Northeastern University
College of Engineering

Computation and Visualization IE 6600

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Assignment 2

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I analysed housing market data from 2000 to 2024 by collecting information from online sources using Python from Fred's website. I looked at how this data connects with GDP trends to better understand housing market patterns and make meaningful insights.

```
pip install pandas-datareader -q
```

```
import pandas_datareader as pdr # access fred
import pandas as pd
import requests # data from api
import plotly.express as px # visualize
from datetime import datetime
```

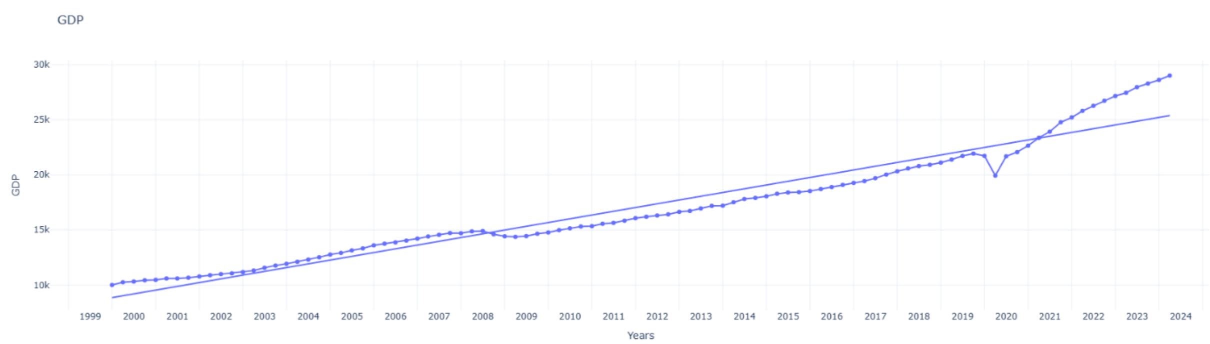
```
df1 = pdr.DataReader('ASPUS','fred','2000-01-01','2024-04-30')
```

```
df2 = pdr.DataReader('MORTGAGE30US','fred','2000-01-01','2024-04-30')
```

```
df3 = pdr.DataReader('MSACSR','fred','2000-01-01','2024-04-30')
```

```
df4=pdr.DataReader('GDP','fred','2000-01-01','2024-04-30')
```

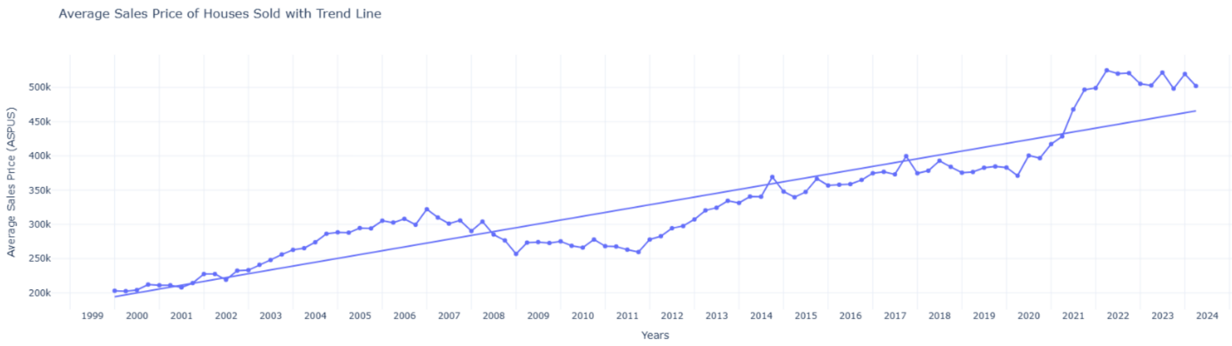
GDP



This graph illustrates the U.S. Gross Domestic Product (GDP) over time, with data points spanning from 2000 to 2024. The y-axis, labelled "GDP," shows values in billions of dollars, while the x-axis represents the years. A trend line is included to highlight the general upward growth trend of the economy.

The health of the overall economy, measured by GDP, strongly influences housing market trends. Strong GDP growth from 2010 to 2019 meant more jobs and income security, which led to increased home buying. In contrast, during economic downturns like the 2008 financial crisis and briefly during the 2020 COVID-19 pandemic, home sales dropped as people faced job uncertainty and financial stress.

