Analyzing Local Dynamics in House Pricing During COVID-19

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Abstract. Covid-19 has made it possible for people to work from home. As a result, there has been an increase in the demand for space. Since many positions now allow for the possibility of working online, people realize that having a larger space at home is necessary. This paper will use mathematical methods of data analysis and regression analysis in the context of the COVID-19 outbreak to discuss whether California house prices are suffering from an epidemic of infectious diseases.

1 Introduction

Due to the backdrop of the global Covid-19 pandemic outbreak and a series of political events in early 2022, the price of natural gas doubled. Moreover, the cost of many items is also increasing, with raw materials plus labor costs, transportation costs, and all other uncontrollable factors that increase the firm's expense, ultimately causing the plant's supply chain to have been delayed. How can profitability be maintained without sacrificing market competitiveness? The answer many companies give is layoffs. Layoffs have reduced disposable income while affecting real estate development. The majority of Americans do not have six-month emergency savings. Once they lose their jobs, they cannot pay their mortgages, car payments, and all other living expenses. A foreclosure proceeding will be initiated if a person fails to pay their mortgage for three months. However, many workers were sick and had to stay at home. If they can't go to work, they won't have any income. It becomes a vicious circle.

In response to COVID-19's increased inflation, the Federal Reserve has adopted a corresponding monetary policy, which will impact the real estate market. Gene Amromin, Neil Bhutta, and Benjamin J. Keys analyze the market impact in light of the combination of market, institutional, and policy-making factors. Keys, Amromin, and Bhutta emphasize the sensitivity of the market and its ability to predict what the Federal Reserve will do at its next meeting.[1] Before the Federal Reserve announces a change in the federal funds rate, other rates have already changed. As we are experiencing an increase in interest rates because of monetary policy, major financial institutions have long since begun to increase their interest rates.

Typically, home buyers choose a 30-year fixed mortgage, and if interest rates increase, the lender will have to pay back more of the loan. The 2%-3% interest rates during the pandemic make it advantageous for many buyers to purchase a home before interest rates rise. In addition, with constant news reports regarding interest rate increases, people are concerned that interest rates will increase and they will not be able to afford their mortgages, so consumers will choose to obtain a mortgage before interest rates change. However, the Federal Reserve has raised interest rates to maintain price stability and maximize employment, in contrast to inflation, which is the most pressing issue facing the Federal Reserve today, to reduce inflation. So, does this represent a negative development? High interest rates will benefit individuals as well, not just banks. When an individual has a deposit in a bank, the higher the interest rate, the more APY the bank will have to pay every year. The value of investments, such as social security, 401(k) and other retirement plans, can be harmed by inflation. But the interest rate growth has allowed these investments to increase in value. Even though the Federal Reserve continues to raise interest rates, the economic situation is quite positive. A fixed interest rate is applied to home loans taken out by people who have already purchased a home. In this case, the rise of interest rates, for example, 5%-6.5%, will not impact those individuals who locked their mortgage rate at a historical low of <3% in mid-2021. At a median price of $592,000, such increase in mortgage rate will bring significant increase in financial burdens of the buyer. As shown in Table 1, the mortgage rate begins to rise in April 2022. Therefore, only buyers purchasing after April will be affected by these changes. When the mortgage rate is low, such as in October 2020, these buyers will not be affected because the mortgage rate is fixed. Buyers who have applied for a loan are adversely affected by high interest rates, since they are required to pay more interest to the bank. Consequently, when interest rates rise, buyers who are in the market to purchase a house will take advantage of the low rates at that time. The average 30-year fixed mortgage rate can be found in Table.1.

Table 1. 30-year Mortgage Rate in the U.S. by Month

Date	Mortgage Rate
Jan-20	3.65%
Apr-20	3.33%
Jul-20	3.13%
Oct-20	2.88%
Jan-21	2.66%
Apr-21	3.18%
Jul-21	2.98%
Oct-21	2.99%
Jan-22	3.56%
Apr-22	4.72%
Jul-22	5.70%
Oct-22	7.08%

In this paper, we will dissect the recent development in the real estate market by looking at the price dynamics in California to attribute such change to various sociological and demographic factors.

