

An Analysis on the Impact of Pandemic on Home Prices

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Executive Summary

Our group is analyzing the housing market between January 2018 and July 2023. We will be comparing home prices from different time periods (pre-pandemic, during, and post-pandemic) to understand how the housing market was impacted nationwide. We will analyze, at a regional level, to determine how families across different cities and states in the United States were impacted differently.



Time Periods: Pre-Pandemic: 2018-2020 During Pandemic: 2020-2021 Post-Pandemic: 2022-2023



Overview of Data Collection, Cleanup & Exploration Processes



Data Collection:

1. Website used for downloading data: <https://www.zillow.com/research/data/>
2. Data downloaded:
 - a. For-Sale Inventory (*Smooth, All Homes, Monthly view*): The unique count of active listings.
 - b. Median List Price (*Smooth, All Homes, Monthly view*): The median price at which homes were listed.
 - c. Median Sale Price (*Smooth, All Homes, Monthly view*): The median price at which homes were sold.
 - d. Median Sale to List Ratio (*Smooth, All Homes, Monthly view*): Ratio of median sale to list prices.

Definition:

All homes: It refers to single-family, condominium and co-operative homes with a county record.

Smooth- Data compiled by removing unwanted noise or behaviors.

Monthly view: Monthly data was presented.

Data Cleanup

1. All CSV files had data for each month. All of our csv files had RegionID, SizeRank, RegionName, RegionType & StateName.
2. Data Cleansing: Data sets were cleaned by first extracting the data by our desired RegionName (for eg. Austin), and then transposing the data from rows to columns. Fortunately there were no missing data.

RegionID	SizeRank	RegionName	RegionType	StateName	2018-03-31	2018-04-30	2018-05-31	2018-06-30	2018-07-31	2018-08-31	2018-09-30
102001	0	United States	country		1421528.0	1500193.0	1592414.0	1660614.0	1709143.0	1733388.0	1723098.0
394913	1	New York, NY	msa	NY	73707.0	80345.0	85864.0	90067.0	91881.0	91252.0	90050.0
753899	2	Los Angeles, CA	msa	CA	21998.0	23784.0	25605.0	27109.0	28811.0	29874.0	30428.0
394463	3	Chicago, IL	msa	IL	38581.0	42253.0	45757.0	47492.0	48984.0	49782.0	49630.0
394514	4	Dallas, TX	msa	TX	24043.0	25876.0	28225.0	30490.0	32408.0	33567.0	33512.0
394692	5	Houston, TX	msa	TX	25618.0	27360.0	29634.0	31129.0	32397.0	32911.0	32423.0
395209	6	Washington, DC	msa	VA	20262.0	23466.0	26180.0	26325.0	25145.0	23728.0	23421.0
394974	7	Philadelphia, PA	msa	PA	24797.0	26773.0	28663.0	29743.0	29468.0	28691.0	27833.0

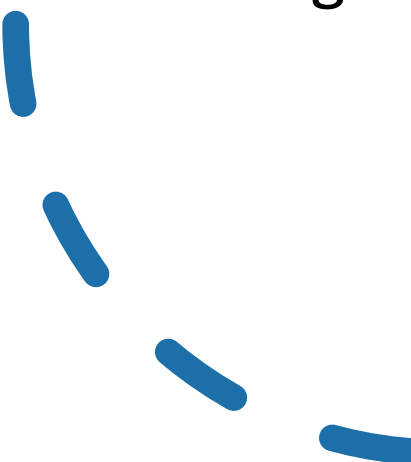
date	median_list_price
2018-03-31	362567.0
2018-04-30	367600.0
2018-05-31	370717.0
2018-06-30	372084.0
2018-07-31	371751.0
...	...
2023-02-28	509954.0
2023-03-31	514967.0
2023-04-30	531300.0
2023-05-31	542967.0
2023-06-30	549633.0

