Google Search Interest, Mortgage Rates, and Home Prices: Are They Related?

A statistical correlation analysis within Python using multiple data analysis methods

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Change Log

12/7/2025 - Changes since 11/25/2025 submission:

- Added “Data Sources – Merged After Processing” slide
- Increased font size and readability for each of the graphs
- Added additional comments to “future considerations”

Overview

- Introduction
- Data Sources
- Summary of the Results
  - Time Series Analysis
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  - Regression Plots
  - Pair Plots
  - Correlation Heatmap
  - Conclusion
- Challenges
  - Data Analysis Related
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Introduction

- This project explores whether **housing demand** (via google searches) **moves** with **mortgage rates** and **prices**.

- Using 20 years of monthly data, the analysis compares:
  - Google Trends search interest for “homes for sale”
  - 30-year fixed mortgage rates
  - Median U.S. home prices

- By using **time-series analysis, smoothed trend lines, correlation matrices, and regression plots** of publicly available data, the project will assess correlations, providing insights into how early indicators like Google Trends might anticipate changes in housing affordability and market activity.

- All data collection, processing, and analyzing is completed using a **fully automated Python pipeline**, publicly available on GitHub.

Data Sources

Data Range: 2004 –2024					
Name / Short Description	**Source/URL**	**Type**	**List of fields**	**Format**	**Raw Data Size**
Google Search Interest for “homes for sale”	Google Trends via PyTrends	API	Monthly Date Google Index Score (1 other not used)	Pandas DataFrame → CSV	241
30-Year Fixed Mortgage Rates	Federal Reserve Economic Data	API	Weekly Date Mortgage Rate (2 not used)	JSON → CSV	2,852
Median Home Prices	Kaggle - USA Real Estate Dataset	API	Sold Date (Day) Price (10 not used)	CSV	2,226,382

Data Sources – Merged After Processing

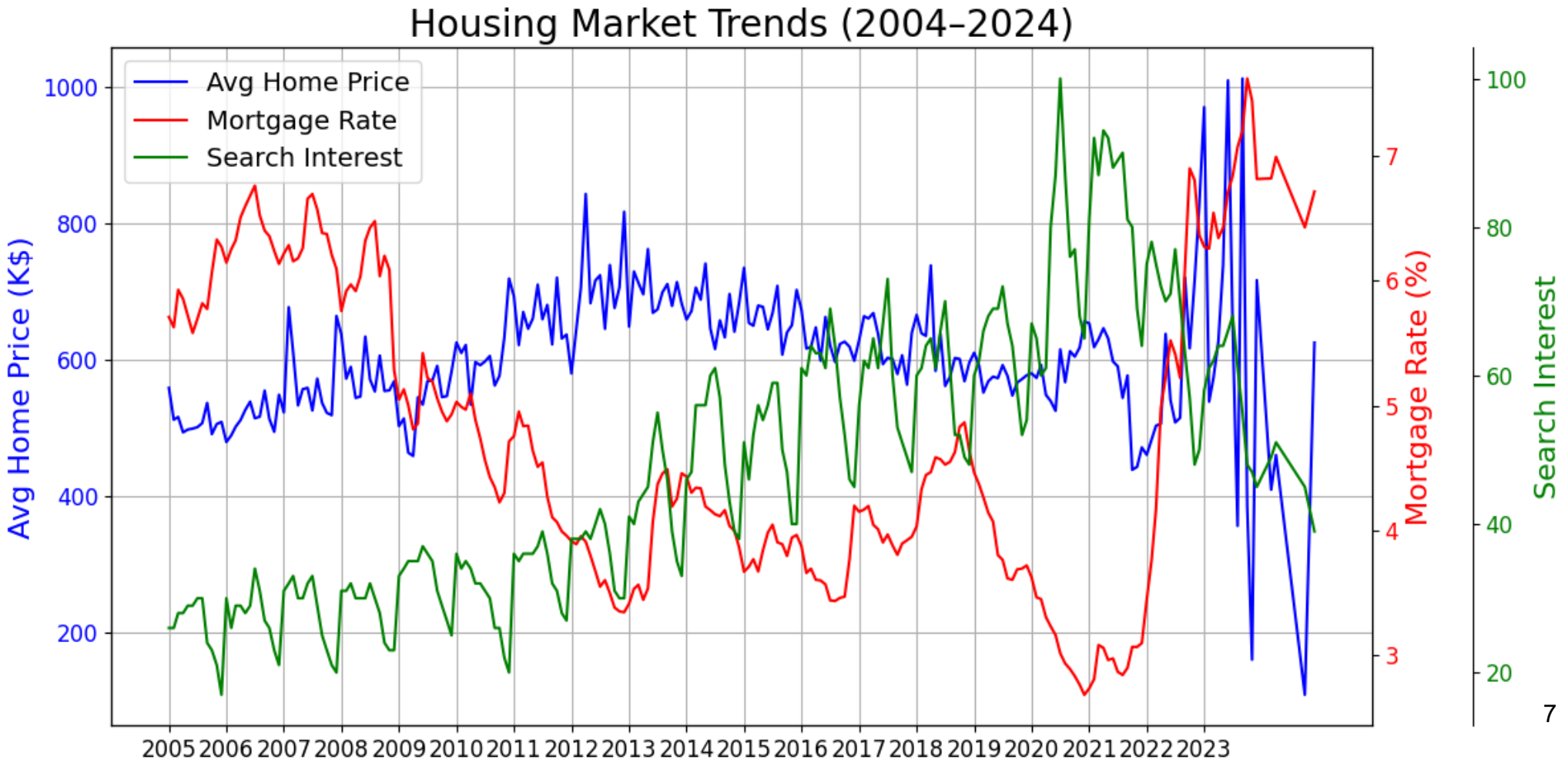
Data Range: 2004 –2024		
CSV File	**List of fields**	**Cleaned Data Size**
merged_clean.csv	Month Avg_Price (Housing Monthly Avg) Search_Interest (Monthly) Mortgage_Rate (Monthly Avg) 6 others generated for future use (Percent changes, directional changes, etc)	232 rows* 4 headers 928 cells total

