

South bay area house price analysis and investment recommendation

1.1 Introduction

In the past few years, San Francisco south bay area, with another name "Silicon Valley", has double digit house price growth rate. With its already expensive housing price, it has topped United States as one of the most expensive regions. On the other side, after dot-com bubble burst in 2000, high tech companies such as Apple, Google, Facebook and etc whose headquarters located in Silicon Valley have immense growth, and created tons of work opportunities, and their high salary and outstanding benefit systems attracted candidates all over the world to swarm into this area, and keep pushing house price higher and higher.

1.2 Business problem

Whether it is still a good time to invest in real estate in Silicon Valley is a valuable and realistic question to answer. A major cause of high housing costs in the Silicon Valley is expansive job growth without adequate housing production. In 2018, close to 36,000 new jobs were created in the area (34% of which were tech jobs); only 8,400 new residential units were issued permits. Imbalanced demand and supply relationship in the housing market suggested potential good investment return from new house construction or remodeling of existed houses. However, as construction permit approval normally takes couple of years. While with background of COVID-19 and emerging working from home, there is uncertainty that whether the economy will continue its trajectory and the evolution of house supply-demand relationship. Before pouring millions and billions of dollars in house market investment, It is necessary to do detailed analysis and house price prediction to understand whether it is still a good time to invest in South Bay Area housing. In addition, significant house price difference from different cities/ neighborhoods is observed. Which area is most promising for investment also worth a thorough data analysis.

1.3 Target and audience

The problem mentioned above is applicable to investors who want to invest in Silicon Valley housing and real estate, as well as young engineers and scientists who just moved to Silicon Valley and are trying to make decision whether to buy their houses from Silicon Valley and which location to choose.

1.4 Data and analysis approach

1.4.1 Stock market performance analysis based on data from Yahoo Finance

<https://finance.yahoo.com>

As growth of economy and booming of internet of things is the driving force of job opportunities in silicon valley, it is necessary to analyze whether there is strong correlation of stock market performance from S&P500, Dow Jones and Nasdaq and house price growth from whole country and from silicon valley. Monthly stock price for open, close, high, low are included in the datasheet, but we will only extract the monthly stock price at close and normalize them based on Jan. 1999 stock price to calculate the growth rate. Linear regression will be used to project stock market

performance in the following couple years. The result and correlation with house price will be used to forecast house price growth in the near future.

1.4.2. US and south bay area house supply demand analysis

https://www.huduser.gov/portal/ushmc/hd_home_sales.html

With US total housing supply and demand data, we can analyze whether vacancy/sale ratio will impact house price. 'Manufactured monthly' and 'sale monthly' data will be extracted as features and used to calculate supply and demand relation.

1.4.3 Comparison of cities and neighborhoods for investment opportunities

Local house prices have several determining factors: 1. Whether the neighborhoods have good school resources for the kids. 2. Whether the location is convenient for life and work commute. 3. What is the average education level of households. To assess which factor is the dominating factor, and whether this factor can withstand economic cycles, we will use Foursquare exploration and search functions to compare nearby schools, restaurants and high tech companies. We will analyze major company distribution in south bay area, public school rating and distribution, and Asian food restaurant distribution, assuming Asian immigrations take the major part of the job market of bay area , and finally propose which city to invest in real estate.

