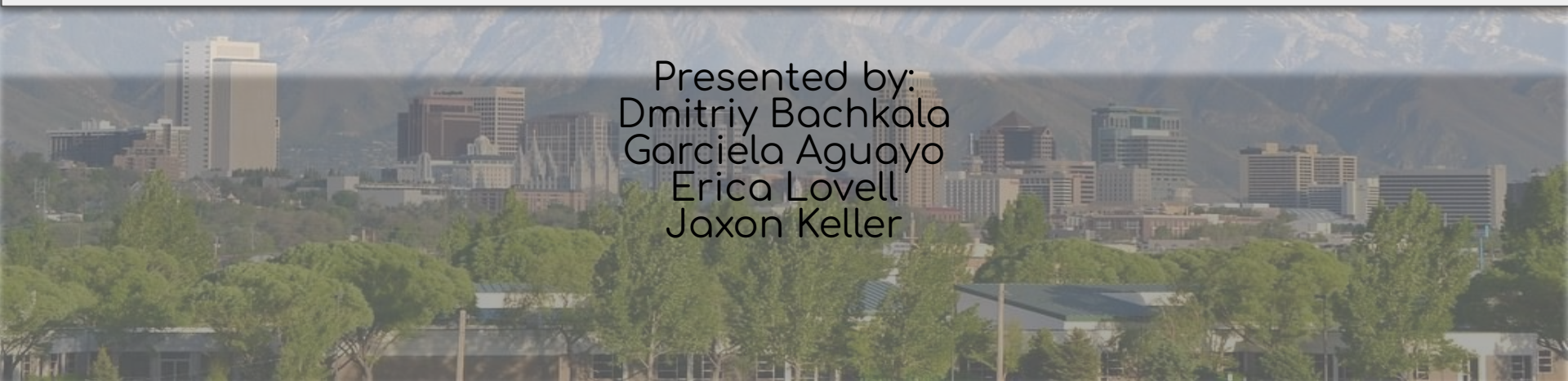
Economic Factors in the US Housing Market



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Project Overview

- Analysis of the relationship between:

  Home prices

  Mortgage rates

  Treasury yield rate

  Loan performance.

- How alterations in one factor can influence the others?

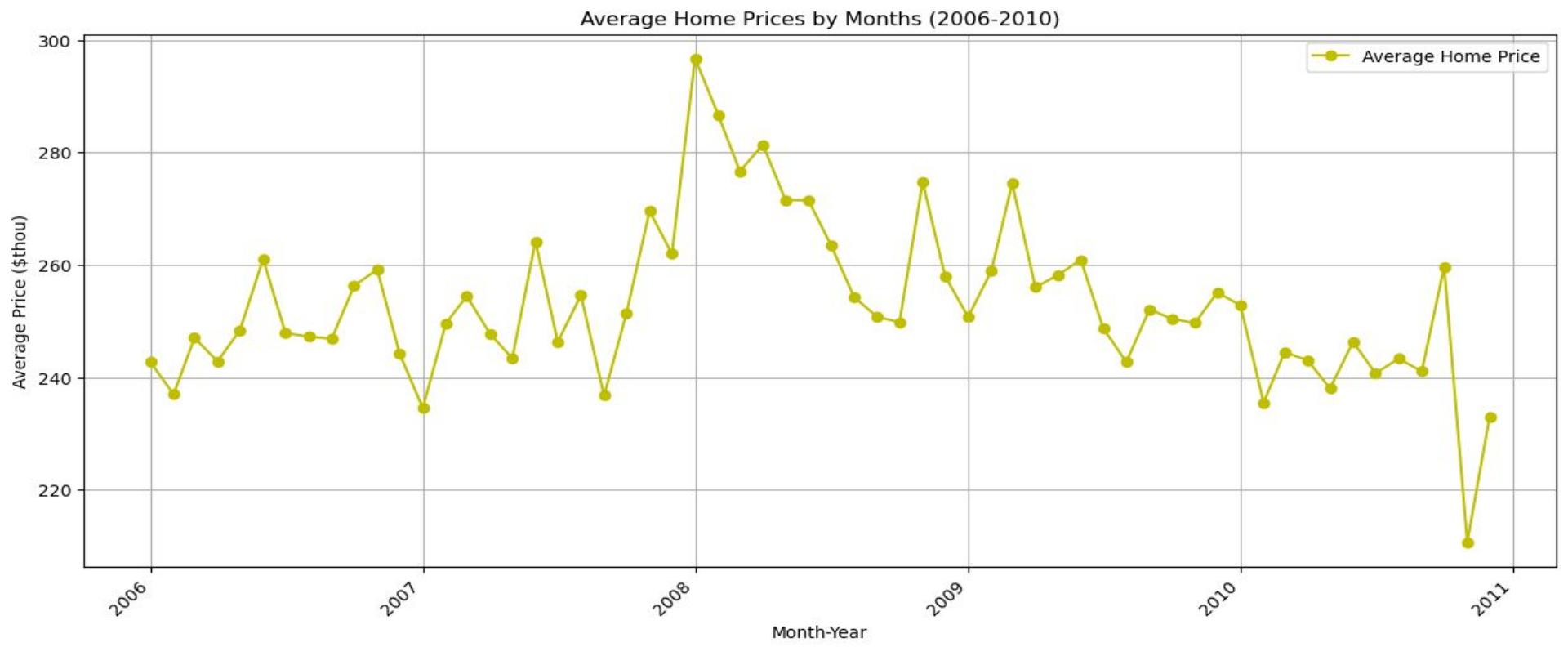
- What causational relationships exist between these variables?