*Note: Each data point in the graphs shown later in this presentation represents one of these 232 rows.

Summary of Results – Time Series Analysis

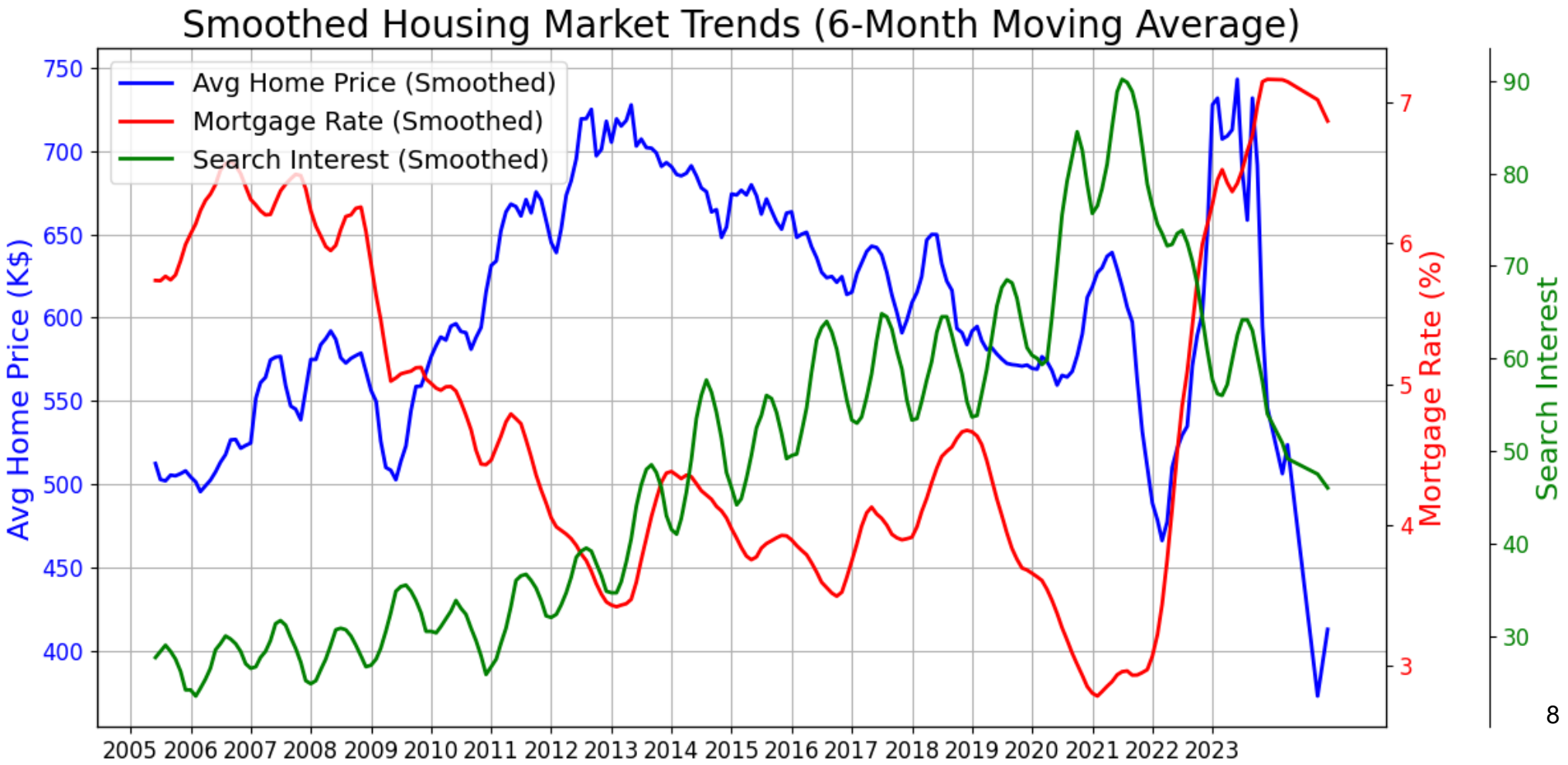
- Avg Home Price (K$) vs Mortgage Rate (%) vs Google Search Interest from 2004 to 2024.

