INFLUENCING FACTORS

for residential home prices in the U.S. over the next decade

Real Estates represents a significant portion of a person's wealth. This is especially true for home owners in the world's bubbliest housing market, United States. Housing has the highest weightage in the CPI basket and depends highly on economic factors along with demographic and location.

Demographic

Data related to the composition of a population in a nation is the smallest level to start for factors that can affect Housing markets. This can be gender, age, sex, income, etc.

This can be useful in making numeric metrics that drives the demand for houses. It could be anything from population growth rate of a location, migration patterns, or income per capita.

For example: If income per capita is more in a location the demand for house can increase, thus increasing the housing sales price

Location

The more desirable the location of the house, the more will be the demand and hence higher home prices. This can be divided into several other factors:

- Infrastructure development: If there is a new connectivity, highway, transport road, malls, etc. that provides connectivity to key locations, the house prices will rise due to more demand.
- Upcoming/available amenities: Utilities near the house provides conveniences. It could be within a society or apartment like parking space, basement garage, mini-

terrace, kitchen lawn, architectural design, or modern convenient interiors.

- Local development: Area surrounding locality can play an important role for the long run. This could be anything like gated residential colony, welfare association, green cover, security surveillance, etc.
- Home size and shape can drive the prices up.
- Age and condition of the house can affect the prices.
- Land cost.
- Number of houses that are available for sale.

Economic

- Interest rate: Central bank of a nation decides the interest rates as part of their monetary policy to have sustainable economic growth, low unemployment, and price stability pf the nation's currency. In the U.S. Fed decides these rates to control the borrowing and lending costs.

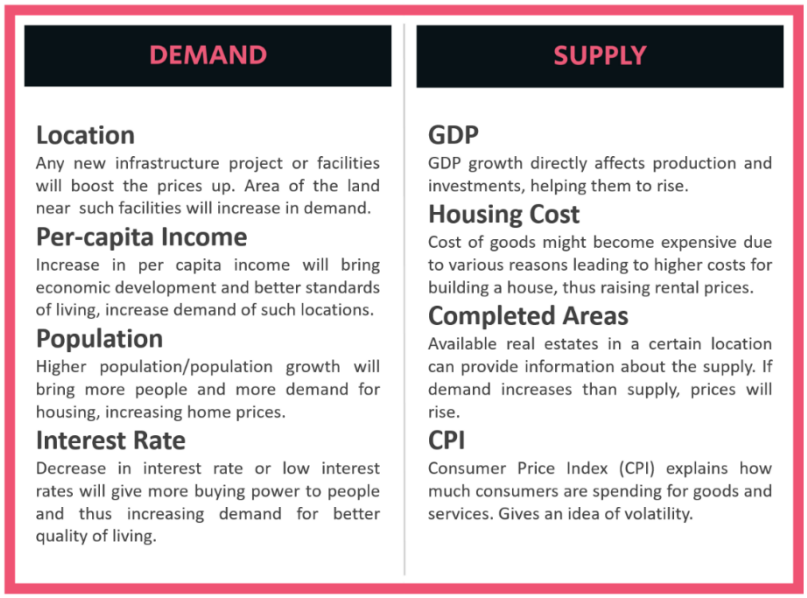
  The interest rate has a key role to play in a macro level. If interest rates are less, it gives more buying power to consumers. Affording a house becomes possible driving the demand up, increasing the house prices.

  If interest rate drops, it reduces buying power, which reduces the number of buyers and the demand goes down. Inventory rises with low demand leading to a fall in home values.
- GDP: The GDP describes nation's overall economy and one of the important indicators to display how the nation as a whole is performing. This can give a reflection of cost of goods or raw materials required for construction.
- Unemployment rates: If unemployment rates are high/rising, then demand for houses will be less and vice versa.
- CPI: This is the weighted measure of a nation's inflation data. Housing has the highest weightage in the CPI basket. If inflation is high, value of money goes down reducing a consumer's buying power.

- Government policies and subsidies: Tax credits, deductions, and subsidies are some of the ways the government can temporarily boost demand for real estate.

MECE FRAMEWORK

Adding key major components in a MECE framework.



MECE FRAMEWORK ANALYSIS

(Working with available data in the limited time.)

