MINI PROJECT 1
HOUSE PRICES AND POPULATION GROWTH

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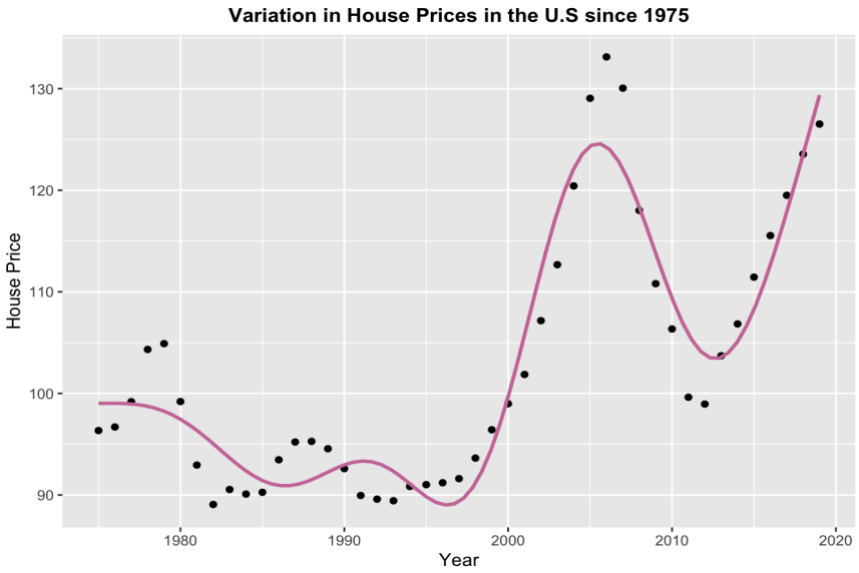
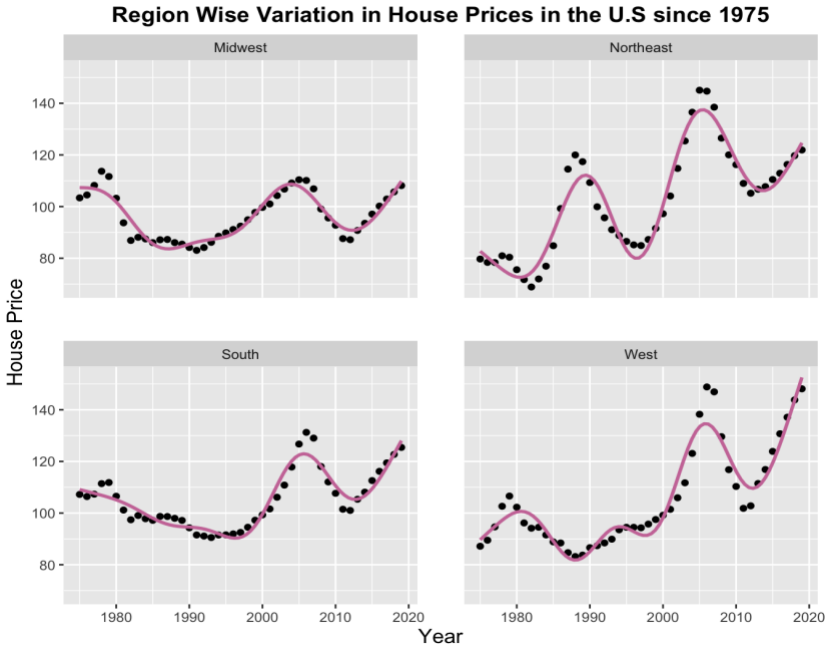
INTRODUCTION