Home Prices

- Before the financial crisis in 2008, the relationship between mortgage rates and home prices exhibited a stable trend.
- Mortgage rates and home prices showed relatively consistent patterns, creating a sense of stability in the housing market

- In 2008, there was a significant and abrupt increase in mortgage rates and a notable impact on home prices.
- The sharp increase in mortgage rates had a direct correlation with a sudden decline in home prices, marking a significant moment in the housing market.

- Following the 2008 crisis, there was a period of gradual decrease in both mortgage rates and home prices from 2008 to 2010.
- During this time, the housing market would gradually decrease. Both mortgage rates and home prices gradually went down.



- Stable Trend (pre 2008)
- Sharp Increase in 2008
- Gradual Decrease (2008-2010)

Mortgage Rates

- In the year 2006, mortgage rates started at a relatively high point, reaching 6.2%.
- The initial high rates shaped the overall atmosphere, affecting the dynamics of the housing market throughout this period.

- There were consistent jumps in the mortgage rates occurring in the middle of each year except 2010.
- These mid year increases could be attributed to various economic factors affecting interest rates and impacting the real estate market.

- Despite the mid year jumps, there was an overall trend of gradual decrease in mortgage rates over the years 2006 to 2010
- This gradual decrease might have contributed to a more stabilized market towards the end of the analyzed period

- Initial high rates (2006 at 6.2%)
- Jumps in the middle of each year except 2010
- Gradual decrease over the year

HPI Yearly Changes Throughout the U.S.