Data collection and Preparation

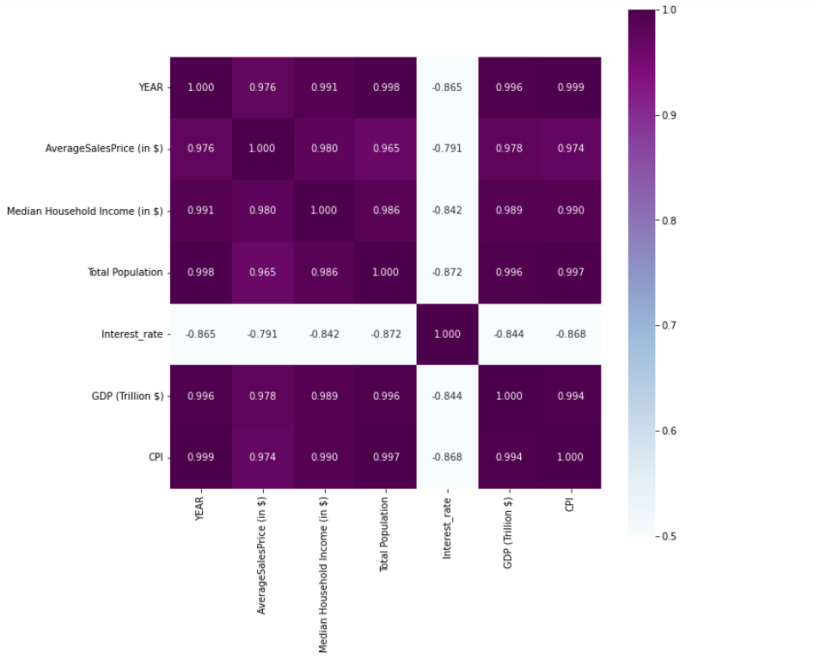
Data is collected and prepared using various websites and reports (*SQL*).

Available yearly data was collected for median sales price of houses, median household income, total population, interest rate, GDP, CPI, Median household income

```
drop table if exists HousePrice

select year(observation_date) YEAR, AVG(MSPUS) AVG_HOUSE_SALES_PRICE into HousePrice from RealEstate..HouseSalesPrice
GROUP BY year(observation_date)

select * from HousePrice
-----------------------------------------------------------------------------------------------------------------------
drop table if exists MedianIncome

select Year, [Median Household Income] into MedianIncome from RealEstate..MEDIANINCOME

select * from MedianIncome
-----------------------------------------------------------------------------------------------------------------------
drop table if exists TotalPopulation

select label year, [Total Population] into TotalPopulation from RealEstate..Population
-----------------------------------------------------------------------------------------------------------------------
drop table if exists IR

select year, Interest_rate into IR from
(select year([Release Date]) year, Actual Interest_rate
, row_number() over(partition by year([Release Date]) order by year([Release Date]), month([Release Date]) desc) r from RealEstate..InterestRates) t
where r =1
order by year asc

select * from IR
-----------------------------------------------------------------------------------------------------------------------
drop table if exists RealGDP

select Year, [Real GDP (trillions)] gdp_in_tr into RealGDP from RealEstate..GDP
-----------------------------------------------------------------------------------------------------------------------
drop table if exists CPIData

select YEAR, AVE# into CPIData from RealEstate..CPI

Select * from CPIData
-----------------------------------------------------------------------------------------------------------------------

select a.YEAR, AVG_HOUSE_SALES_PRICE [AverageSalesPrice (in $)], cast(replace(substring([Median Household Income],2,len([Median Household Income])-1),',','') as float) as [Median Household Income]
, [Total Population], Interest_rate, cast(replace(replace(gdp_in_tr,'$',''),',','') as float) GDP, AVE# CPI
from HousePrice a inner join MedianIncome b on a.YEAR=b.Year inner join TotalPopulation c on a.YEAR=c.year
inner join IR d on d.year=a.YEAR inner join RealGDP e on e.Year=a.YEAR inner join CPIData f on f.YEAR=a.YEAR
```

Correlation

Checking the correlation of the available data (*Python*):

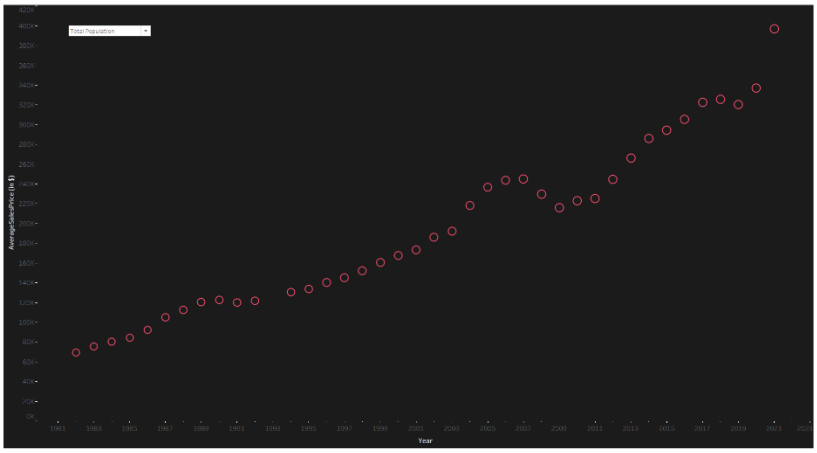


Very strong correlation (both positive and negative)