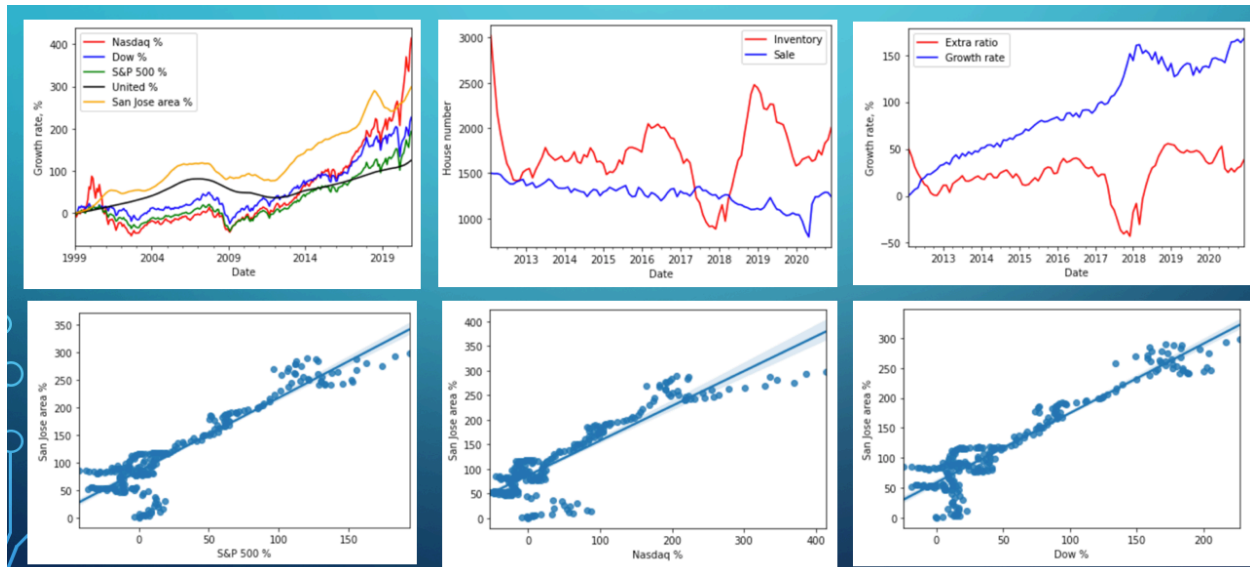
California school table will be used to extract the following features:

- City name
- Zipcode
- Latitude
- Longitude

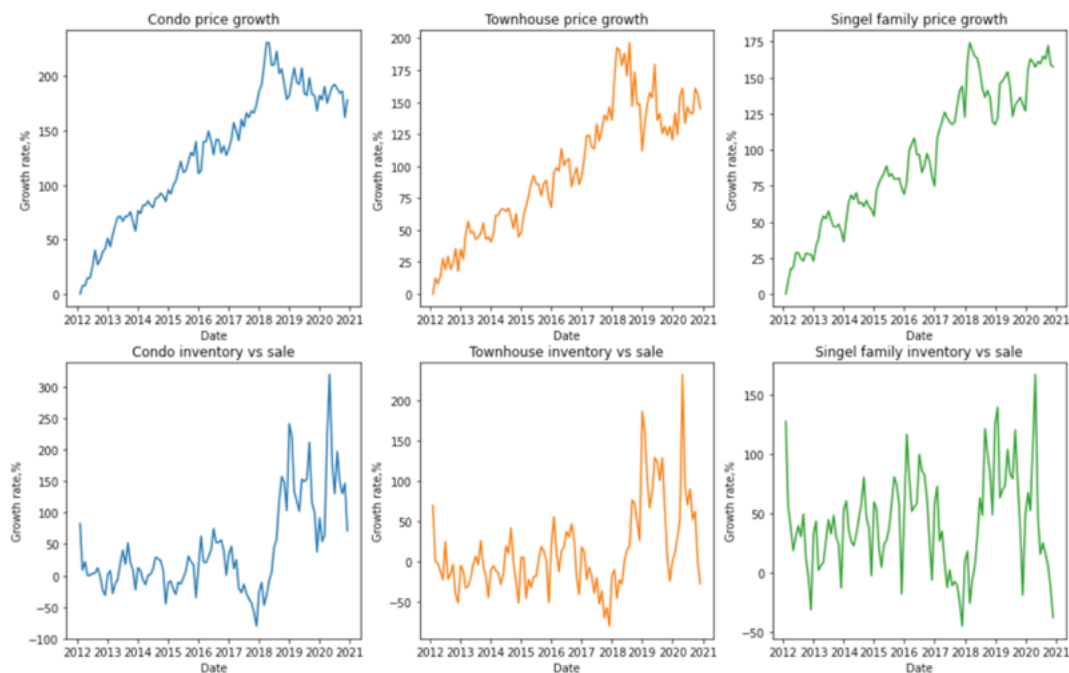
1.5 Data analysis and discussion

When stock market performance and house price appreciation were plotted together for the past 20 years, it was found that house price generally follow the trend of stock market before 2009, however, after 2010, US median house price grown at a much slower rate than stock market, while, south bay area house price still closely follow stock market. When linear regression plot is used to correlate S&P 500, Dow Jones and Nasdaq with south bay area house price, it was found the correlation is very high. Multiple linear regression with training and testing dataset between the 3 stock index and south bay area median house price shown a variance score 0.9.