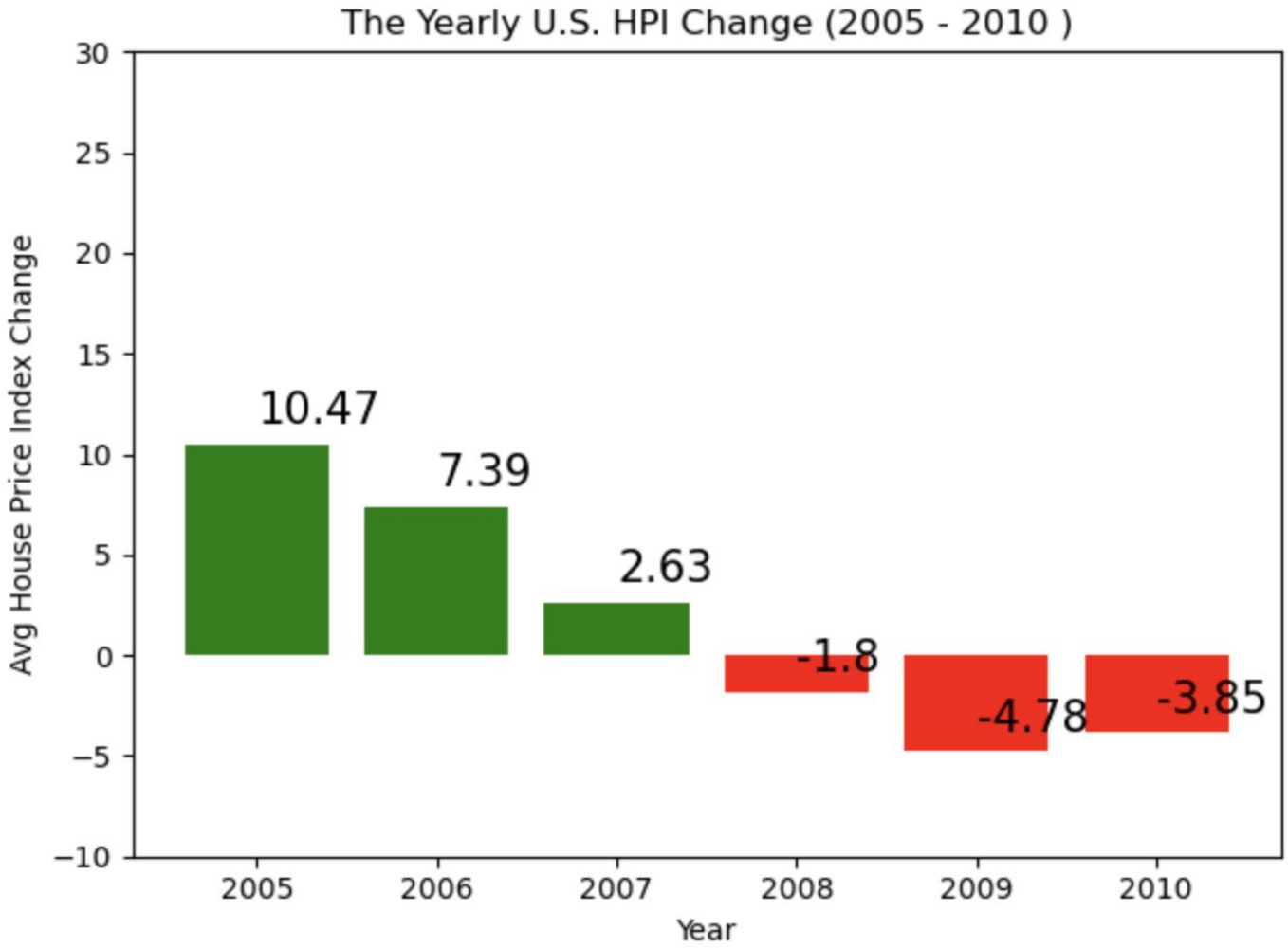
Questions:

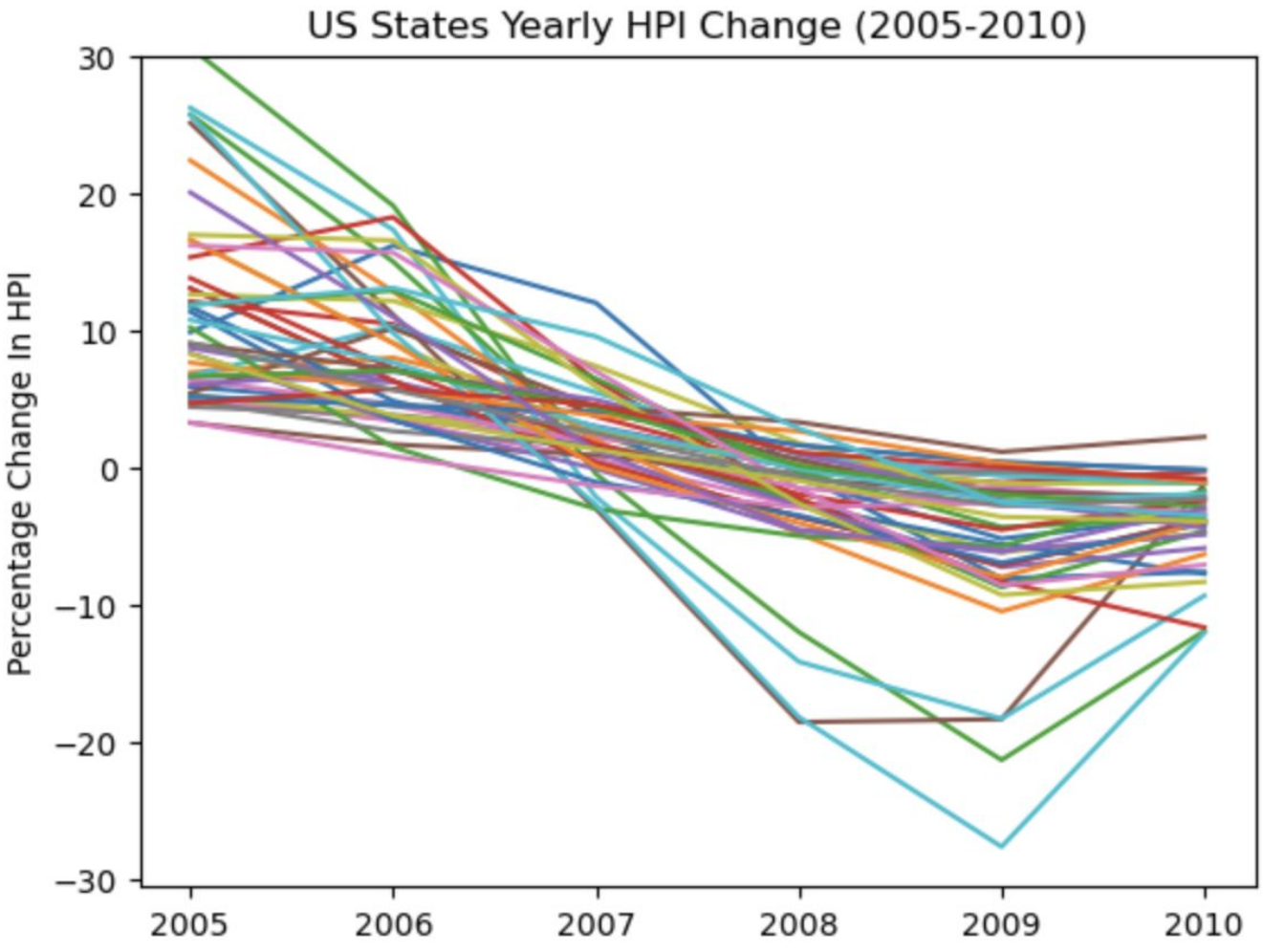
- What does the House Price Index Change tell us?

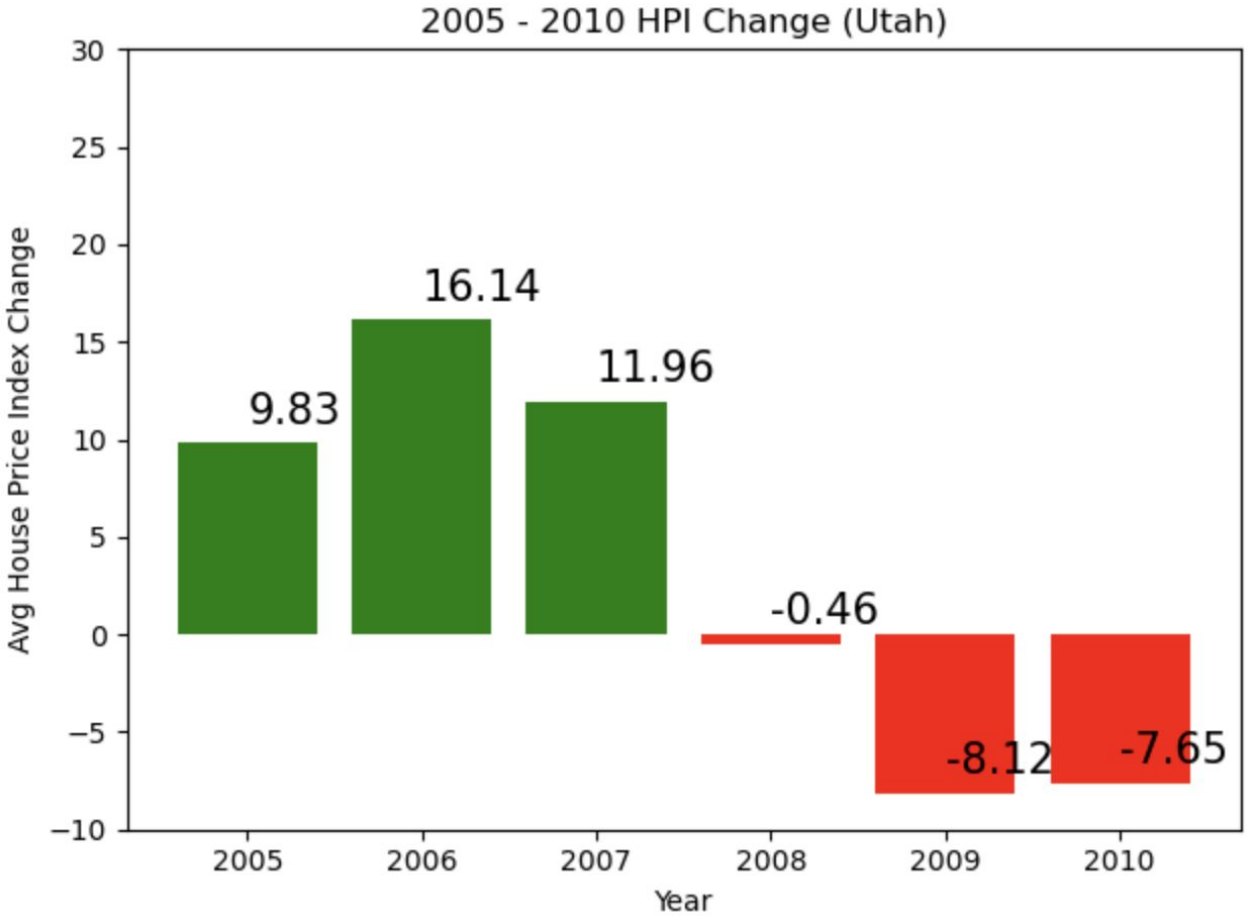
- Looking at the U.S. what can the HPI change throughout 2005-2010 tell us about the house prices throughout that time?