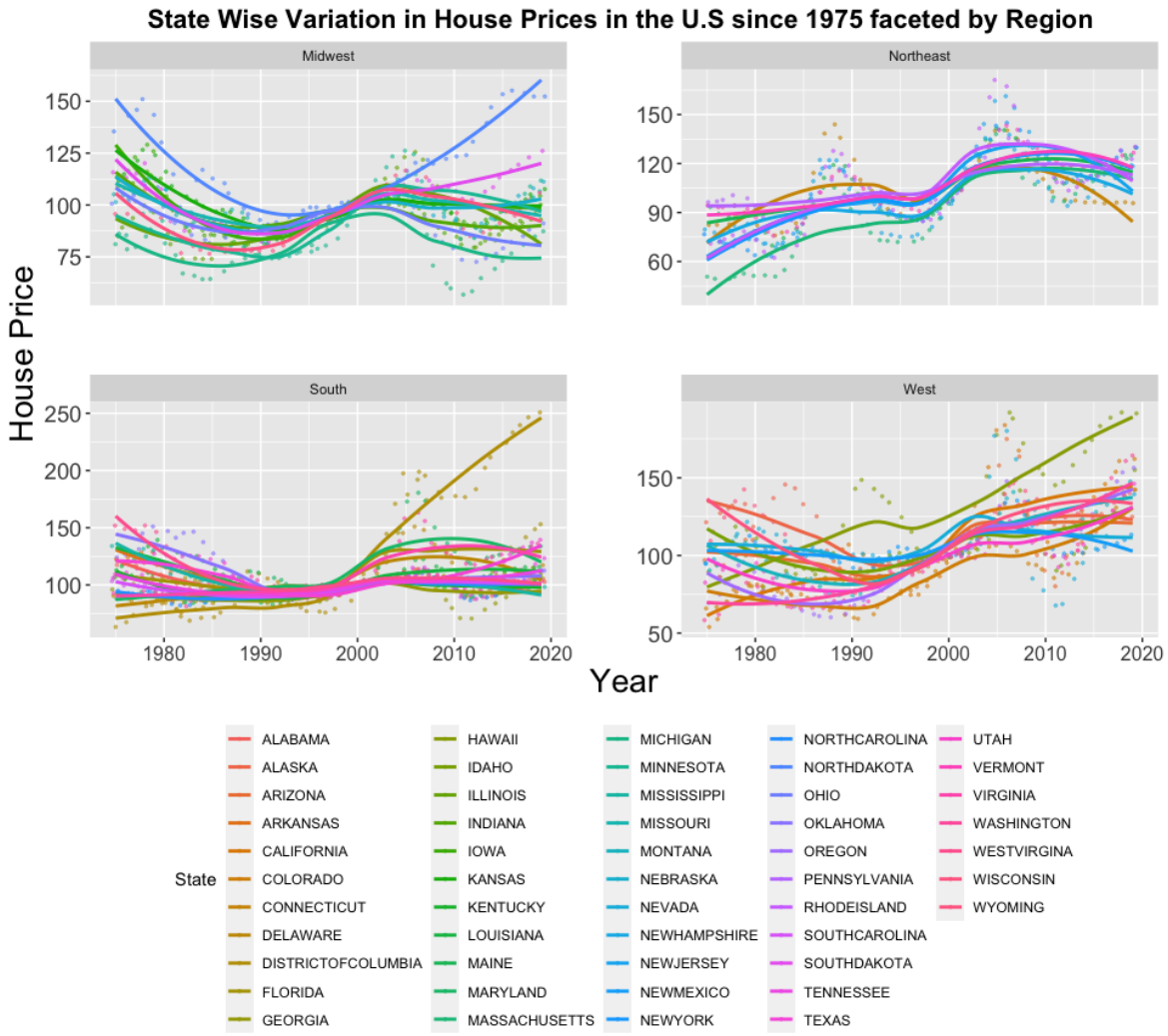
The project focuses the change of house prices in the United States over the past few decades and how it varies with population change. It appears that house prices are influenced by the population density (population per area).

HOUSE PRICES OVER TIME

CPI measures the purchasing power of the consumer. The house prices are CPI adjusted. The inflation is determined by dividing the house price index through by the CPI. Every state has a value of 100 for the baseline time of December 2000. Then if a state has, say, a Price of 150 in 2015, that will mean that real (CPI-adjusted) house prices in that state went up 50% from 2000 to 2015.







How have house prices in the U.S changed since 1975, after adjusting for inflation (i.e., relative to the CPI?)

The house prices have changed a lot since 1975, after adjusting for inflation. The trend does not appear to be monotonic. House prices were in general low in the early 1970s, but they continued to fall until the late 1980s. After a brief surge in house prices in the late 1980s, we can again see a downward trend in house prices. The general housing prices were modest between 1970 and 1995, however there was a lot of variances in the pricing. In comparison to 1975 to 1995, we may see large variations from 2000 to 2020. The greatest price increase occurred after 1995, while the greatest price decrease occurred after 2005. This could be linked to a shift in market dynamics.

How have changes in prices varied by state? Do the typical patterns vary between the four regions (Northeast, Midwest, South, and West)? Have changes in prices within each state mostly followed the same basic pattern, and are there outliers to that pattern?