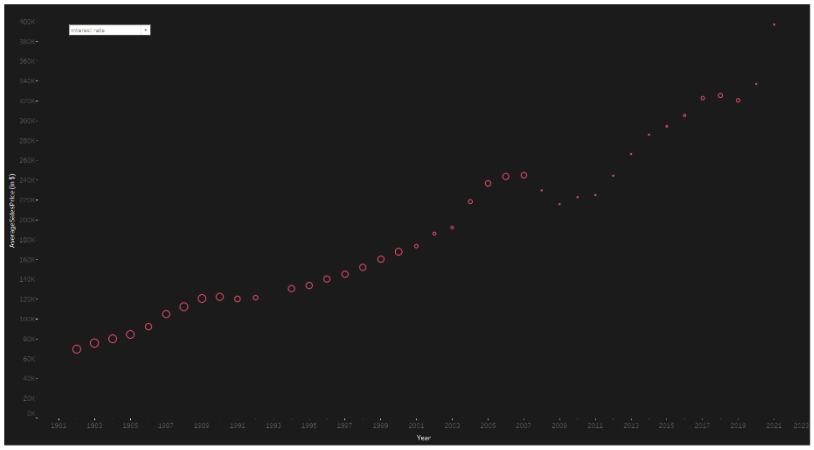
It can be seen from the figure that all these parameters (*Year, Median sales price of house, population, interest rate, GDP, CPI, Median household income*) have a **very strong correlation**. All have strong positive correlation except interest rate.

Visualization

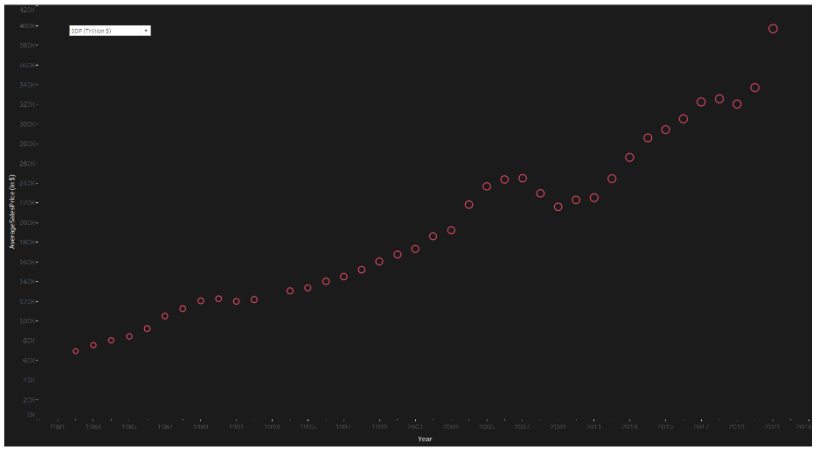
Visualizing the data shows a **linear relationship** (*Tableau*)



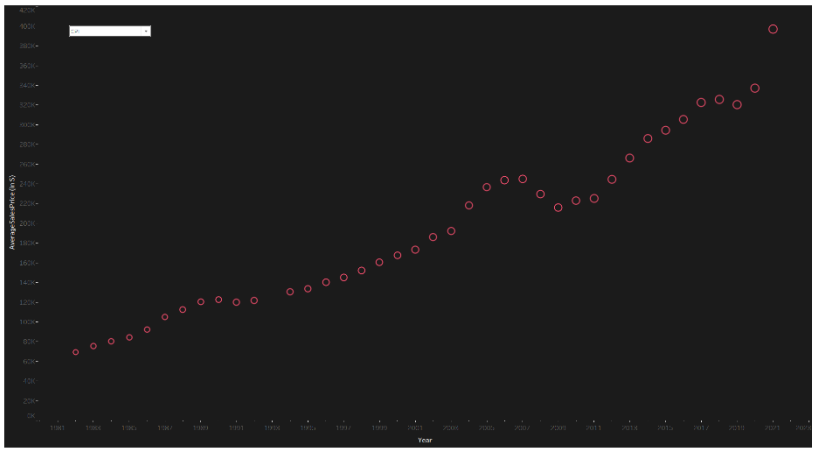
Visual 1: Median sales price(y), Year (x), Data points: population