- When was the best time for buyers and sellers?

Dataset : https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx


The Yearly U.S. HPI Change (2005 - 2010)
Avg House Price Index Change
30
25
20
15
10
5
0
−5
−10
10.47
7.39
2.63
-1.8
-4.78
-3.85
2005
2006
2007
2008
2009
2010
Year


US States Yearly HPI Change (2005-2010)
Percentage Change In HPI
30
20
10
0
−10
−20
−30
2005
2006
2007
2008
2009
2010


2005 - 2010 HPI Change (Utah)
Avg House Price Index Change
Year
30
25
20
15
10
5
0
−5
−10
2005
2006
2007
2008
2009
2010
9.83
16.14
11.96
-0.46
-8.12
-7.65

Comparison of Mortgage Rate & Treasury Yields

Questions:

- Is there a close, causative correlation between Treasury yields and mortgage interest rates?

- Is that correlation maintained during great financial upheaval?

Comparison of Mortgage Rate & Treasury Yields

Datasets

Treasury Rates

- US Department of the Treasury
  - Annual Daily Treasury Par Yield Curve Rates, 2006-2010

Mortgage Rates

- Federal Housing Finance Agency
  - Terms on Conventional Single Family Mortgages, Fixed-Rate 30-YEAR And 15-Year Non-Jumbo Loans; 1990-2019

