels contain unit roots       Number of periods =     13

Time trend:          Not included        Asymptotics: T, N -> Infinity
Heteroskedasticity:  Not robust                       sequentially
LR variance:         (not used)
_____
                 Statistic        p-value
_____
    z            21.2369          0.0000
_____
```

The next step is stationarity test for independent variables. To test all independent variables for stationarity, either Hadri or Im-Pesaran-Shin stationarity tests were implemented. As can be seen from Figures 2-9, all independent variables are stationary since their p-values are less than 1%, 5%, and 10% levels of significance.

Figure 2 – Hadri stationarity for variable LINCOME

```
. xtunitroot hadri LINCOME

Hadri LM test for LINCOME
─────────────────────────────

Ho: All panels are stationary          Number of panels =      17
Ha: Some panels contain unit roots     Number of periods =     13

Time trend:           Not included     Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust                      sequentially
LR variance:          (not used)
─────────────────────────────────────────────────────────────────
              Statistic        p-value
─────────────────────────────────────────────────────────────────
   z          27.0840          0.0000
─────────────────────────────────────────────────────────────────
```

Figure 3 – Hadri stationarity test for variable LGRP

```
. xtunitroot hadri LGRP

Hadri LM test for LGRP
─────────────────────────────

Ho: All panels are stationary          Number of panels =      17
Ha: Some panels contain unit roots     Number of periods =     13

Time trend:           Not included     Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust                      sequentially
LR variance:          (not used)
─────────────────────────────────────────────────────────────────
              Statistic        p-value
─────────────────────────────────────────────────────────────────
   z          25.1237          0.0000
─────────────────────────────────────────────────────────────────
```

Figure 4 – Hadri stationarity test for variable LPOP

```
. xtunitroot hadri LPOP

Hadri LM test for LPOP
_____

Ho: All panels are stationary          Number of panels  =      17
Ha: Some panels contain unit roots     Number of periods =      13

Time trend:          Not included      Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust                      sequentially
LR variance:         (not used)
_____

                     Statistic        p-value
_____

   z                 19.1643          0.0000
```

Figure 5 – Im-Pesaran-Shin stationarity test for variable INF

```
. xtunitroot ips INF

Im-Pesaran-Shin unit-root test for INF
_____

Ho: All panels contain unit roots      Number of panels  =      17
Ha: Some panels are stationary         Number of periods =      13

AR parameter: Panel-specific           Asymptotics: T,N -> Infinity
Panel means:  Included                              sequentially
Time trend:   Not included

ADF regressions: No lags included
_____

                                              Fixed-N exact critical values
                  Statistic     p-value        1%       5%      10%
_____

  t-bar           -1.8692                     -2.020   -1.870  -1.790
  t-tilde-bar     -1.6722
  Z-t-tilde-bar   -1.9683       0.0245
```

Figure 6 – Im-Pesaran-Shin stationarity test for variable UNEM

```
. xtunitroot ips UNEM

Im-Pesaran-Shin unit-root test for UNEM
_____

Ho: All panels contain unit roots      Number of panels  =      17
Ha: Some panels are stationary         Number of periods =      13

AR parameter: Panel-specific           Asymptotics: T,N -> Infinity
Panel means:  Included                              sequentially
Time trend:   Not included

ADF regressions: No lags included
_____

                                              Fixed-N exact critical values
                  Statistic     p-value        1%       5%      10%
_____

  t-bar           -4.1318                     -2.020   -1.870  -1.790
  t-tilde-bar     -2.5294
  Z-t-tilde-bar   -6.7453       0.0000
```

Figure 7 – Hadri stationarity test for variable COVID

```
. xtunitroot hadri COVID

Hadri LM test for COVID
_____

Ho: All panels are stationary          Number of panels =     17
Ha: Some panels contain unit roots     Number of periods =    13

Time trend:          Not included      Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust                        sequentially
LR variance:         (not used)
_____