There is a belief that south bay area house price growth is driven by the shortage of house supply. To confirm whether house supply is the major root cause of rapid house price growth, median house price evolution with time (from 2012 to 2021) is plotted together with (supply-sale)/sale ratio with time, and found there is no obvious correlation: house supply from high level is steady except for a dip in 2019 and a peak in 2020, while house price grown steadily in the past 10 years.

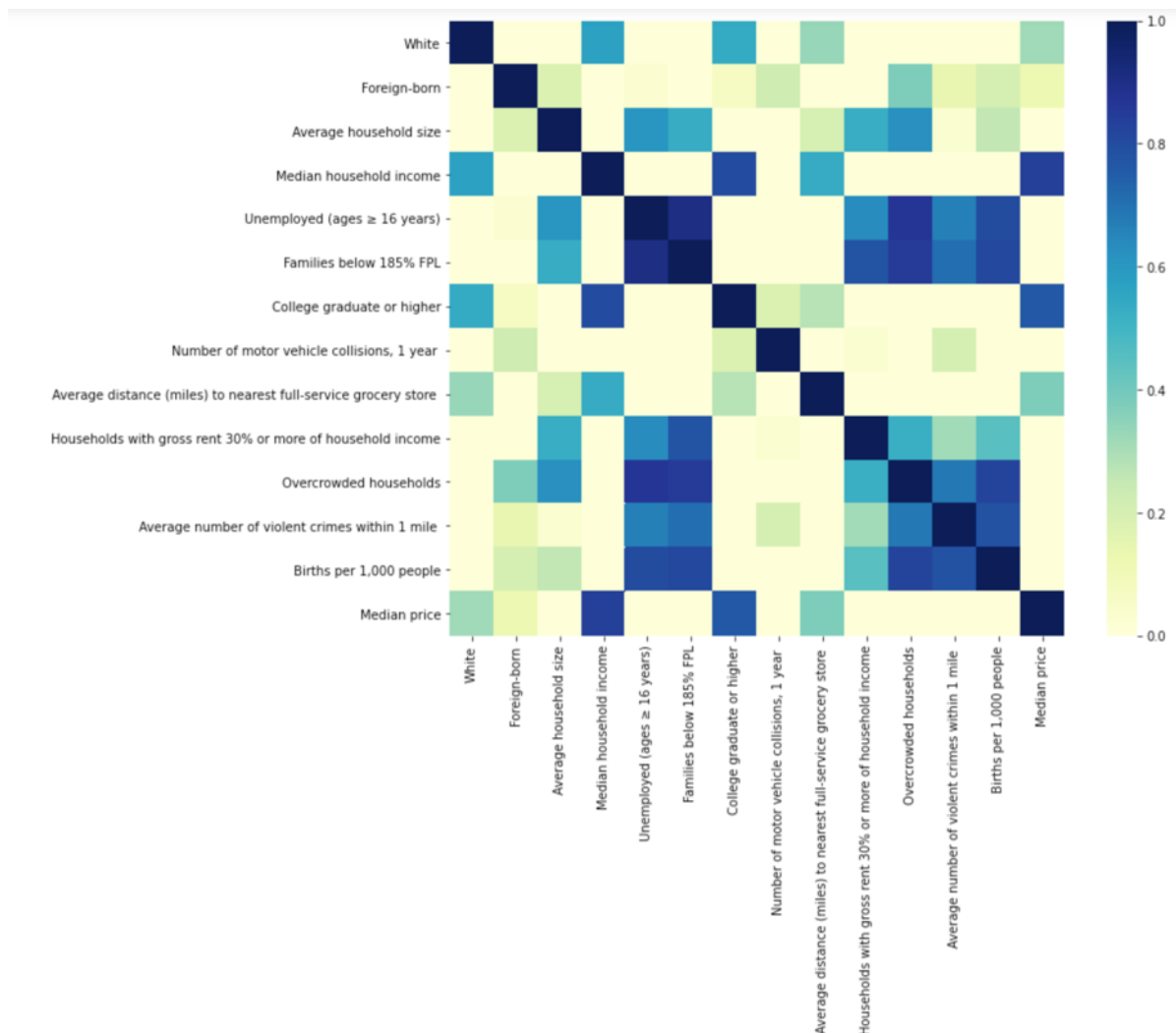


As different types of houses target for different customers, condo, townhouse and single family house are separately analyzed. It was found median house price for three types of home all have similar steady growth pattern, however, condo and townhouse reached peak price by 2019 and shown a downward trend, probably due to the increased inventory since 2019, while single family house supply has no obvious trend of decrease or increase with time, and the median house price is still increasing with time.