Treasury

Datasets

- Starting point: 5 separate datasets with daily rates

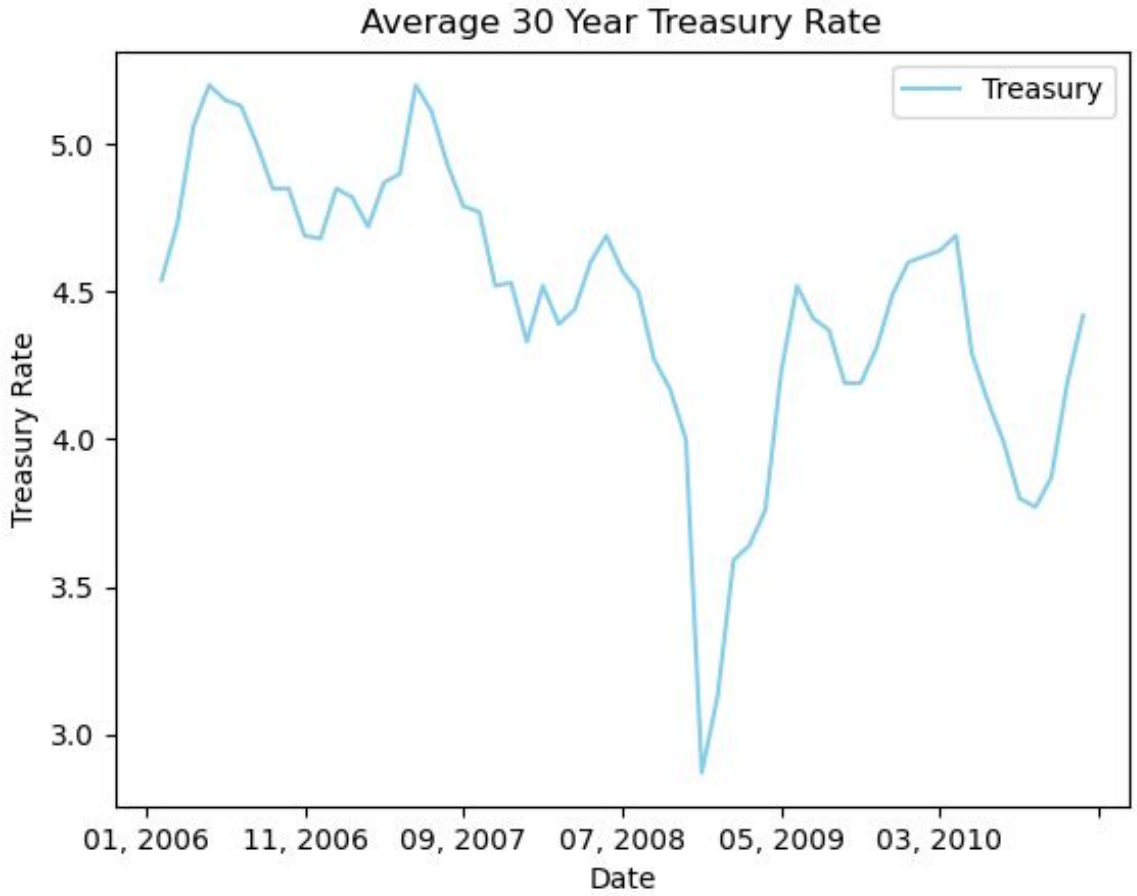
Treasury

Datasets

- Starting point: 5 separate datasets with daily rates

- Cleanup involved:
  - Generating a monthly average rate within each dataset
  - Merge the 5 datasets into one
  - Utilize concat to combine the 5 columns of data into one vertical column
  - Convert month to two digits with zfill
  - Create new column with combined month & year