- Difficult to interpret due to consistent jumps.



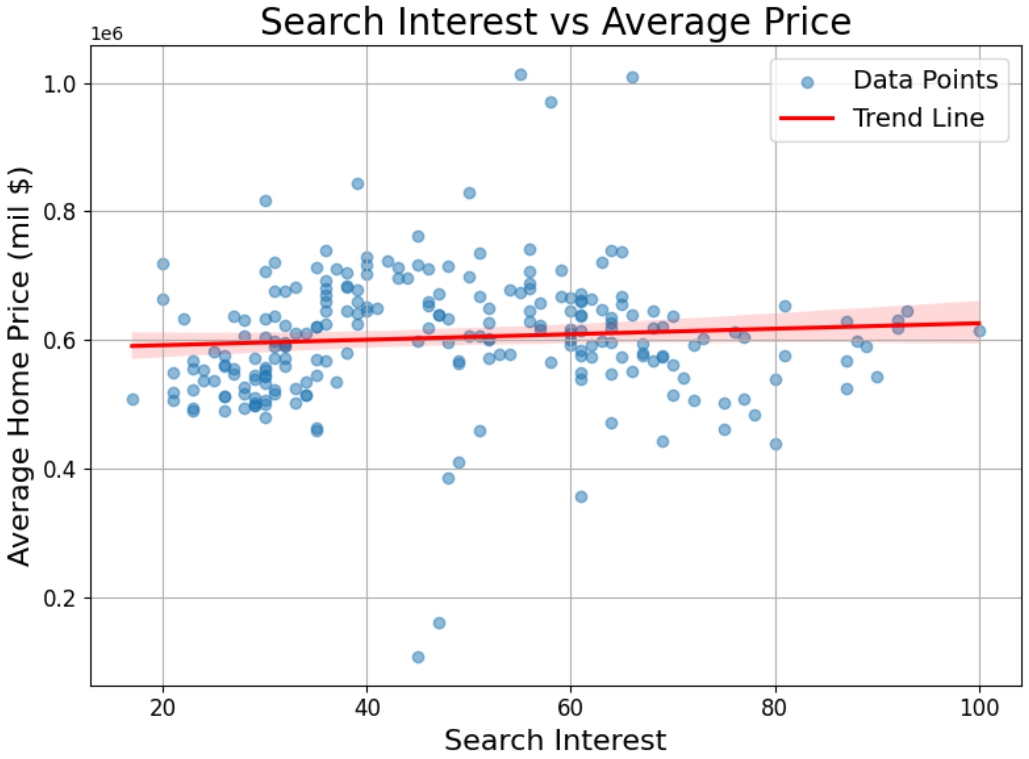
Summary of Results – Time Series Analysis 6-Month Moving Average