2 Analyzing the impact of COVID-19 on population migration and housing prices from the perspective of urban dynamics

2.1 Imbalanced impact across different ethnic groups.

Emily A. Benfer, Robert Koehler, Alyx Mark, Valerie Nazzaro, Anne Kat Alexander, Peter Hepburn, Danya E. Keene & Matthew Desmond (2022) stated: many black and Hispanic renters in low-income neighborhoods were adversely affected by the pandemic as the cost of housing increased. [2] A spike in unemployment during the first weeks of the pandemic was attributed to massive layoffs, resulting in many tenants being unable to pay their rent. This could result in tenants being evicted by their landlords, resulting in a doubling of homelessness. During a pandemic, the government provides some assistance with rent. The funds, however, are slow to be disbursed and do not solve the rental problem, and not all tenants are eligible to receive subsidies. There is further evidence that housing inflation causes people to have less disposable income due to rent increases.

Data from the United States Census Bureau indicate that African Americans account for 12.4% of the population of California, Asians account for 6%, and Hispanics account for 18.7%. It is reasonable to conclude, based on these data, that ethnicity has specific effects on the region.

The epidemic has led to a depression in the rental market, but the home-buying market shows a different trend. According to Matthew E. Kahn's study of home buyer preferences based on race and ethnicity across geographical locations, Asians and Hispanics are more likely to purchase homes in California, and home prices increase at varying rates across zip codes (different regions). [3] It also concludes that the average difference in loans between racial and ethnic groups is minimal. Kahn claims that more Asians and Hispanics are purchasing homes in California,[3] which indicates that California attracts many immigrants and workers who wish to stay and work there.

It is worth noting that the rise in home prices in high-priced areas is not an artifact of the economic boom during the epidemic. A study by Kilian Heilmann and Matthew E. Kahn on crime rates and temperature in Los Angeles found that the relationship between temperature and crime is more pronounced in low-income communities, while wealthy communities are unaffected. Heilmann and Kahn's findings demonstrate that people move to affluent neighborhoods to live a more secure life. [4] Although there is a higher cost of living in affluent neighborhoods, these neighborhoods are more livable, and the value can appreciate. Therefore, even if there is an increase in home prices in affluent neighborhoods, it can be considered a regular appreciation, not a bubble.

2.2 Spillover effects between urban areas due to the COVID-19 pandemic

People's lifestyles have changed significantly due to Covid-19, but some have been negative. A study by John A. Mondragon and Johannes Wieland published in 2022 in the NBER discusses the effects of remote work on housing demand. Mondragon and Wieland stated that

"Based on our cross-sectional estimates controlling for migration spillovers, we argue that remote work accounts for at least one-half of the 24% increase in house prices from December 2019 to November 2021. While remote work also facilitated migration across cities, which was correlated with house price growth, most of the effect of remote work on house prices across CBSAs is due to the direct effects of the shift in demand." [5]

During the Covid pandemic, many people recognized the need for residential space due to the widespread use of remote work. Having enough space in a living environment became apparent to more people as a necessity. Mondragon and Wieland mention the facilitation of cross-city migration due to remote work. [5] Remote work makes people realize that transportation to work is independent of where they live. People with a limited budget may consider buying a house in a neighboring city farther away and cheaper. The price of homes in nearby cities will also increase due to this.

Different studies illustrate the same issues. Jan Brueckner, Matthew E. Kahn, and Gary C. Lin examine the impact of work from home on the housing market.[6] The authors conclude that prices and rents of city houses fluctuate due to supply and demand, and WFH leads to a decline in housing prices and rents in high-productivity regions. It should be noted, however, that a change in the house price in a particular city may not necessarily result in a decrease in the house price in surrounding cities.

2.3 The diversity of housing needs generated by WFH

In a study published in 2021 by Christopher T. Stanton and Pratyush Tiwari, the authors examine the housing differences among households with and without remote work.[7] Compare these households' housing costs before and after the Covid pandemic. Companies benefit from remote work because it reduces the cost of office space. On the other hand, remote workers require more space to complete their work. According to Stanton and Tiwari, this time of year is difficult for remote workers. Housing prices have increased, making it more difficult for them to own a house with more space, and government and company subsidies can only help a little.