              Statistic      p-value
_____

   z           15.3568       0.0000
_____
```

Figure 8 – Im-Pesaran-Shin stationarity test for variable 2020

```
. xtunitroot ips _IYear_2020

Im-Pesaran-Shin unit-root test for _IYear_2020
_____

Ho: All panels contain unit roots      Number of panels =     17
Ha: Some panels are stationary         Number of periods =    13

AR parameter: Panel-specific           Asymptotics: T,N -> Infinity
Panel means:  Included                               sequentially
Time trend:   Not included

ADF regressions: No lags included
_____

                                       Fixed-N exact critical values
               Statistic     p-value     1%       5%      10%
_____

   t-bar        -3.4641                 -2.020  -1.870  -1.790
   t-tilde-bar  -2.4495
   Z-t-tilde-bar -6.3000     0.0000
_____
```

Figure 9 – Im-Pesaran Shin stationarity test for variable 2021

```
. xtunitroot ips _IYear_2021

Im-Pesaran-Shin unit-root test for _IYear_2021
─────────────────────────────────────────────────────────────
Ho: All panels contain unit roots       Number of panels  =     17
Ha: Some panels are stationary           Number of periods =     13

AR parameter: Panel-specific             Asymptotics: T,N -> Infinity
Panel means:  Included                                  sequentially
Time trend:   Not included

ADF regressions: No lags included
─────────────────────────────────────────────────────────────
                                        Fixed-N exact critical values
                    Statistic   p-value      1%      5%     10%
─────────────────────────────────────────────────────────────
 t-bar              -3.4641                -2.020  -1.870  -1.790
 t-tilde-bar        -2.4495
 Z-t-tilde-bar      -6.3000     0.0000
─────────────────────────────────────────────────────────────
```

Test for multicollinearity is the next important step before regression analysis. Multicollinearity means a high correlation between independent variables. The presence of multicollinearity negatively affects the validity of the model since a high correlation between independent variables may lead to biased results.

As can be seen from the correlation matrix in Figure 10, some variables are highly correlated with each other and may eventually lead to multicollinearity. Correlation higher than 50% can be observed between variables, LINCOME and LGRP, as well as between variable COVID and a set of variables.

Figure 10 – Correlation Matrix

```
. correl LPRICE LINCOME LGRP LPOP COVID UNEM INF _IYear_2020 _IYear_2021
(obs=221)
```

	LPRICE	LINCOME	LGRP	LPOP	COVID	UNEM	INF
LPRICE	1.0000						
LINCOME	0.7297	1.0000					
LGRP	0.7567	0.7816	1.0000				
LPOP	0.1465	-0.0402	0.3147	1.0000			
COVID	0.4197	0.6373	0.3666	0.0379	1.0000		
UNEM	-0.2570	-0.4802	-0.3191	0.0291	-0.2715	1.0000	
INF	0.2788	0.3487	0.1801	0.0057	0.5159	-0.0592	1.0000
_IYear_2020	0.1243	0.2312	0.1497	0.0223	0.5270	-0.1261	0.0655
_IYear_2021	0.2194	0.3290	0.1731	0.0290	0.5270	-0.1601	-0.0081

	_IY~2020	_IY~2021
_IYear_2020	1.0000	
_IYear_2021	-0.0833	1.0000

To test for the multicollinearity of the model, the Mean-Variance Inflationary Factor (VIF) was used. The optimal range of Mean VIF varies from 1 to 5. In this range, the model is considered to be not affected by multicollinearity. As can be seen from Figure 11, variables COVID and LINCOME have VIF higher than, which may reduce the precision of these variables' coefficients during regression analysis. Overall, the model has a VIF equal to 3.95, which indicates moderate, but acceptable multicollinearity in the model.

Figure 11 – Variance Inflationary Factor (VIF)