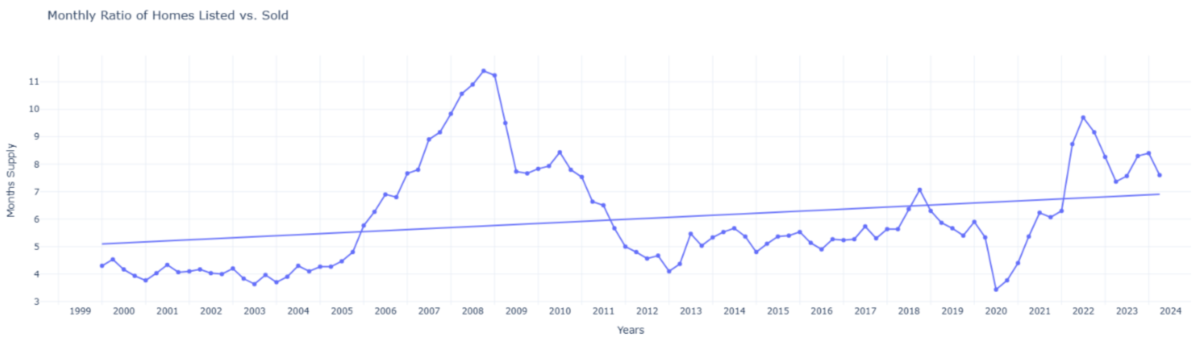
Average Sales Price of Houses Sold



This graph displays the average sales price of houses sold over time, with a trend line indicating the general price increase. The x-axis is labelled as "Years," covering the period from 2000 to 2024, while the y-axis represents "Average Sales Price (in USD)," ranging from 200k to around 500k USD.

The average house price started around $200,000 and climbed to about $500,000. During the 2008 financial crisis, prices dropped sharply. From 2010 to 2019, prices slowly went back up as the market recovered. When COVID-19 hit in 2020, house prices shot up quickly due to low interest rates and high demand. By 2022-2023, prices leveled off at their peak, showing smaller ups and downs. The trend line clearly shows that despite some big drops and jumps, house prices have generally gone up over these 25 years.

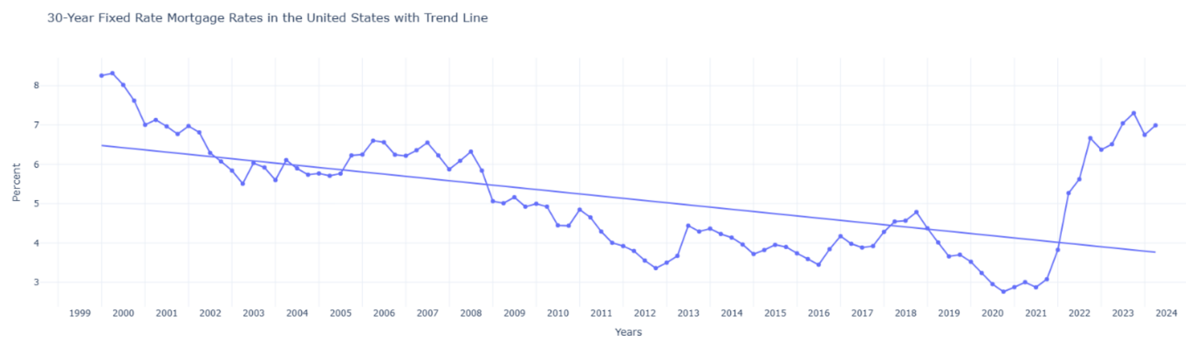
Monthly Ratio of Homes Listed to Sold



The graph displays the monthly ratio of homes listed versus homes sold over time, measured in "Months Supply" on the y-axis, where higher values indicate a buyer's market with more supply than demand, and lower values suggest a seller's market with higher demand than supply; the x-axis spans from 2000 to 2024, providing insight into real estate market supply trends.

The relationship between mortgage rates and the economy shows clear patterns over time. During the 2008 financial crisis, the economy weakened and home supply increased as fewer buyers could afford purchases. To help recovery, the government lowered mortgage rates after 2008, making homes more affordable and boosting the housing market. This strategy was used again during COVID-19, when even lower rates led to a strong housing market rebound. However, since 2021, rising mortgage rates have made homes less affordable, potentially leading to slower sales and increased housing inventory on the market.