3 Data Analysis and Chart

3.1 Describing the Data Intuitively

The following graph (see Fig. 1) illustrates the trend in housing prices in Los Angeles County from January 2018 to June 2022. Until March 2020 (the start of the COVID pandemic), home prices in LA County have been relatively stable and regular. Every year, home prices reach their lowest point in January and December and peak in the summer months, especially June and August. A parabola can be seen in the graphs for 2018 and 2019. Therefore, we can assume that Californian home sales are seasonal. However, after March 2020 (when the Covid pandemic broke out in the United States), house prices did not go up as expected in April and May. The housing market rebounded in June (the start of the summer) and continued to grow until November. Despite a smaller winter price pullback, home prices showed a seasonal pattern. After the covid pandemic was properly controlled in 2021, home prices rose significantly in the spring but remained flat during the summer. This year's prices did not significantly decline as opposed to previous winters. The housing price curves in these other five California counties, San Francisco, Sacramento, San Jose, Bakersfield, and San Diego, are similar to those in Los Angeles County with only a difference in magnitude.

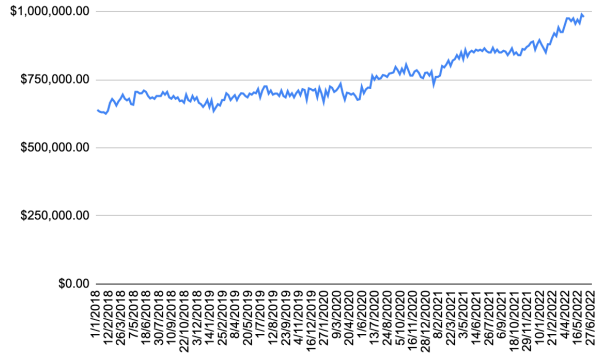

Fig. 1. Los Angeles median sales price VS Date

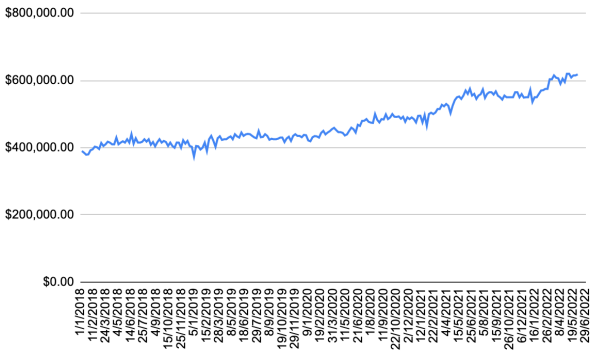