The trend in the price changes for every state can be explained by analyzing every region:

Midwest – In this region, all the states observed a decrease in the house prices from 1975 to late 1980s. This is trend is then followed by a small increase and again a slight decrease in the house prices from the early 2000s

Northeast – In this region, there is somewhat an upward trend in the house prices till 1995 with a slight dip till late 1990s and then an increase in the house prices

South – In the region, all the states nearly follow the same trend with a slight decrease in house prices till 1995 and then an increase in the house prices.

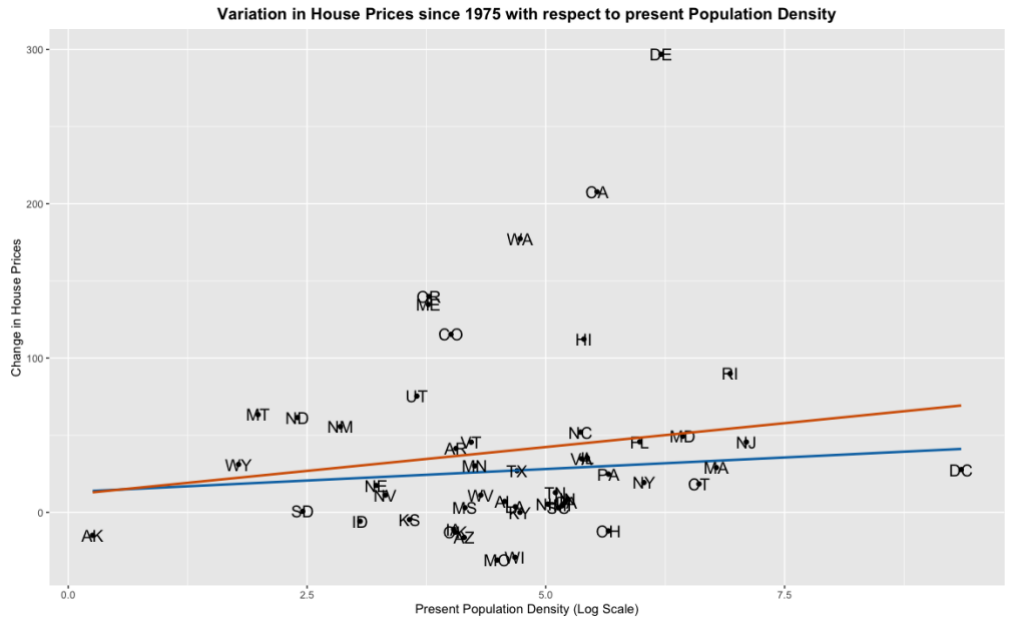
West – In this region, all the states observe a decrease again in the prices till 1990 and then a good upward trend in the house prices after 1990.

Despite a somewhat different trend in all regions, there are some outlier states with the largest increase a decrease in the house prices.

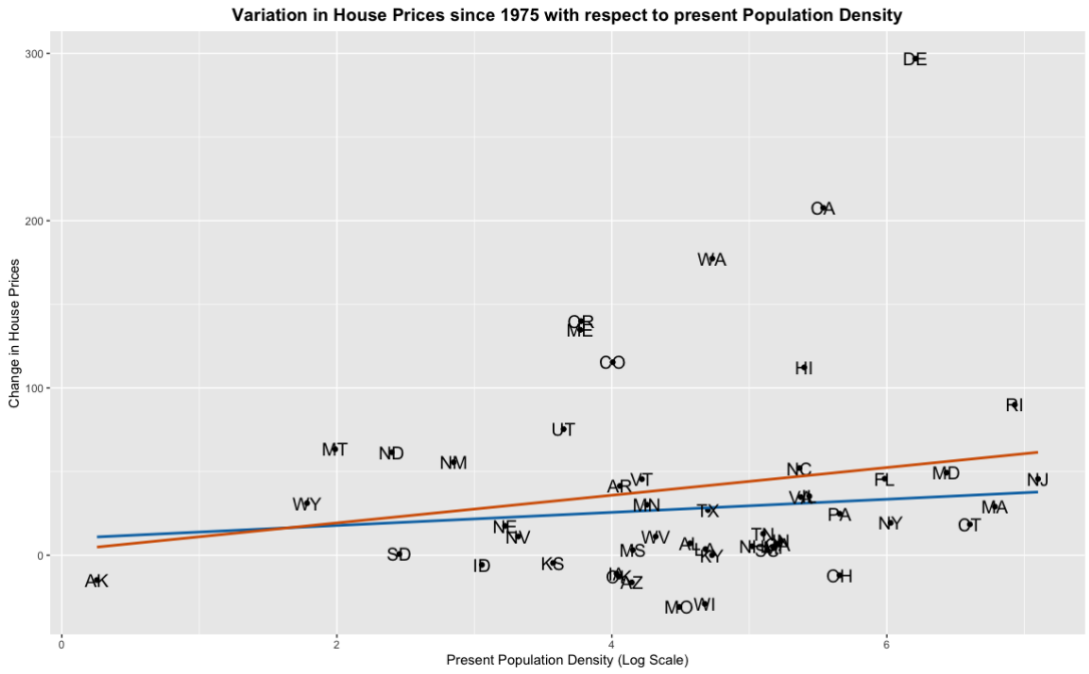
Which states have seen the biggest increases in real house prices, and which have seen the biggest decreases?