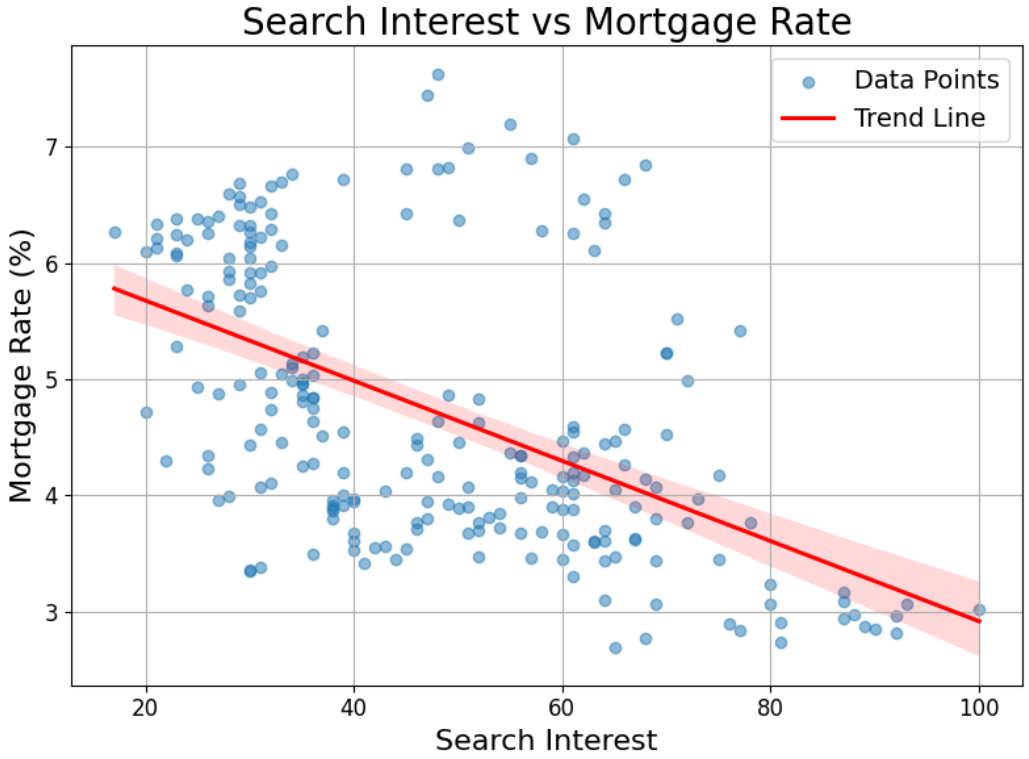
- Shows long-term trends by smoothing out short-term spikes.
- Avg Home Price steadily increases, decreases, then ends with uncertainty.
- Mortgage rate decreases sharply then steadily then jumps up.
- Google Search interest steadily increases then drops sharply.