Fig. 2. Sacramento median sales price VS Date

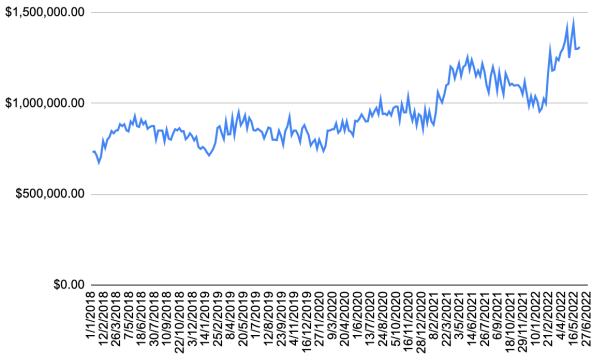

Fig. 3. San Francisco median sales price VS Date

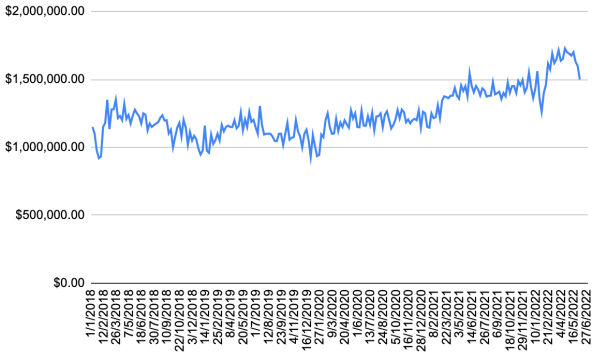

Fig. 4. San Jose median sales price VS Date

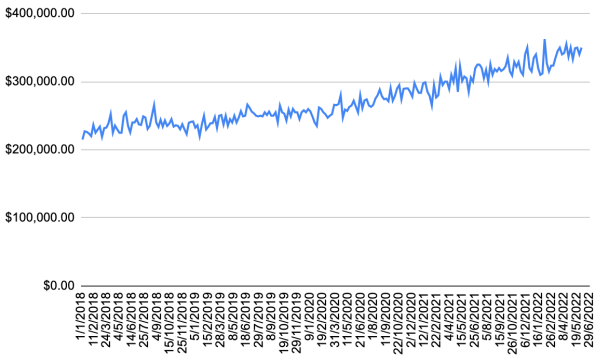

Fig. 5. Bakersfield median sales price VS Date

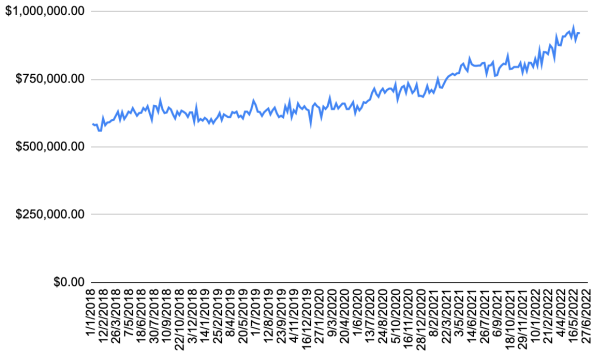

Fig. 6. San Diego median sales price VS Date

3.2 Price time series

To verify that the assumption of section 1 is correct, we used the first difference of time series (Y_t-Y_{t-1}) to prove the graph of the six regions above. The results of this study support the hypothesis I presented in section 1, that housing prices fluctuate according to the season. As can be seen in Figure 1 to Figure 6, the first difference of median housing price versus date has a random distribution around the mean. A closer look at (Fig.2) reveals that Sacramento's median sales price first difference VS date is also distributed around the mean but is more symmetrical. Figures 7 to 12, however, do not appear to be completely random but rather show a strong seasonal pattern.

To ensure the accuracy of the statistical sample and other variances, the first difference of time series stationary test was conducted on all of my test data, which included median housing prices for six regions in California between January 2018 and June 2022, interest rates between January 2018 and June 2022, and total COVID cases in California.