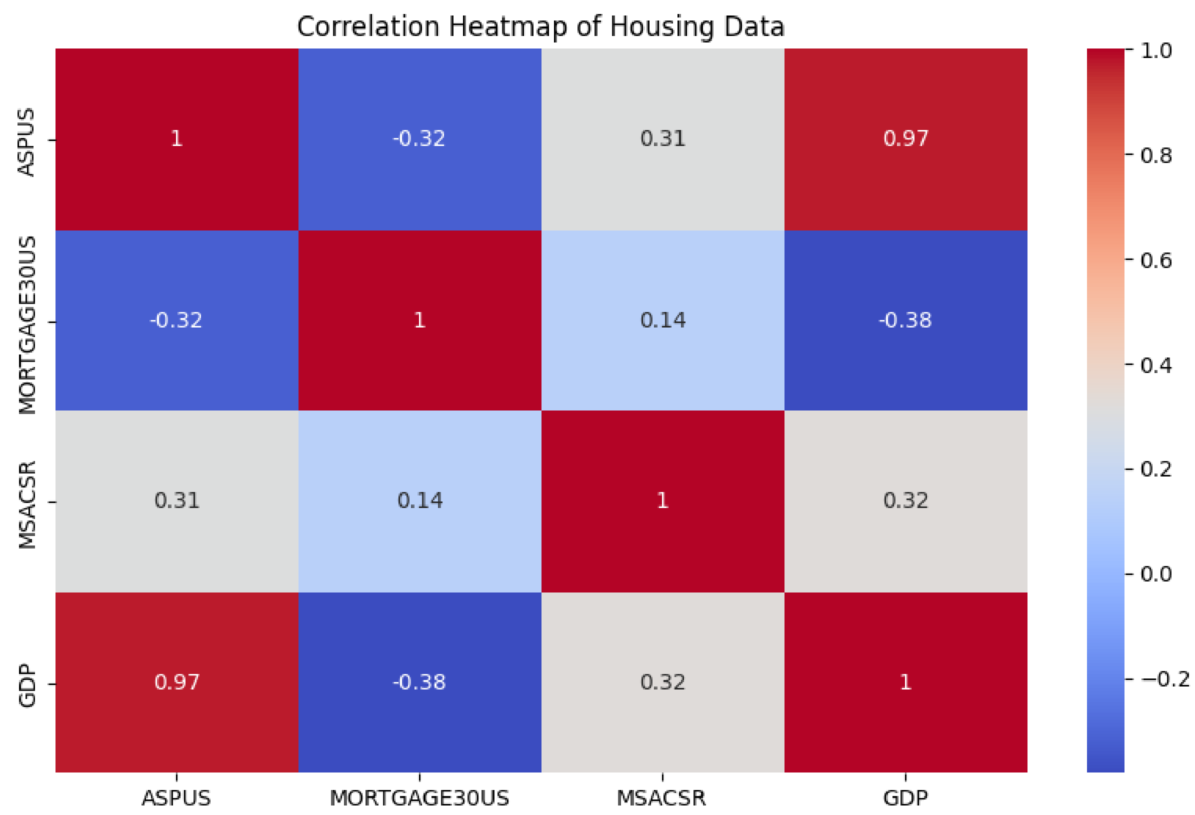
30-Year Fixed Rate Mortgage Rate



Mortgage rates have a direct impact on housing demand. From 2010 to 2020, low rates made homes more affordable, leading to high buyer demand and quick sales, which reduced the number of homes available on the market. However, since 2021, rising mortgage rates have made buying homes more expensive, causing demand to decrease and homes to stay on the market longer, which has started to slow down or reduce home prices in many areas.

Long-Term Cycles and Economic Events

Looking at housing market patterns over long periods, we can see how major economic events shape the market. After the 2008 financial crisis, mortgage rates were kept low for many years to help the market recover, which worked well. During COVID-19 in 2020, quickly lowering mortgage rates helped prevent a housing market crash. From 2021 to 2023, rates increased to control economic growth, which has slowed down home buying. These big economic events create turning points that set new trends - like how after 2008, low rates led to more home buying, while today's higher rates are causing fewer people to buy homes.



1. Home Prices and Economy (GDP):

Very strong positive connection (0.97)

When economy grows, home prices typically rise

Strong economy means more people can afford homes

2. Mortgage Rates Impact:

Shows negative connection with home prices (-0.32)

Also negative connection with economy (-0.38)

Higher rates usually mean lower home prices

Small impact on housing supply (0.14)

3. Housing Supply Relationships:

Moderate positive link with home prices (0.31)

Similar connection with economy (0.32)

Supply affects prices but less than other factors

4. Key Findings:

Economy and home prices move closely together

Lower mortgage rates help both home prices and economy

Housing supply matters but less than economic factors

Demand factors have bigger impact than supply on prices

Summary Report

The U.S. housing market has experienced ups and downs over the past few decades due to economic shifts, mortgage rates, and supply and demand changes. The charts show how average home prices, sales, mortgage rates, supply, and GDP interact over time and how key economic events have influenced these trends.

The charts show some clear patterns in how these factors relate to each other:

- Home prices and GDP are strongly connected. As the economy grows, so do home prices.
- Mortgage rates have an opposite effect: when rates are high, home prices tend to slow down.
- The supply of homes also plays a role but less directly. A strong economy often brings more houses to the market, though demand is usually the bigger driver of prices.

Major events like the 2008 financial crisis and COVID-19 pandemic left visible marks on the housing market. In 2008, home prices and sales dropped sharply as mortgage defaults increased. The government cut interest rates to help the economy recover, which eventually brought buyers back. During COVID-19, the market faced a temporary dip, but low mortgage rates and stimulus payments helped it bounce back quickly, driving prices up further.

Overall, the housing market closely follows economic performance, with GDP and mortgage rates being the main influences. While supply matters, demand factors like income and interest rates play a bigger role in shaping prices. Although crises can disrupt the market, it has shown resilience and an ability to recover over time. Future trends will likely depend on interest rates and broader economic conditions.