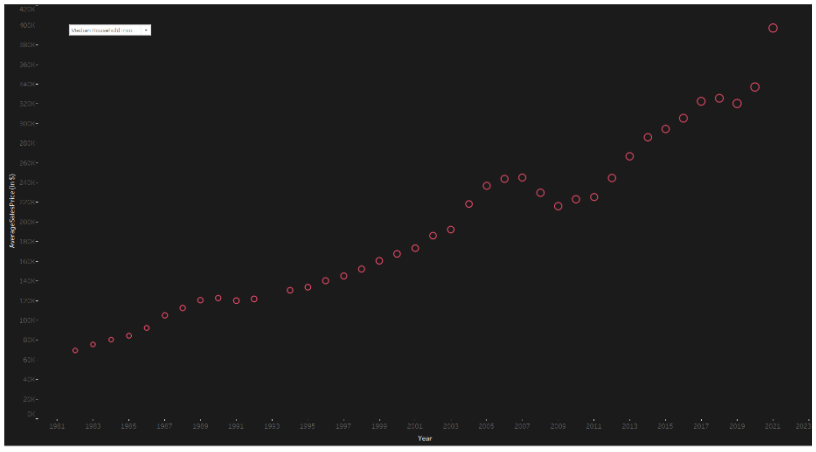
Visual 2: Median sales price(y), Year (x), Data points: interest rate



Visual 3: Median sales price(y), Year (x), Data points: GDP (Trillion $)



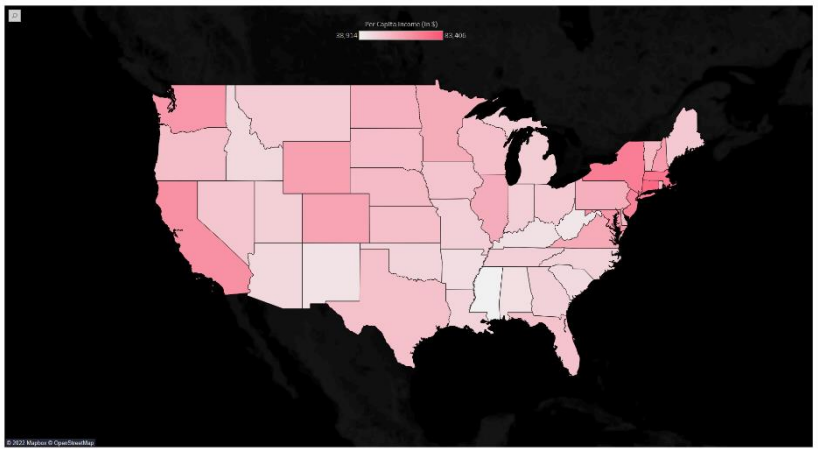
Visual 4: Median sales price(y), Year (x), Data points: CPI



Visual 5: Median sales price(y), Year (x), Data points: Median income (in $)

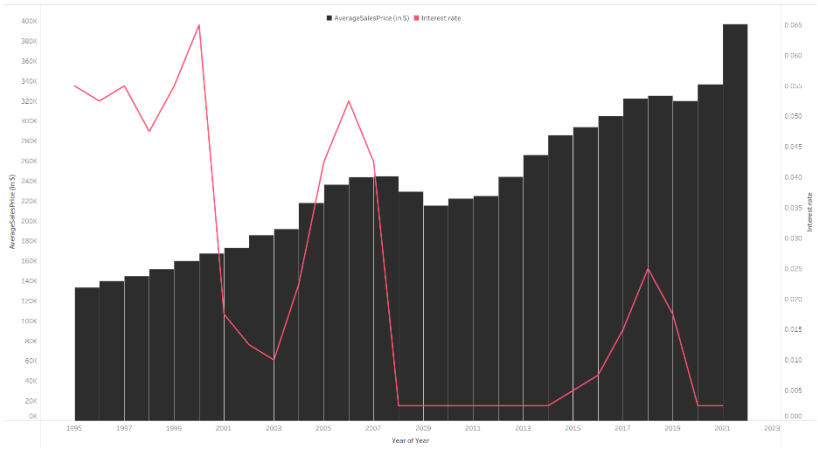
Scope Ahead

- State wise data can be analysed to get prospective location.



Visual 6: Per capita income in US state wise

- Machine Learning models can be implemented for a larger data set to predict house prices in the future taking these factors into account (Multi Linear Regression can be used). This can be done for remaining data like location, sizes, number of available houses, etc.
- Interest rates play a huge role as there are fixed rate and adjustable-rate mortgages which influence the housing market significantly.. So, keeping an eye on the interest rate will be a key to get a range of future prices.



Visual 7: y-Average sales price (in $), Interest rate, x-Year