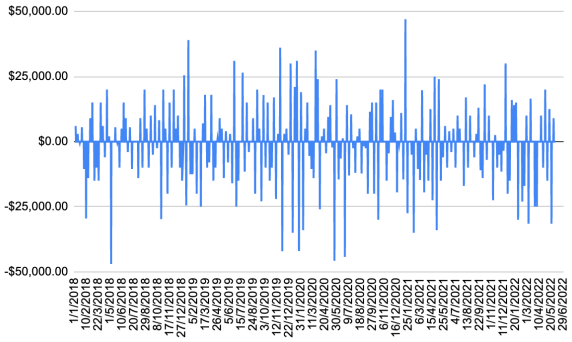

Fig. 7. Los Angeles median sales price first difference VS Date

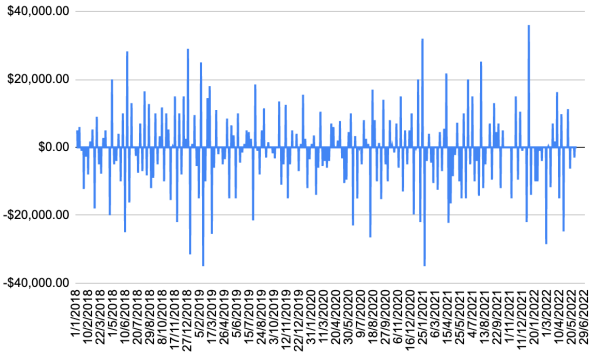

Fig. 8. Sacramento median sales price first difference VS Date

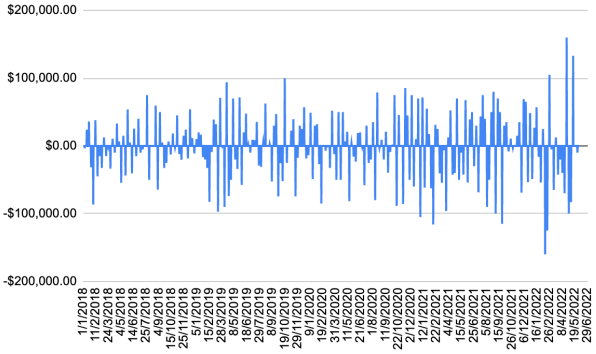

Fig. 9. San Francisco median sales price first difference VS Date

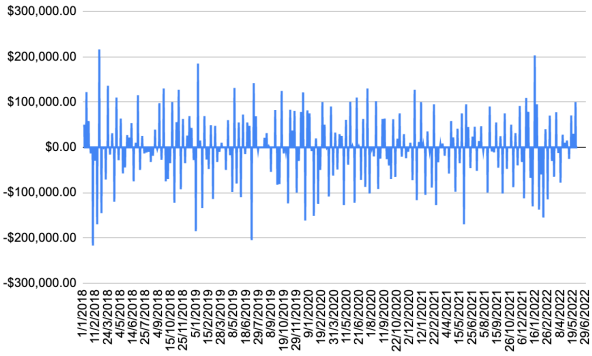

Fig. 10. San Jose median sales price first difference VS Date

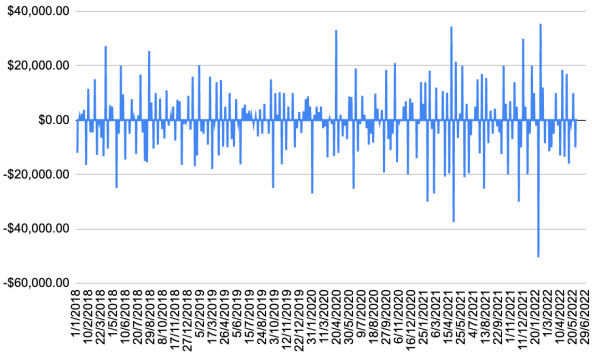

Fig. 11. Bakersfield median sales price first difference VS Date

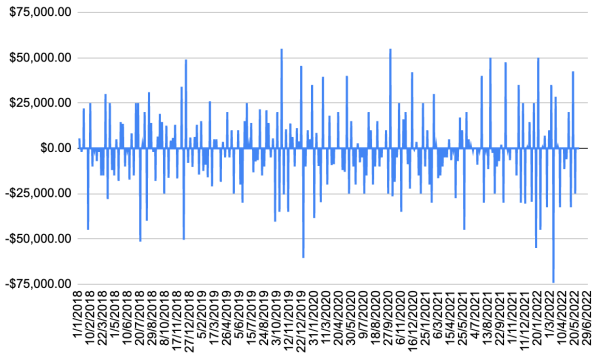

Fig. 12. San Diego median sales price first difference VS Date

3.3 Price vs. Interest Diff

Tables 2 through 7 present the first difference in median sales price versus the first difference in interest rate for the six California regions of Los Angeles, Sacramento, San Francisco, San Jose, Bakersfield, and San Diego.

We can observe from table 2 that the correlation between the median sales price and interest rate in Los Angeles is about $R^2 = 0.004$, meaning that the change in median sales prices and the change in interest rates can explain approximately 0.04% of the growth in house prices. It is also evident that there is little or no relationship between these variables, as the Multiple R = 2%. The p-value =0.76 is too high and is not statistically significant.

Table 2. Los Angeles median sales price first difference VS Interest rate first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.02006009
R Square	0.00040241
Adjusted R Square	-0.0039818
Standard Error	16931.2861T
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	26312080.2	26312080.2	0.09178576	0.76219533
Residual	228	6.536E+10	286668450		
Total	229	6.5387E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1461.7009	1118.54688	-1.3067856	0.19260206	-3665.7117	742.309761	-3665.7117	742.309761
X Variable 1	-421823.02	1392331.45	-0.3029616	0.76219533	-3165305.2	2321659.17	-3165305.2	2321659.17

In contrast, Table 3 illustrates that the multiple correlation between the median sales price and interest rate in Sacramento is 0.1516 and that about 2.30% of the increase in house prices can be explained by the change in the median sales price and interest rate. In our analysis, we use the national interest rate, which means a strong correlation exists between the rise in the housing price and the change in the median sale price and interest rate. The p-value is approximately 0.0215. Thus, there is a statistically significant correlation between the change in the median sale price and interest rate in Sacramento and the increase in house prices. House prices are correlated with each other.