Treasury

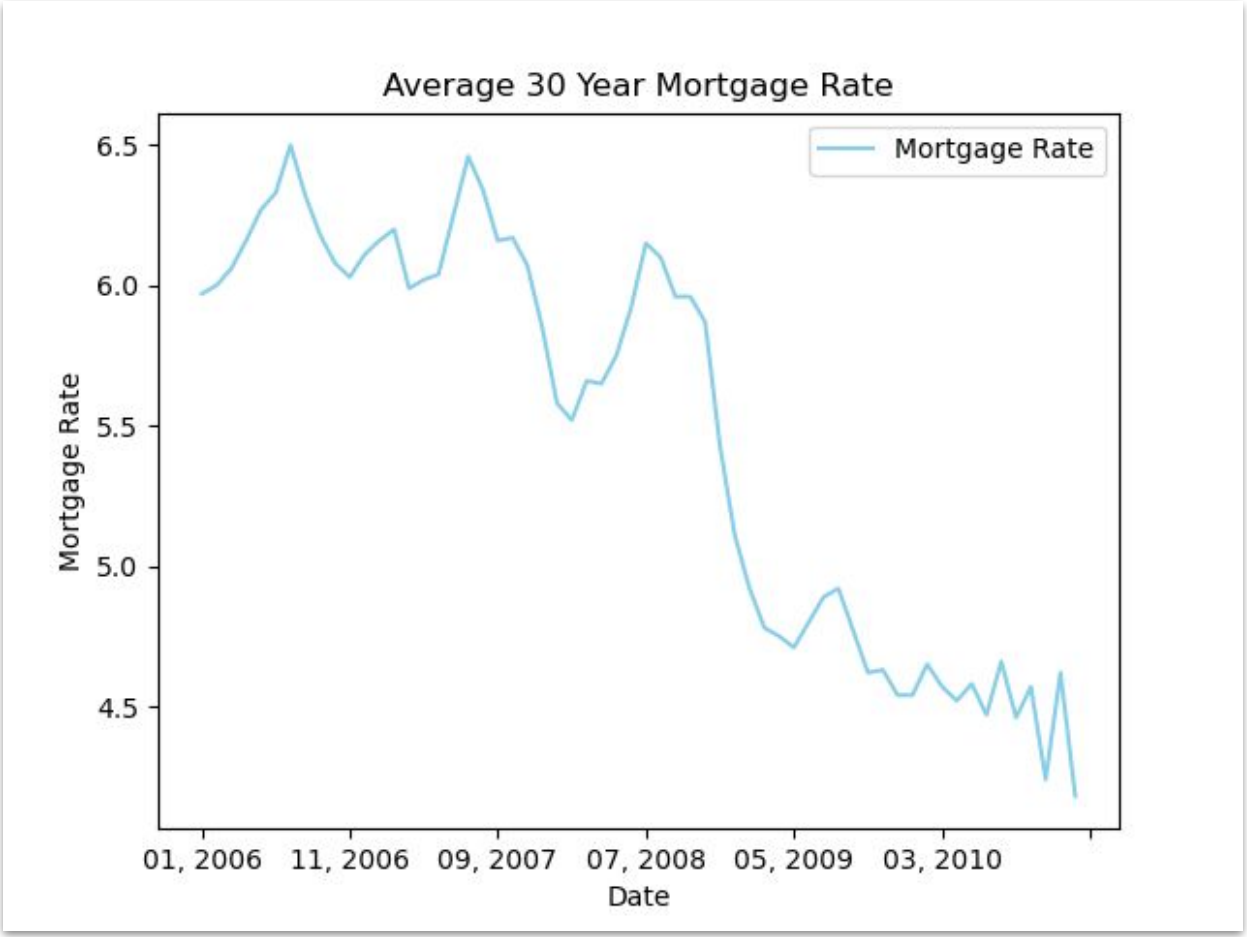

Average 30 Year Treasury Rate
Treasury
5.0
4.5
4.0
3.5
3.0
Treasury Rate
01, 2006
11, 2006
09, 2007
07, 2008
05, 2009
03, 2010
Date