Data exploration

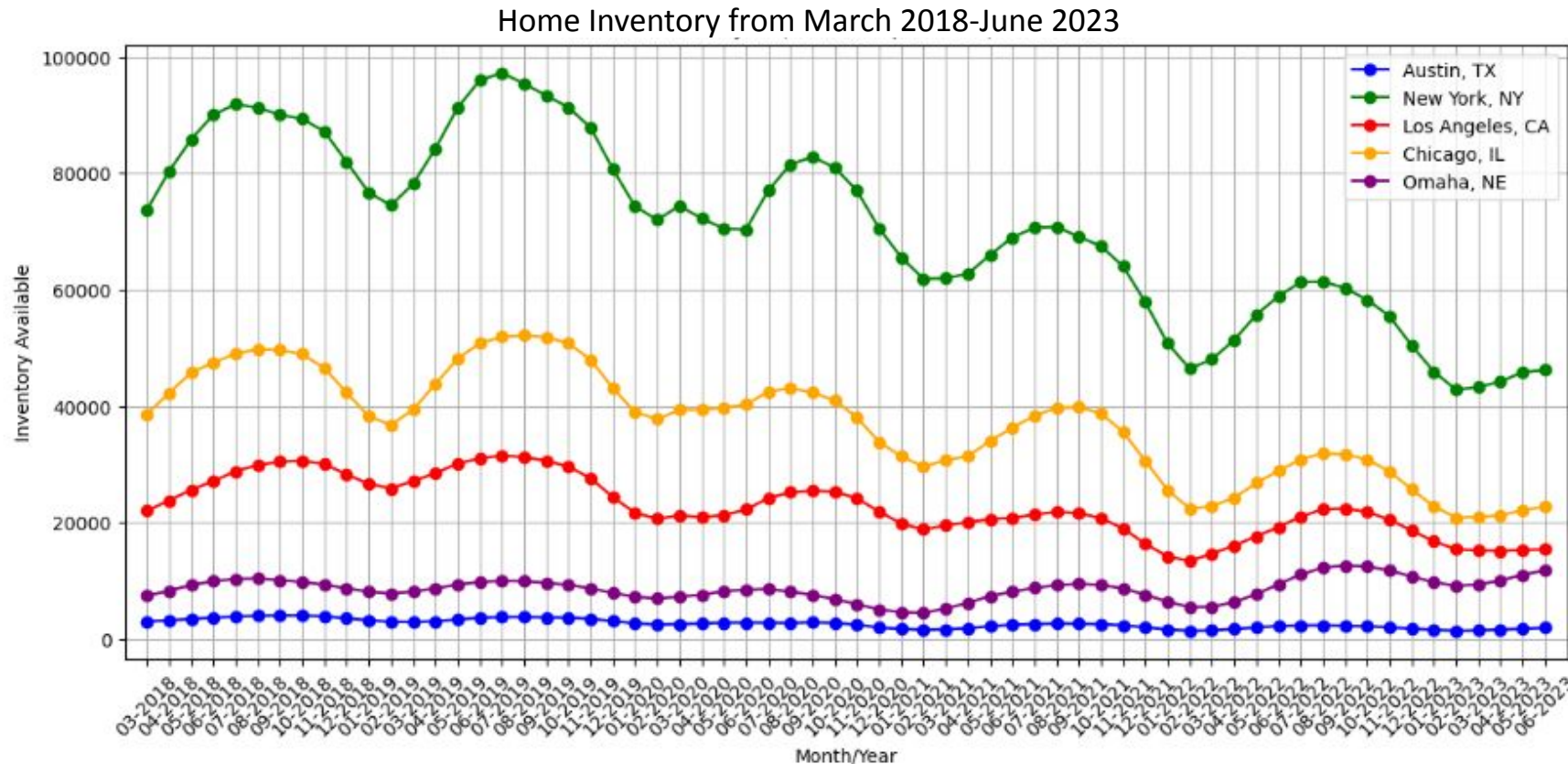
- We explored the data for five major cities: Austin, Omaha, New York, Chicago, & Los Angeles.
- We started with a scatter plot to see the datasets.
- Then we used the line and bar graphs for visualization.
- We also did Linear regression analysis and Independent t-test of median list price and median sale price.



The approach our group took to achieve the project goals

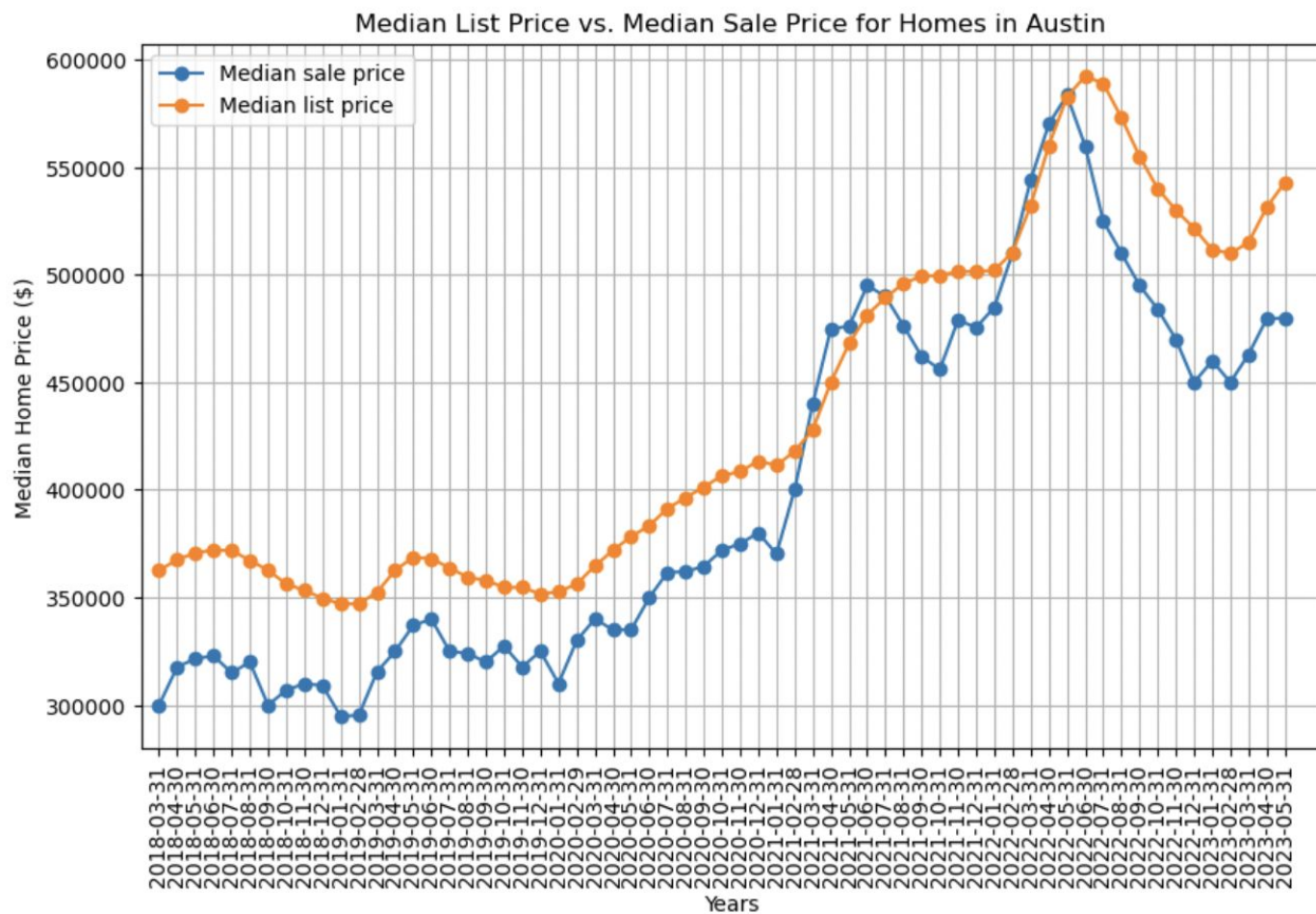
- We decided on what we wanted to analyze (list price, sale price, inventory & sale to list ratio)
 - We assigned each analysis among our group members.
 - We created a Github repository that had all the data sets.
 - Each members of the team did their analysis and were able to merge their code to the repository.
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Result/ Conclusions