Table 3. Sacramento median sales price first difference VS Interest rate first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.15155408
R Square	0.02296864
Adjusted R Square	0.01868341
Standard Error	153440.899
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.262E+11	1.262E+11	5.35996064	0.02149328
Residual	228	5.3681E+12	2.3544E+10		
Total	229	5.4943E+12			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	941845.617	10136.905	92.9125428	3.32E-183	921871.625	961819.61	921871.625	961819.61
X Variable 1	29212896.5	12618095.8	2.31515888	0.02149328	4349907.9	54075885.2	4349907.9	54075885.2

In reviewing Tables 4 to 7, it becomes evident that the results for these other four regions are very similar to the data obtained for the Los Angeles region. Therefore, the same result is available for San Francisco, San Jose, Bakersfield, and San Diego. In all five regions except Sacramento, there is no correlation between house price increases, median sales, and interest rates.

Table 4. San Francisco median sales price first difference VS Interest rate first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.04565201
R Square	0.00208411
Adjusted R Square	-0.0022736
Standard Error	50548.3684
Observations	231

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1222012399	1222012399	0.47825699	0.4899134
Residual	229	5.8513E+11	2555137545		
Total	230	5.8635E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-2619.222	3329.94642	-0.7865658	0.43234929	-9180.4728	3942.0288	-9180.4728	3942.0288
X Variable 1	-668741.18	967002.063	-0.6915613	0.4899134	-2574100.1	1236617.72	-2574100.1	1236617.72

Table 5. San Jose median sales price first difference VS Interest rate first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.04410004
R Square	0.00194481
Adjusted R Square	-0.0024326
Standard Error	78816.4539
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2759892205	2759892205	0.44428161	0.50573702
Residual	228	1.4163E+12	6212033411		
Total	229	1.4191E+12			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1307.61	5206.92271	-0.2511291	0.80194045	-11567.451	8952.23129	-11567.451	8952.23129
X Variable 1	-4320149.2	6481411.22	-0.6665445	0.50573702	-17091272	8450973.81	-17091272	8450973.81

Table 6. Bakersfield median sales price first difference VS Interest rate first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.01459723
R Square	0.00021308
Adjusted R Square	-0.004172
Standard Error	12883.6256
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	8065745.61	8065745.61	0.0485924	0.82572822
Residual	228	3.7845E+10	165987808		
Total	229	3.7853E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-598.53235	851.142615	-0.7032104	0.48264207	-2275.6435	1078.5788	-2275.6435	1078.5788
X Variable 1	233547.351	1059475.16	0.22043683	0.82572822	-1854067.1	2321161.79	-1854067.1	2321161.79

Table 7. San Diego median sales price first difference VS Interest rate first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.09189975
R Square	0.00844556
Adjusted R Square	0.00409664
Standard Error	22098.1132
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	948325377	948325377	1.94198998	0.16480953
Residual	228	1.1134E+11	488326608		
Total	229	1.1229E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1328.8291	1459.88765	-0.910227	0.36366407	-4205.4256	1547.76734	-4205.4256	1547.76734
X Variable 1	-2532394.6	1817221.55	-1.393553	0.16480953	-6113090.1	1048300.94	-6113090.1	1048300.94

3.4 Price vs. COVID cases count

Due to the sudden increase in house prices following the pandemic, we ran another regression test with the median sales price first difference and the California COVID cases first difference. Tables 8 through 13 show the results of the regression tests for the six California regions and California's total COVID cases.

The regression test results for LA county are shown in Table 8. The multiple correlation between the median sales price in LA county and the total number of COVID cases in California is Multiple R = 0.0421. The median sales price and COVID cases can explain approximately 0.1773% of the increase in house prices. Considering the p-value=0.52519158, it is evident that the increase in house prices in California is not correlated with the rise in median sales prices and total COVID cases.

Table 8. Los Angeles median sales price first difference VS California covid cases first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.04210543
R Square	0.00177287
Adjusted R Square	-0.0026053
Standard Error	16919.6756
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	115921978	115921978	0.40493164	0.52519158
Residual	228	6.5271E+10	286275424		
Total	229	6.5387E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1766.9803	1201.82427	-1.4702485	0.1428731	-4135.0827	601.122124	-4135.0827	601.122124
X Variable 1	0.00677953	0.01065391	0.63634239	0.52519158	-0.0142132	0.02777224	-0.0142132	0.02777224

In line with my expectations, the multiple correlation and other data results for Sacramento, San Francisco, San Jose, Bakersfield, and San Diego were similar to those for the Los Angeles regions. There is a minimal correlation between house price growth and COVID cases. Although we believe that remote work increased the demand for housing during the pandemic, leading to an increase in house prices. The results of this regression test indicate that the increase in house prices is not correlated with the pandemic. As a result, we can also assume that housing prices would not be negatively affected by the end of the pandemic.