Regression plot of house (supply-sale)/sale vs house price are plotted for these three types of houses, and it was found condo and townhouse median price has moderate correlation with house supply, while single family house price is independent of the house supply.

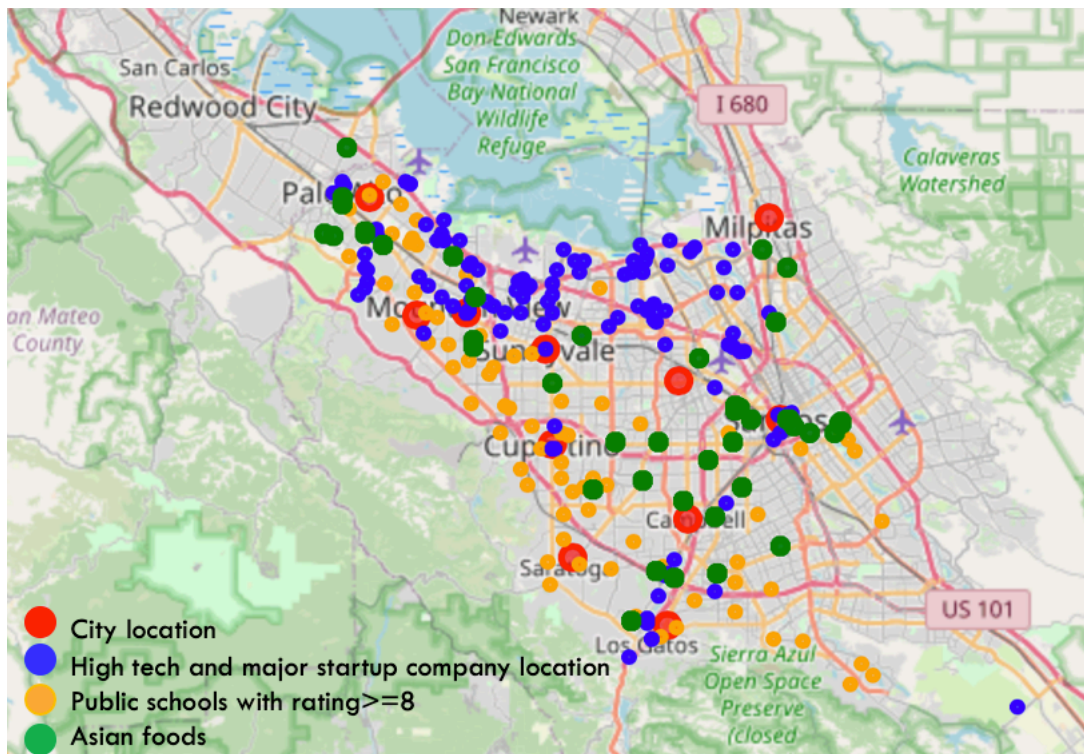
Santa Clara county neighborhood data that potentially impact house price were analyzed and found the top factors that could have positive impact on house prices are: median household income, level of education, convenience to access full service grocery store, and lastly, race has moderate role in house price, for example while household has moderate trend for higher house price. It is a surprise that crime violent, birth rate, poverty rate don't show obvious correlation with house price.



1.6 Conclusion

In the last, public school rating, company distribution and Asian food store distribution (per Foursquare search and cleaning) are overlaid in bay area city map through folium map function. It was found cities that could meet the requirement of variety of job opportunity, good public school and reasonable Asian food accessibility are Palo Alto, west Mountainview, west Sunnyvale, and

Cupertino. Those cities have better chance to attract more people from the world, and keep pushing up house price in the future. So for long term investors, those cities can be considered if the stock market follow its trajectory in the coming years.



Reference

US housing supply and demand

https://www.huduser.gov/portal/ushmc/hd_home_sales.html

S&P 500, Dow Jones, Nasdaq YOY growth rate for the past 20 years

<https://finance.yahoo.com>

Fed rate for lending

<https://www.macrotrends.net/2015/fed-funds-rate-historical-chart>

Redfin median house price growth in Silicon Valley

<https://www.redfin.com/news/data-center/>

Affordable housing in the Silicon Valley

https://en.wikipedia.org/wiki/Affordable_housing_in_the_Silicon_Valley