Key observations:

- Interest rates were really low during Pandemic
- June-2019 had a sharp increase of people selling their homes. The inventory grew in all regions
- Builders = Building less
- Investors = Buying more
- Not much inventory available in Austin, Texas compared to New York.



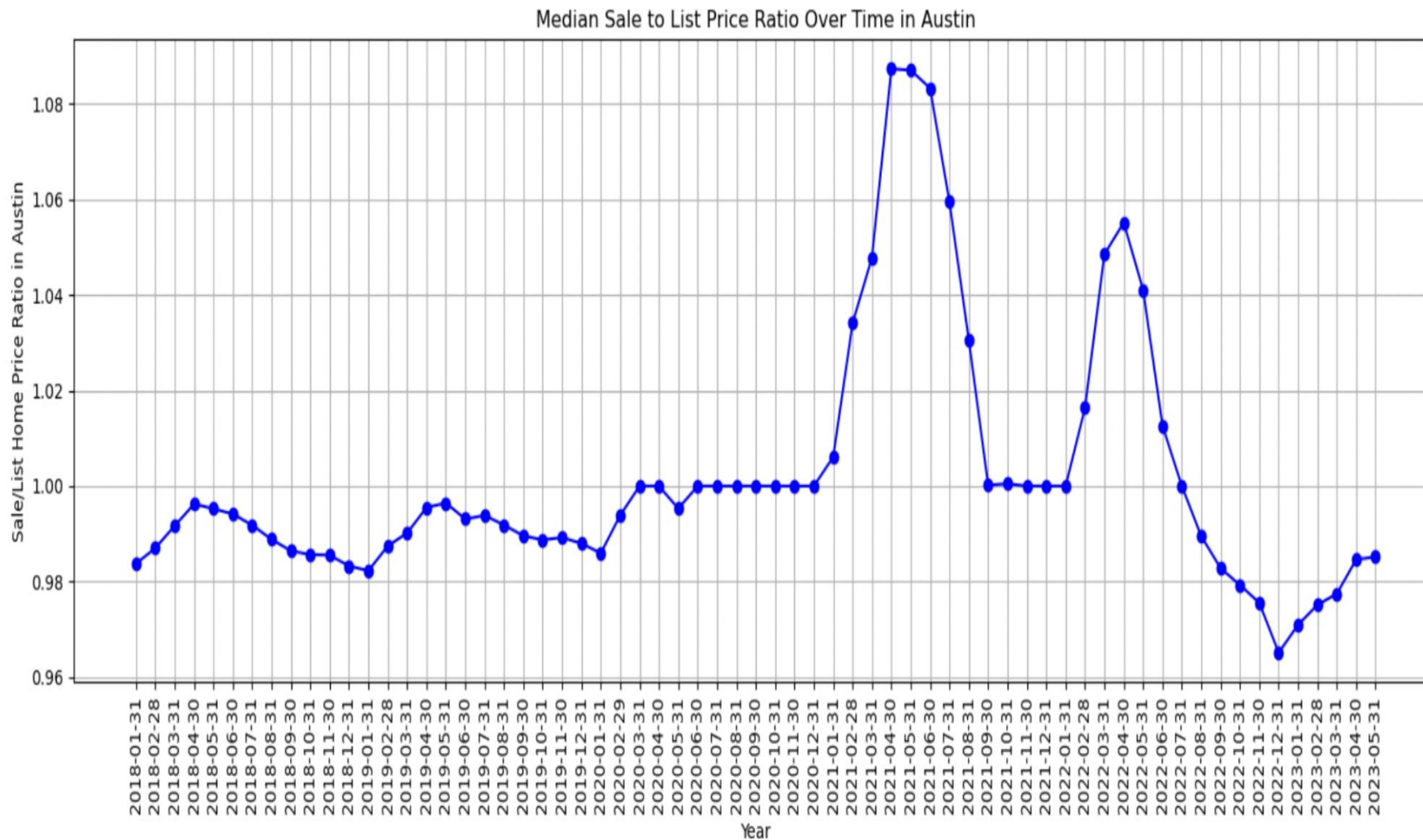
Key observations:

- From 02/2021 - 8/2021 & from 02/2022- 5/2022 people started paying more than the list price.
- House price doubled in value in 3/2022 from 2018.
- Independent T-test of Median List price and Median Sale price resulted into:
T-statistic: 10.814044159056538
P-value: 1.4899235546206616e-22

There is a statistically significance difference between the median list price and median sale price in Austin, TX.

- Linear Regression results:**
Coefficient (Median list price): 47117.97287878784
Intercept (Median list price): -94786932.42070068
R-squared (R^2) value (Median list price):
0.8294861903931595

Coefficient (Median Sale price): 21315.641089499208
Intercept (Median Sale price): -42680688.96828908



Recap:

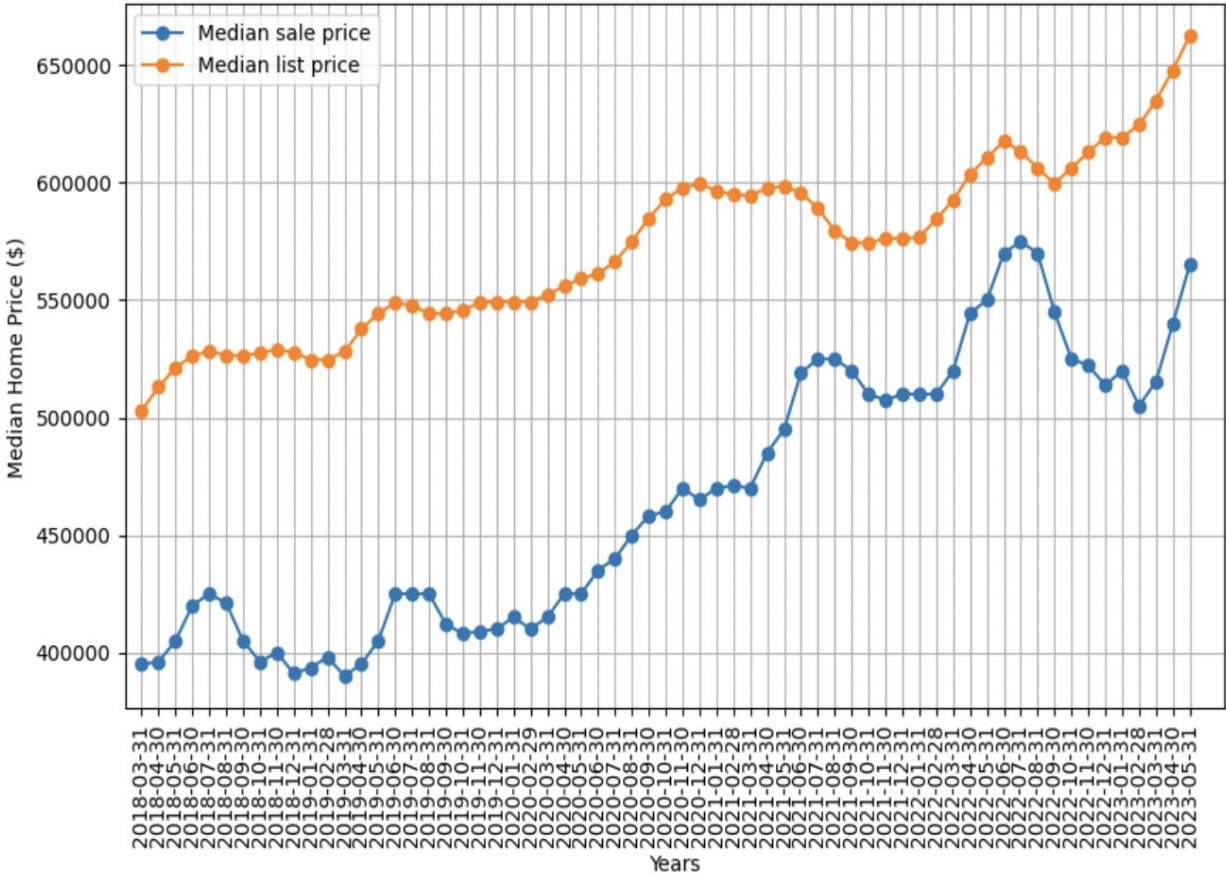
In Median list vs Median sale graph, We found that people started paying more than the list price from 02/2021 - 8/2021 & from 02/2022- 5/2022