Summary of Results – Regression Plots

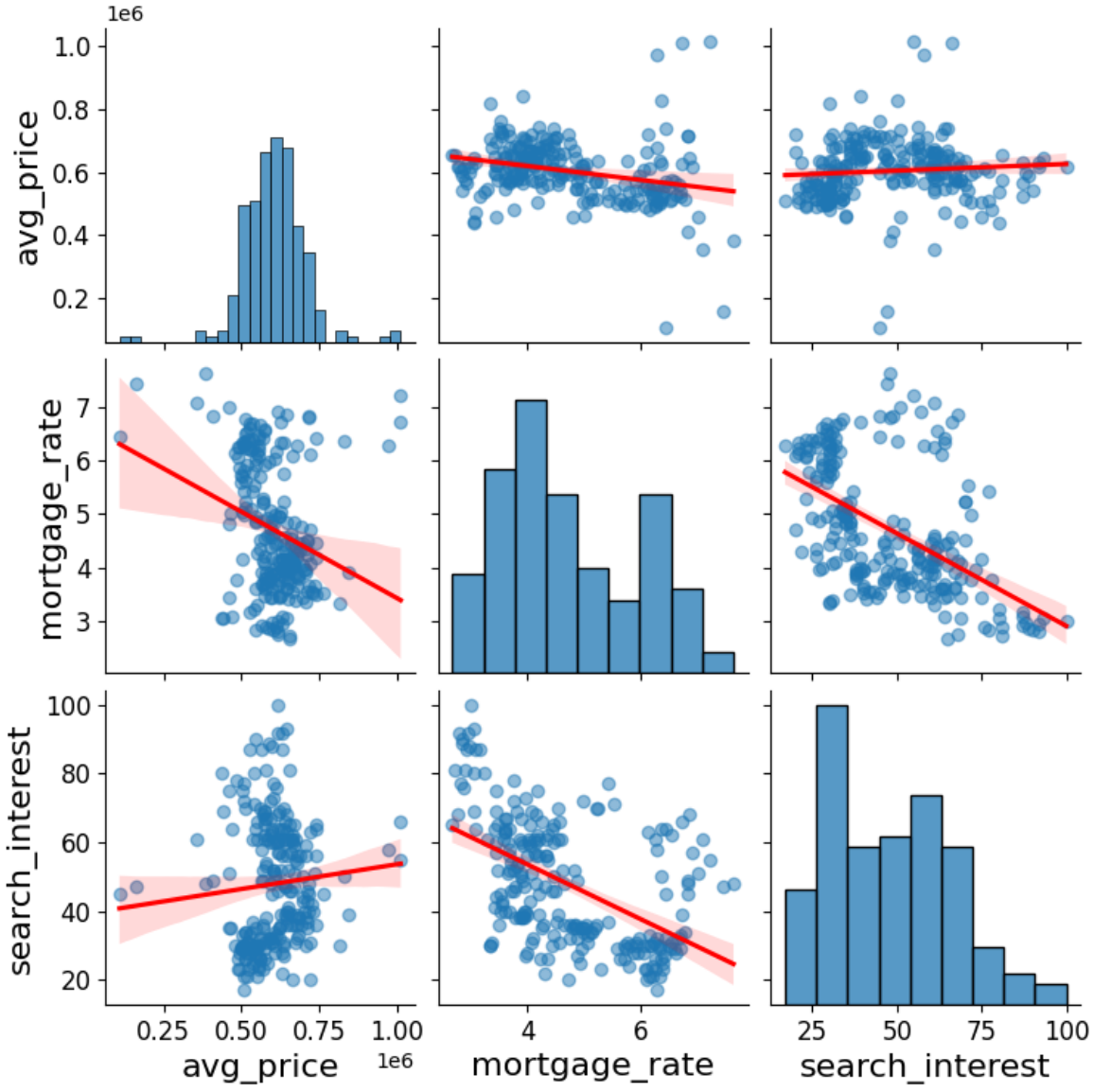
- Splitting the two by price, we can better interpret correlations, if any.
- Do rates and prices move with google search trends?
- As search interest increases, avg house prices slightly increases, an almost negligible relationship.
- Google search interest increases when mortgage rates drop, as expected.