```
. estat vif

    Variable |       VIF       1/VIF
-------------+----------------------
       COVID |      8.42    0.118734
     LINCOME |      6.94    0.144154
        LGRP |      4.57    0.218660
 _IYear_2021 |      3.16    0.316364
 _IYear_2020 |      3.04    0.328690
         INF |      2.53    0.395193
        LPOP |      1.61    0.620086
        UNEM |      1.36    0.736644
-------------+----------------------
    Mean VIF |      3.95
```

Furthermore, the Wooldridge test was conducted to test the model for autocorrelation. Autocorrelation indicates a high correlation between error terms. As can be seen in Figure 12, the p-value is less than 1%, 5%, or 10% significance level. It means that there is an autocorrelation presented in the model.

Figure 12 – Wooldridge test for autocorrelation

```
. xtserial LPRICE LINCOME LGRP LPOP COVID UNEM INF _IYear_2020 _IYear_2021

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     16) =     88.638
           Prob > F =      0.0000
```

Figure 13 represents the result of the heteroskedasticity test of the model. Heteroskedasticity indicates the changes in the variance of terms. It means that dependent and as well as independent variables' standard errors might change over the period, which may cause bias in the model. Results have shown that there is no heteroskedasticity in the model since prob > chi2 is higher than 1%, 5%, and 10% level of significance.

Figure 13 – Heteroskedasticity test

```
. lrtest hetero homo, df(220)


Likelihood-ratio test                         LR chi2(220)=    115.80
(Assumption: homo nested in hetero)           Prob > chi2 =    1.0000
```

The ultimate test that is required to be done before regression analysis is the test for endogeneity. Endogeneity indicates that there are one or more variables in error terms that are correlated with not only the dependent but also with one of the independent variables. The absence of such a variable may bias the results of regression because this variable needs to be included in the model. To have no endogeneity in the model, Durbin chi 2 and Wu-Hausman F-statistic values should be higher than 1%, 5%, or 10%. As can be seen in Figure 14, the Durbin score and Wu-Hausman F statistic values are substantially higher than the required significance levels, which means that there is no endogeneity in the model.

Figure 14 – Test for endogeneity

```
. estat endog

  Tests of endogeneity
  Ho: variables are exogenous

  Durbin (score) chi2(1)          =  .002731  (p = 0.9583)
  Wu-Hausman F(1,217)             =  .002682  (p = 0.9587)
```

Results of all tests have shown only the presence of autocorrelation in the model. However, it makes it impossible to run a regression analysis using OLS, Fixed Effect, and Random effect models. Results of the test have shown the necessity of implementing the Feasible Generalized Least Square (FGLS) model for the research.

There will be a 0.51% increase in the average price for apartments for the corresponding region. Similar results have also been illustrated in the research by Jacobsen and Naug (2005), where average income was one of the explanatory variables with the most significant impact on real estate prices (0.12% increase in real estate prices per 1% increase in average income). LGRP has also a positive impact on LPRICE. FGLS regression results in Figure 15 have shown that a 1% increase in the gross regional product leads to a 0.16% increase in the price for an apartment in that region, as it is statistically significant at 1%. It goes along with the findings of Pashardes and Savva (2009), where real estate prices in Cyprus increased from 0.6% to 1.0%, because of an increase in Cyprus GDP. Furthermore, population has a positive effect on the price of apartments. Variable LPOP is statistically significant at 5%, so, under ceteris

paribus, apartment prices in a region rise by 0.14% if there is a 1% increase in the region's population.

Figure 15 – Regression analysis by Feasible Generalized Least Squares (FGLS) model

```
Cross-sectional time-series FGLS regression

Coefficients:   generalized least squares
Panels:         heteroskedastic
Correlation:    common AR(1) coefficient for all panels   (0.8077)