Key observations:

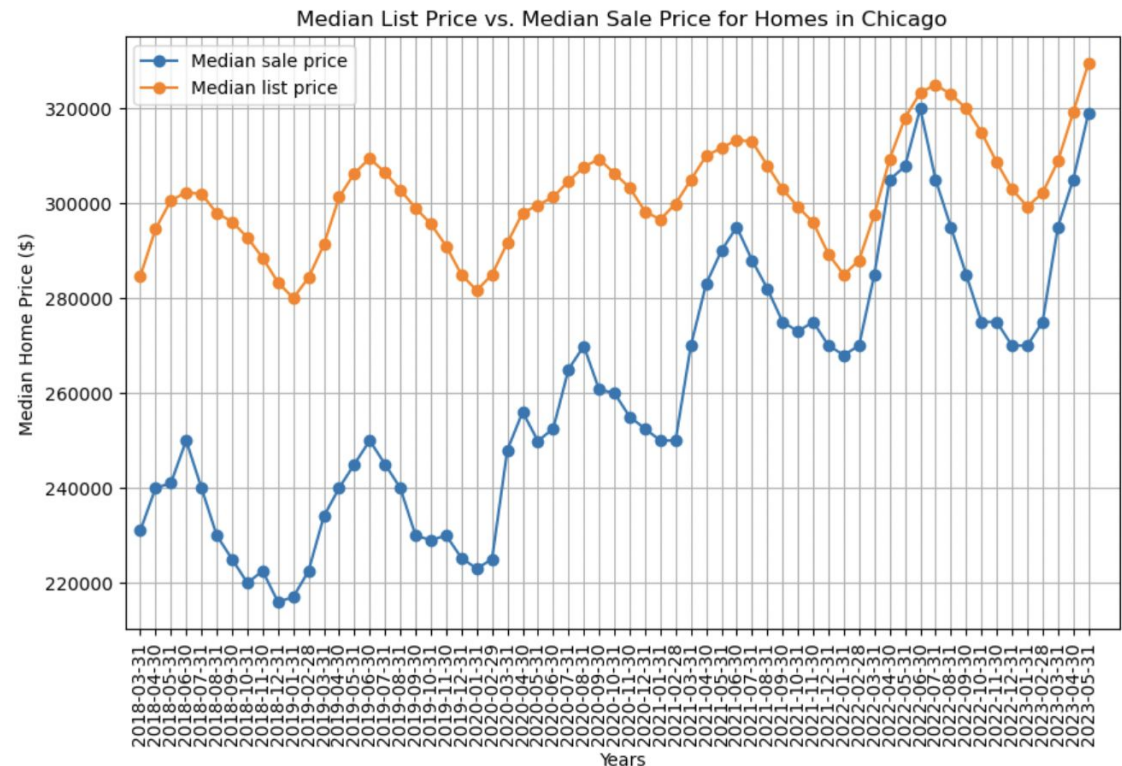
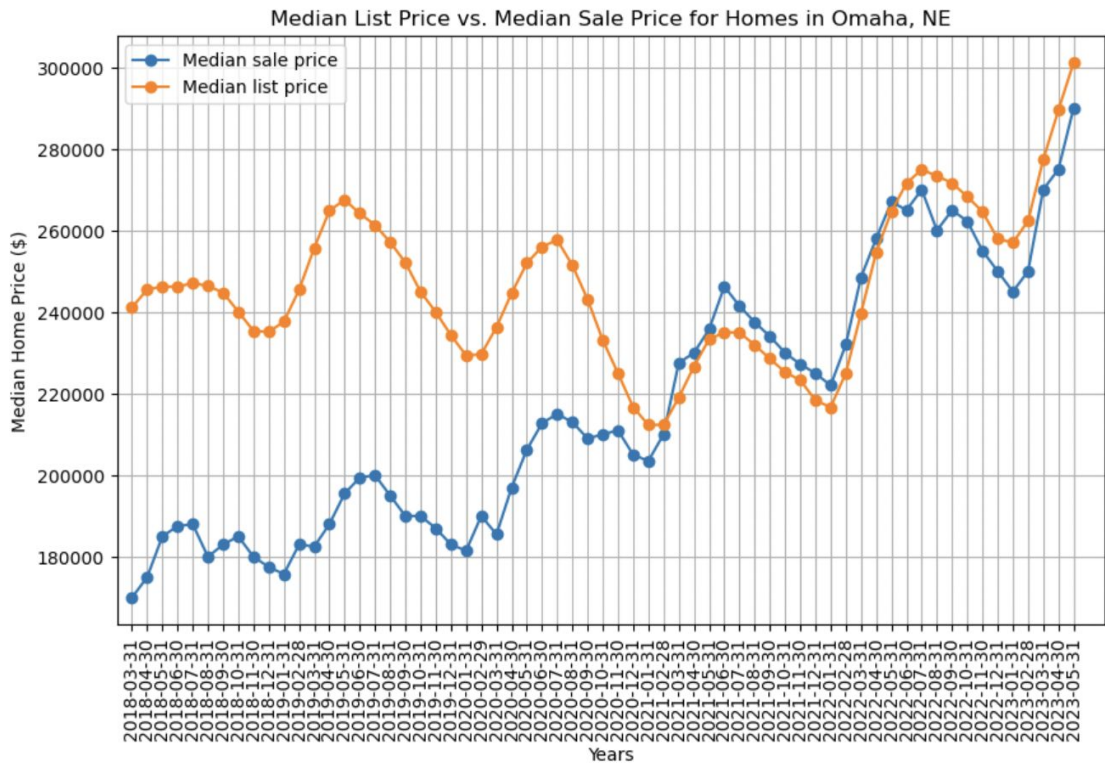
- From December of 2020 till August of 2021, people started paying more than the list price.
- Then it calmed down but people started paying more between Feb,2022 till June,2022
- April of 2021 was the month when people were paying the most above the list price by 8%