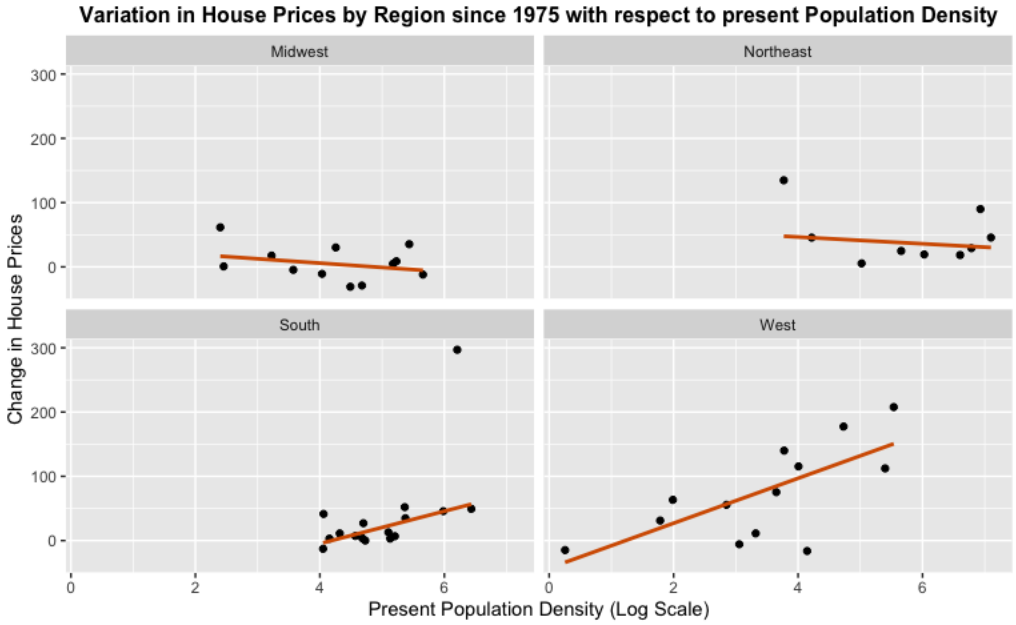
States with the biggest increases are North Dakota, Hawaii
District of Columbia has the steepest increase in the house prices from the late 1990s.

POPULATION DENSITY AND CHANGES IN HOUSE PRICES



The Figure below is with the outlier DC state removed





Here we've used both a regular Linear Model and a Robust Linear Model. RLM gives a better fit because it can reduce the impact of any outliers in the data.