Estimated covariances      =        17      Number of obs      =        221
Estimated autocorrelations =         1      Number of groups   =         17
Estimated coefficients     =         9      Time periods       =         13
                                            Wald chi2(8)       =     587.70
                                            Prob > chi2        =     0.0000
```

LPRICE	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
LINCOME	.5131063	.0860647	5.96	0.000	.3444227	.6817899
LGRP	.1623918	.0485606	3.34	0.001	.0672148	.2575689
LPOP	.1435539	.0690191	2.08	0.038	.008279	.2788288
COVID	-.0424307	.0220871	-1.92	0.055	-.0857206	.0008592
UNEM	.0504617	.0127821	3.95	0.000	.0254093	.0755141
INF	.0033867	.0006269	5.40	0.000	.0021579	.0046155
_IYear_2020	.0185122	.0166247	1.11	0.265	-.0140716	.0510959
_IYear_2021	.0345753	.0119306	2.90	0.004	.0111918	.0579588
_cons	.4886086	.4746746	1.03	0.303	-.4417366	1.418954

Figure 16 – Descriptive statistics

```
. sum LPRICE LGRP LINCOME LPOP INF UNEM COVID _IYear_2020 _IYear_2021
```

Variable	Obs	Mean	Std. Dev.	Min	Max
LPRICE	221	5.278727	.1894499	4.752164	5.759935
LGRP	221	6.380077	.3013543	5.649724	7.282272
LINCOME	221	5.12789	.2150118	4.710456	5.718676
LPOP	221	5.955887	.2335031	5.376635	6.453452
INF	221	1.055428	3.839735	-7.154882	13.55311
UNEM	221	5.086425	.4007906	4.4	7.6
COVID	221	.2307692	.4222815	0	1
_IYear_2020	221	.0769231	.2670743	0	1
_IYear_2021	221	.0769231	.2670743	0	1

The data results (Figure 15) indicated that there is a positive impact of average household income on the average price of an apartment. Variable LINCOME is statistically significant at a 1% significance level. In other words, if the average household income increases by 1%, Capozza et.al. (2002) had similar outcomes in their research, where they discovered a positive correlation between population and house price. Macroeconomic variables, unemployment rate, and inflation rate have positive effects on the real estate market as well. Both variables are statistically significant at 1%. Other variables holding fixed, a 1% increase in unemployment and inflation result in 0.05% and 0.003% increase in regional apartment prices, respectively. Kuang and Liu (2015) report similar results, where there was a positive effect of the inflation rate on apartment prices. A similar tendency to the unemployment rate was in the research conducted by Choi and Painter (2015), where there was a tendency for a decrease in house prices in periods of higher unemployment rates. COVID variable has a p-value of less than 10%, which is considered as weak significance. The time dummy variable for the year 2020 has no effect on the real estate market. On the other hand, the year 2021 is statistically significant at 1%, which means that the time variable 2021 is strongly significant. Real estate prices increased by 0.034% as a result of time-specific events that took place in 2021. Mccord et.al. (2022) reports that there was a huge effect of the year 2021 on the real estate market.

COVID variable has a negative effect on the real estate market. Under ceteris paribus, a 1% increase in COVID-19 rate decreases average apartment price by 0.04%. The following results add up to previous research done on the COVID-19 effect on the real estate market. It means that despite different geographical locations, regression analysis methods, and variables used in the regression model, there is a still negative effect of COVID-19 on average apartment prices. The pandemic significantly decreased in price of real estate.

5. Conclusion

The research has identified the impact of the COVID-19 pandemic and macroeconomic variables on the performance of the real estate market in the Kazakhstani region throughout the period of 2010-22. The COVID-19 pandemic has a significant effect on real estate market performance. The pandemic and its consequences negatively affected real estate market prices. Macroeconomic variables, on the other hand, had a positive and significant impact on the real estate market.

The current study is important in identifying how COVID-19 affects each regional real estate market during the pandemic to assess potential negative consequences. It might serve as an instrument of research not only for Kazakhstani government institutions but also for real-estate market developers.

However, this study has also some limitations. Due to the lack of data on COVID-19 number of diseases in each region of Kazakhstan by year, it is not impossible to identify the numerical effect of the COVID-19 pandemic on the Kazakhstani real estate market. If there is a possibility to use the number of people affected by COVID-19, it would expand the current study from other, more practical perspectives.

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