Median List Price vs. Median Sale Price in New York and Los Angeles

Median List Price vs. Median Sale Price for Homes in New York

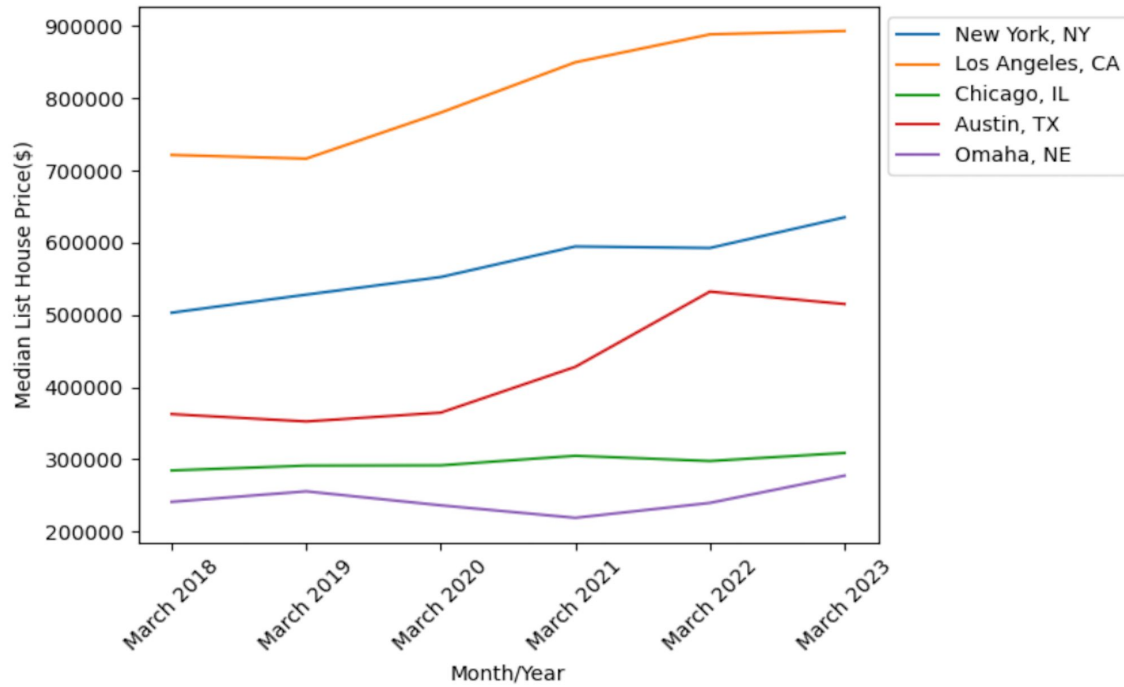