Table 9. Sacramento median sales price first difference VS California covid cases first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.00752224
R Square	5.6584E-05
Adjusted R Square	-0.0043291
Standard Error	11944.5522
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1840746.51	1840746.51	0.01290192	0.90966546
Residual	228	3.2529E+10	142672327		
Total	229	3.2531E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-955.46993	848.435455	-1.1261551	0.26128381	-2627.2468	716.306966	-2627.2468	716.306966
X Variable 1	-0.0008543	0.00752119	-0.1135866	0.90966546	-0.0156742	0.01396563	-0.0156742	0.01396563

Table 10. San Francisco median sales price first difference VS California covid cases first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.03360988
R Square	0.00112962
Adjusted R Square	-0.0032514
Standard Error	50683.0477
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	662346372	662346372	0.2578456	0.612095
Residual	228	5.8568E+11	2568771325		
Total	229	5.8634E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-3195.5057	3600.07591	-0.8876218	0.37567963	-10289.179	3898.1674	-10289.179	3898.1674
X Variable 1	0.01620539	0.03191388	0.50778499	0.612095	-0.0466785	0.07908924	-0.0466785	0.07908924

Table 11. San Jose median sales price first difference VS California covid cases first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.02973619
R Square	0.00088424
Adjusted R Square	-0.0034978
Standard Error	78858.3195
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1254829674	1254829674	0.2017854	0.65371026
Residual	228	1.4178E+12	6218634562		
Total	229	1.4191E+12			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-2457.351	5601.39829	-0.4387031	0.66129208	-13494.476	8579.77413	-13494.476	8579.77413
X Variable 1	0.02230536	0.04965517	0.4492053	0.65371026	-0.0755363	0.12014705	-0.0755363	0.12014705

Table 12. Bakersfield median sales price first difference VS California covid cases first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.02898966
R Square	0.0008404
Adjusted R Square	-0.0035419
Standard Error	12879.583
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	31811914.7	31811914.7	0.19177244	0.66186008
Residual	228	3.7821E+10	165883659		
Total	229	3.7853E+10			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-735.92632	914.851783	-0.8044214	0.42199164	-2538.5715	1066.71885	-2538.5715	1066.71885
X Variable 1	0.0035515	0.00810996	0.43791831	0.66186008	-0.0124286	0.01953155	-0.0124286	0.01953155

Table 13. San Diego median sales price first difference VS California covid cases first difference

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.01827574
R Square	0.000334
Adjusted R Square	-0.0040505
Standard Error	22188.3176
Observations	230

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	37504103.1	37504103.1	0.07617808	0.78279517
Residual	228	1.1225E+11	492321438		
Total	229	1.1229E+11			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1292.5984	1576.06204	-0.8201444	0.41299039	-4398.1076	1812.91079	-4398.1076	1812.91079
X Variable 1	-0.0038562	0.01397144	-0.2760038	0.78279517	-0.0313858	0.02367349	-0.0313858	0.02367349

Essentially here we are saying no meaningful correlation is identified from the regression analysis.

4 Conclusion

In the long run, the Fed's interest rate change will not significantly impact California home prices. It is certain, however, that home prices will decline in the short term due to some factors related to policy and the seasonal pattern. So, in the second half of 2022, California home prices will undoubtedly start to decline until the summer of 2023 (around May-June), which will begin to rise steadily and slowly. Prices will not stop falling in January because of the current monetary policy and our current economic environment. The Federal Reserve will likely raise interest rates at some point in the future. Recently, we have noticed that inflation has begun to control and until the writing of this paper (early September) oil prices were much lower than they were in June and the economy is recovering. This is a good indication that the housing price rebound may occur sooner than my assumption (May-June).

At the end of October as I revise this paper, we noticed that California's real estate market has cooled. However, many home prices remain higher than they were before the pandemic. As predicted, housing prices have fallen in recent months.

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Data details: median price of existing single-family homes
Data2: https://www.car.org/marketdata/data/housingdata
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2) YCharts
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3) Centers for Disease Control and Prevention
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4) Freddie Mac
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6)State of California Department of Finance
https://dof.ca.gov/forecasting/economics/economic-indicators/income/
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7)FRED economic Data/ St. Louis Fed
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Dataset1: median sale price
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Appendix