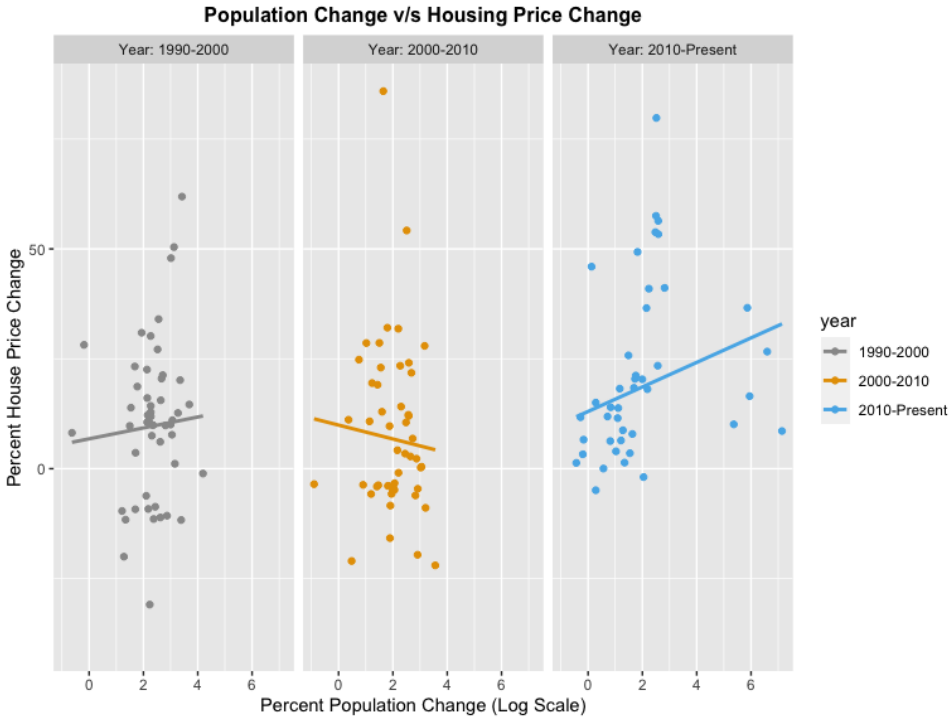
When we plot the graph of population density versus house price fluctuations, we can observe that there are two major outliers: DC and DE. DC has the highest present day population density whereas DE has the highest change in house prices.

When we plot the above plot without log scale on x-axis, we found out that DC has very high population density as compared to the other states hence we remove and replot it as shown in the figure above (without DC).
In general, we can observe a slightly positive trend.

In the region-wise faceted plot we see a properly differentiable trend in the house prices v/s population density.
We see Midwest and Northeast have slightly decreasing trend and in South there is a slight increase whereas West as a substantial increasing trend.

CHANGES IN POPULATION AND CHANGES IN HOUSE PRICES

Moving forward with our analysis, we observe how changes in population is influencing change in the house prices over the span of 1990 – 2000, 2000 – 2010, 2010 – Present.



By showing the graph that illustrates changes decade by decade, the relationship between changes in housing values and changes in population may be seen very clearly. Because there are no big outliers in the trends that can be seen on the graph, we used a linear model to fit the data. When we look at the graph, we can see that the relationship between population changes and housing prices is practically flat in 1990, with a minor positive slope, but it is slightly negative in the 2000s. However, when we look at the trend for 2010, we can see that it is once again quite positive, with a very steep slope.

The region-by-region graph reveals a variety of similar-looking trends for various years over the decade variables. When we look at the graph for the years 2010 to Present, we can see that housing prices have risen in all regions except the Midwest region, which is consistent with the trend seen in the graph divided by decade where we see the overall upward trend in the change in price and population. When we see the decade 2000-2010, we see decreasing trend south and the west regions and slightly positive slope in the Midwest and Northeast regions. But the decade from 1990 to 2000 is the most intriguing characteristic of this graph; throughout this decade, all the regions display a different trend with modifications. Overall new see changes in relation over the three time periods and, we find variations in the regions.

CONCLUSION

House Prices Over Time: Market Dynamics and Inflation Affect the Prices of Goods Over Time: We know that market dynamics and inflation have an impact on the prices of goods over time. By accounting for CPI rates, we have considered the aspects. The graph depicts the upward trend in housing prices over time. This is a logical conclusion based on the information provided and the market trend that we are aware of.

Population Density and changes in House Prices: The relationship between population changes and property price changes is positive, with a marginal increase in value slope. This is because, in addition to changes in population, changes in population have little effect on changes in house prices on a wide scale. House prices vary as a result of inflation, market changes, and currency fluctuations. However, as shown in the figures, we can predict a positive shift in property prices in response to changes in population density.

Changes in Population and Changes in House Prices: The relationship between population changes and changes in housing prices is predicted to show a positive trend, as evidenced by the graphs plotted above. However, we can see in the graph that the market condition (inflation in 1995) allows us to witness some strange and unreported developments. Aside from that, all other areas of the graph indicate a tendency of rising housing prices in unison with population growth.

We may deduce from the preceding trends and graphs that there is a positive tendency in house price changes over time, as well as a somewhat positive trend in house price increases with population growth (which is expected). Because changes in house prices in any country are influenced by factors such as population, population density changes, market changes, inflation, and currency rate changes, we expect house prices to rise in line with population growth.