Median List Price vs. Median Sale Price in Omaha and Chicago

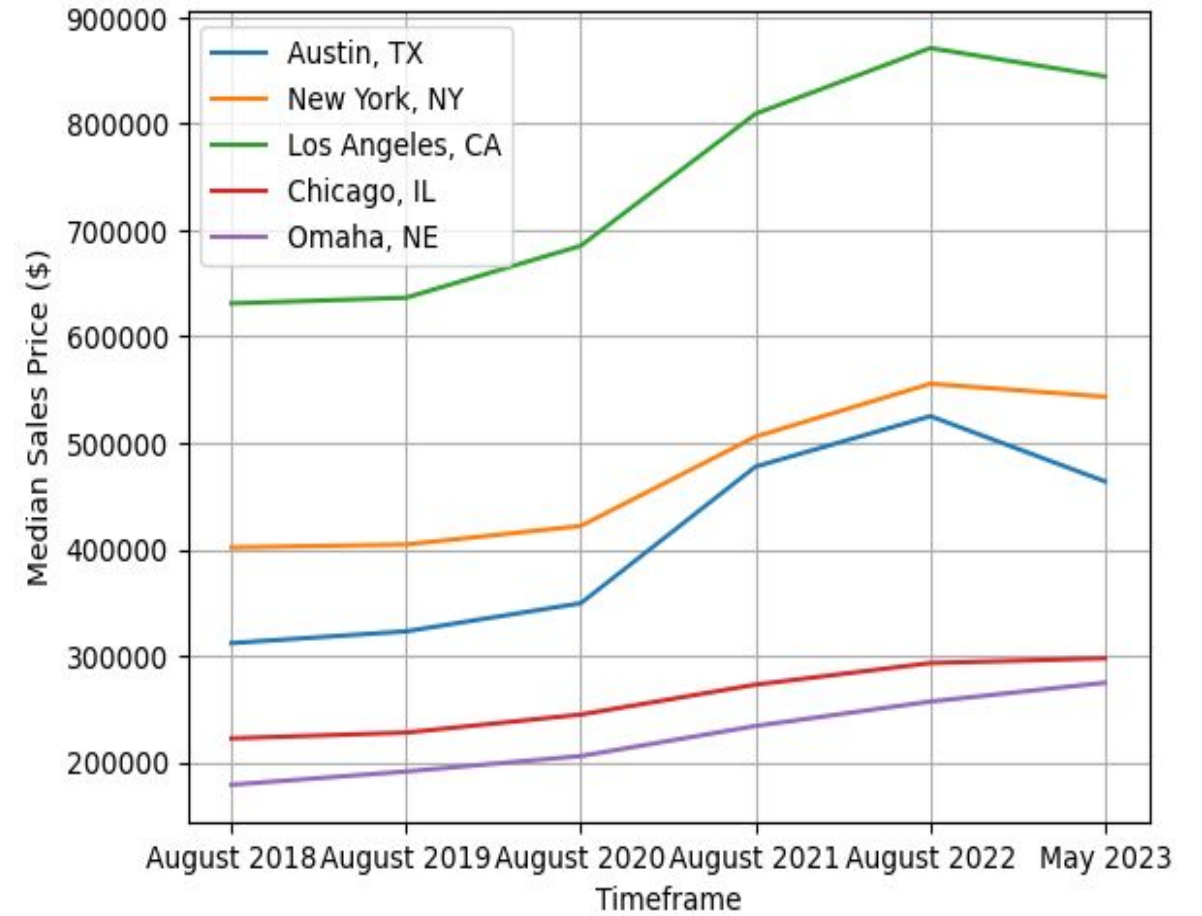


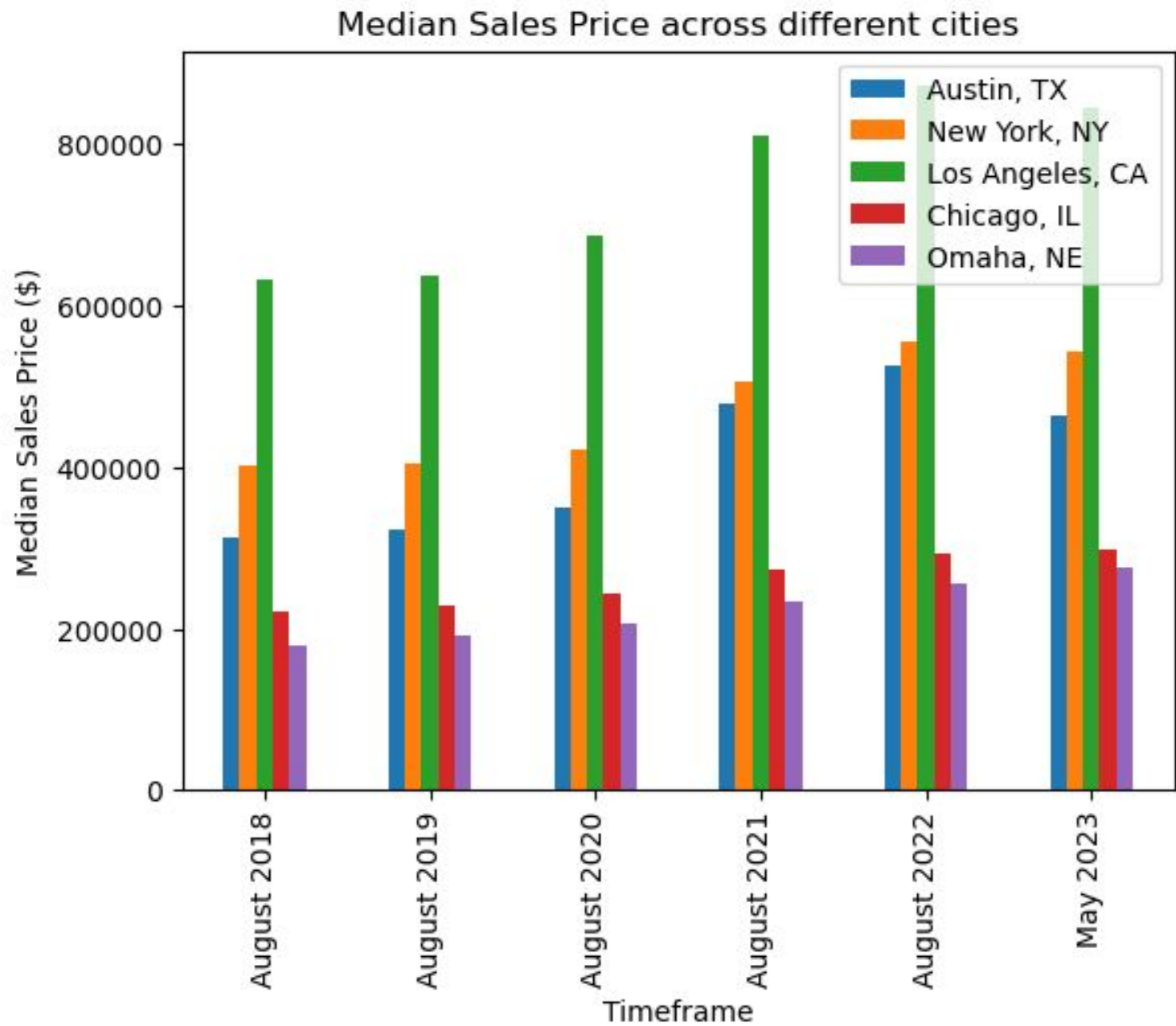
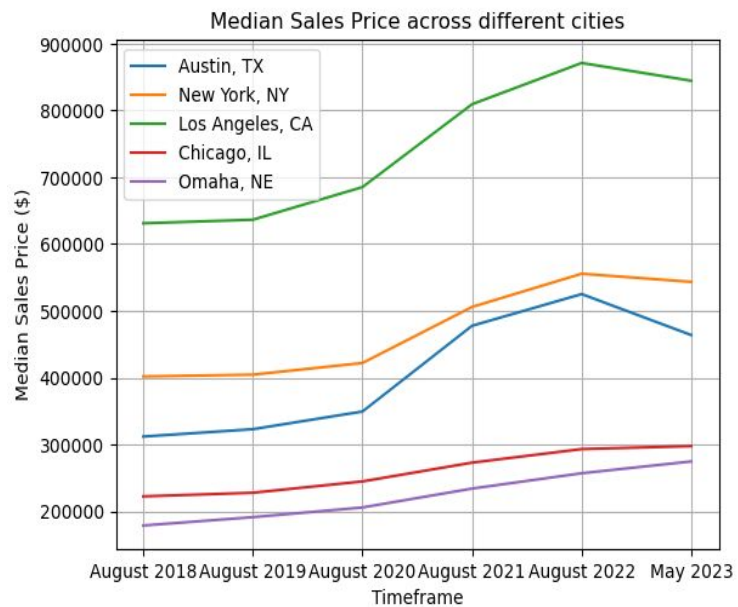
Median Sale and List Prices in 5 States