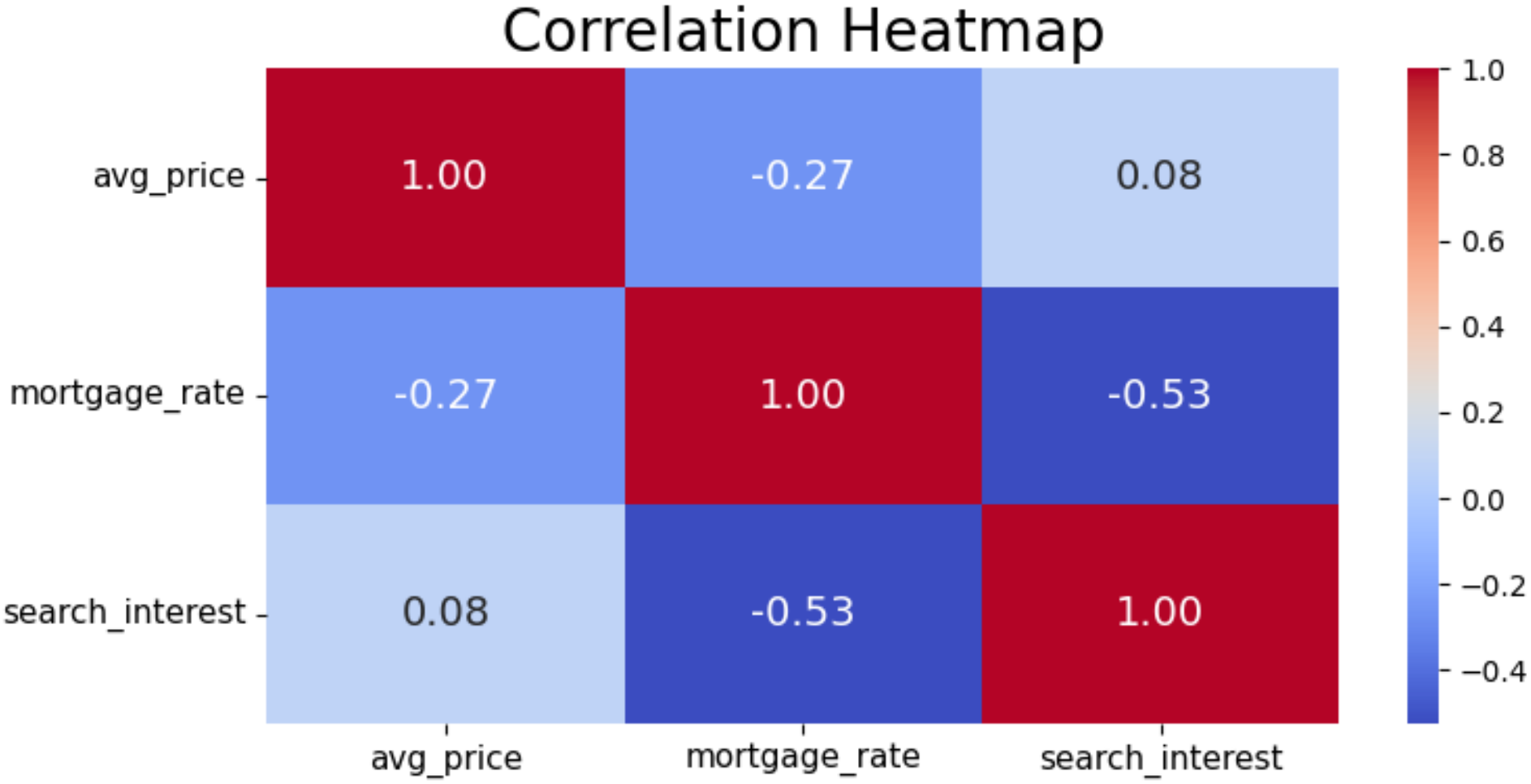
Summary of Results – Pair Plots

- None of the three variables have strong direct correlations except a moderate negative link between mortgage rates and search interest.



Summary of Results – Correlation Heatmap

- The Heatmap allows us to assess the relationships noted before but numerically.



Summary of Results - Conclusion

- Do early indicators such as Google Trends anticipate changes in housing affordability and market activity?

  -No, not with this specific data set. Correlation is not strong enough.

- Do rates and prices move with Google search trends?

  -Not prices but rates do. Higher the rates, lower the general public's interest in purchasing a home.

- Any future considerations?

  -Yes, consider additional housing price data with more precise filters, include additional Google search terms (currently limited by amount of requests), consider shorter analysis periods with major events removed such as housing crisis or COVID.

  -Also consider filtering by summer or winter. Graph consistently shows clear changes into winter of each year.

Challenges

Data Analysis Related

- Though the real estate data contained over 2 million data points, it could still be skewed in terms of whether some states had more data than others or whether more data was collected in specific years than others.
- It is possible to filter housing price and google trend data by state but mortgage rate is federal and cannot be further filtered.
- Percentage and directional changes were derived but ultimately not used due to lack of experience in data analysis.

Course Project Related

- Significant time was spent understanding and troubleshooting new tools including VS Code and GitHub especially in terms of commit logic.
- Needing to rely on external tutorials to understand the workflow instead of focusing solely on providing meaningful results from the analysis.
- Building the entire pipeline from scratch while learning unfamiliar technologies simultaneously.

Thank you!