Median List Prices across different cities



Median Sales Price across different cities





2023 Average Median Sales Price in 926 Cities Across United States

Least Expensive Cities	Most Expensive Cities
Clewiston,FL (\$55,377.83)	Vineyard Haven, MA (\$2,145,166.66)
Macomb, IL (\$74,738.83)	Edwards, CO (\$1,586,222.16)
Selma, AL (\$85,652.66)	Jackson, WY (\$1,430,333.50)
Johnston, PA (\$92,530.66)	San Jose, CA (\$1,404,324.50)
Marion IN (\$95,383.50)	Kappa, HI (\$1,393,110.50)

2023 Average Median Sales Price



Cities of Median Sales Prices Listed in Zillow

Reflections of 2023 Median Sales Price

- **2023 Median Sales Price:** \$254,714.00
- Less than 1% of homes are worth less than \$100,000
- Less than 2% of the homes are worth over a million dollars
- Despite the national median sales house price in 2023 being \$254,714, it is difficult for the average American family to purchase a home because the **national median household income is \$70,784** according to the most recent U.S. Census Bureau Current Population Survey for 2021
- Considering the national median household income to purchase a home three times their annual income and assuming that the homeowner has a good credit score, bank loan approved, 20% down payment, 7.423% interest, and other monthly expenses outside of monthly mortgage (ex. student loans, car payments, food, etc.), the **average American cannot afford to purchase a home worth the median sales price and live comfortably in 2023.**

Limitations

- Data set does not include ALL cities
- In the cheapest cities across the United States, there is no change in median price between months this year
- Unable to see the the number of houses available in each city, how big the house, household amenities

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Did the Pandemic affect Housing Prices in the United States?

YES!

- While buyers are generally still paying below asking price, the Pandemic **DID** affect increasing home prices
- Home prices are increasing and are forecasted to continue the same path
- Supply chains were impacted and left many people “waiting” for their dream home

Potential next steps for the project

- Prediction:
 - Future house prices based on the size of the house, inventories, time, etc.
 - We can also predict when a homeowner is willing to put a home in the market by further analyzing the data.
 - Compare median national household income with the median sales prices to see future trends in house sales
- Solving the Housing Crisis: We can further use this information to find other affordable opportunities in the United States, and come up with solutions to solve the housing crisis.

Works Cited

Helhoski, A. (n.d.). *What is the median household income?*. NerdWallet.

<https://www.nerdwallet.com/article/finance/median-household-income#:~:text=The%20national%20median%20household%20income,to%20over%20%24150%2C000%20in%20others.>