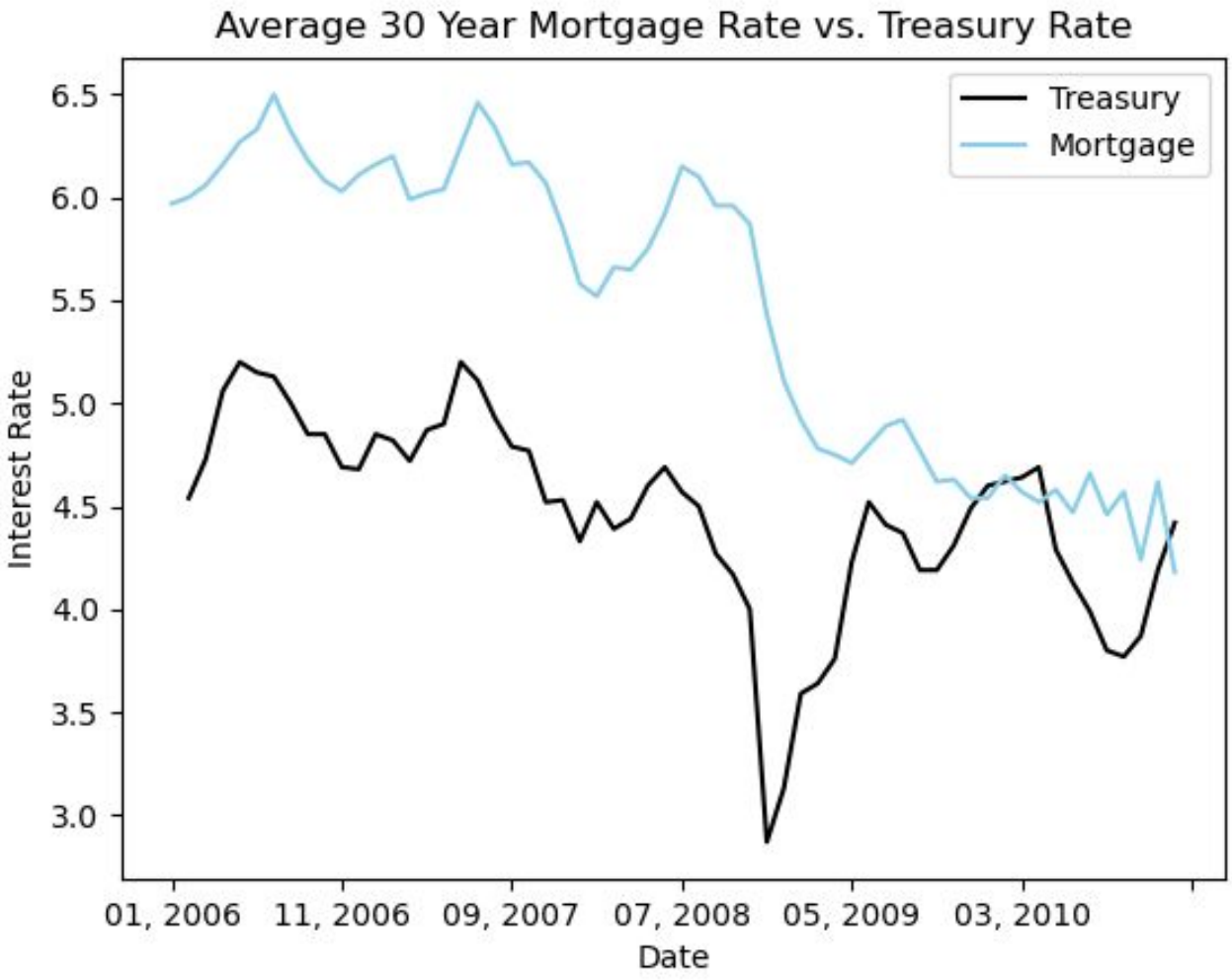
Mortgage

Datasets

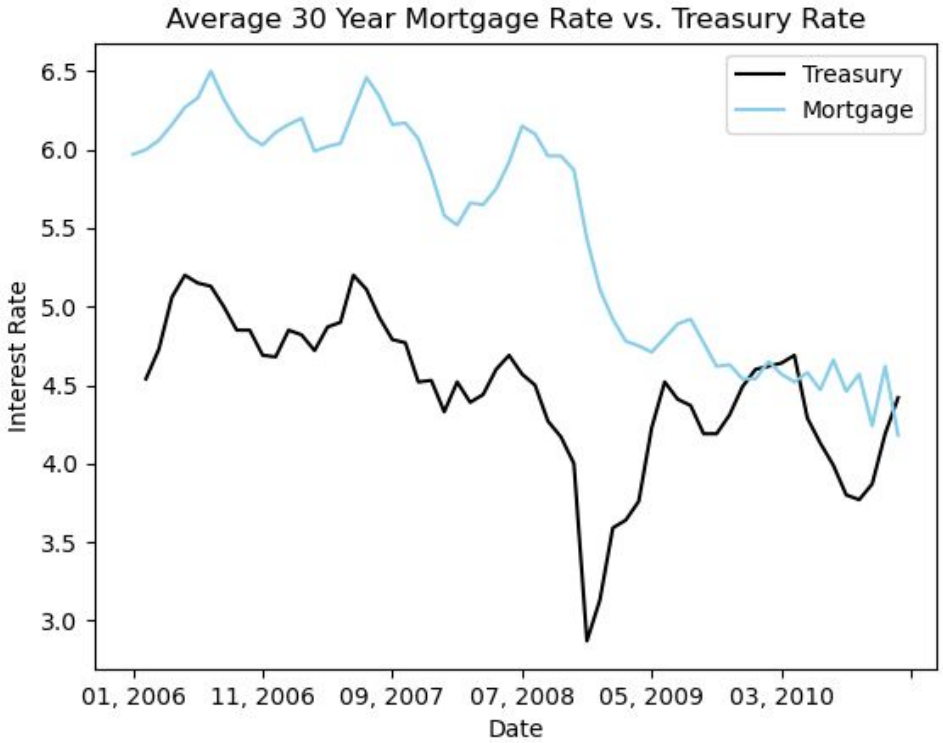
- Starting point: One dataset
- Cleanup involved:
  - Convert month to two digits with zfill
  - Create new column with combined month & year

Mortgage Rates




Average 30 Year Mortgage Rate vs. Treasury Rate
Treasury
Mortgage
Interest Rate
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
01, 2006
11, 2006
09, 2007
07, 2008
05, 2009
03, 2010
Date

Comparison



Ttest

- pvalue=3.417893260344795e-20
- df=99.1509613941911

Mortgage Performance

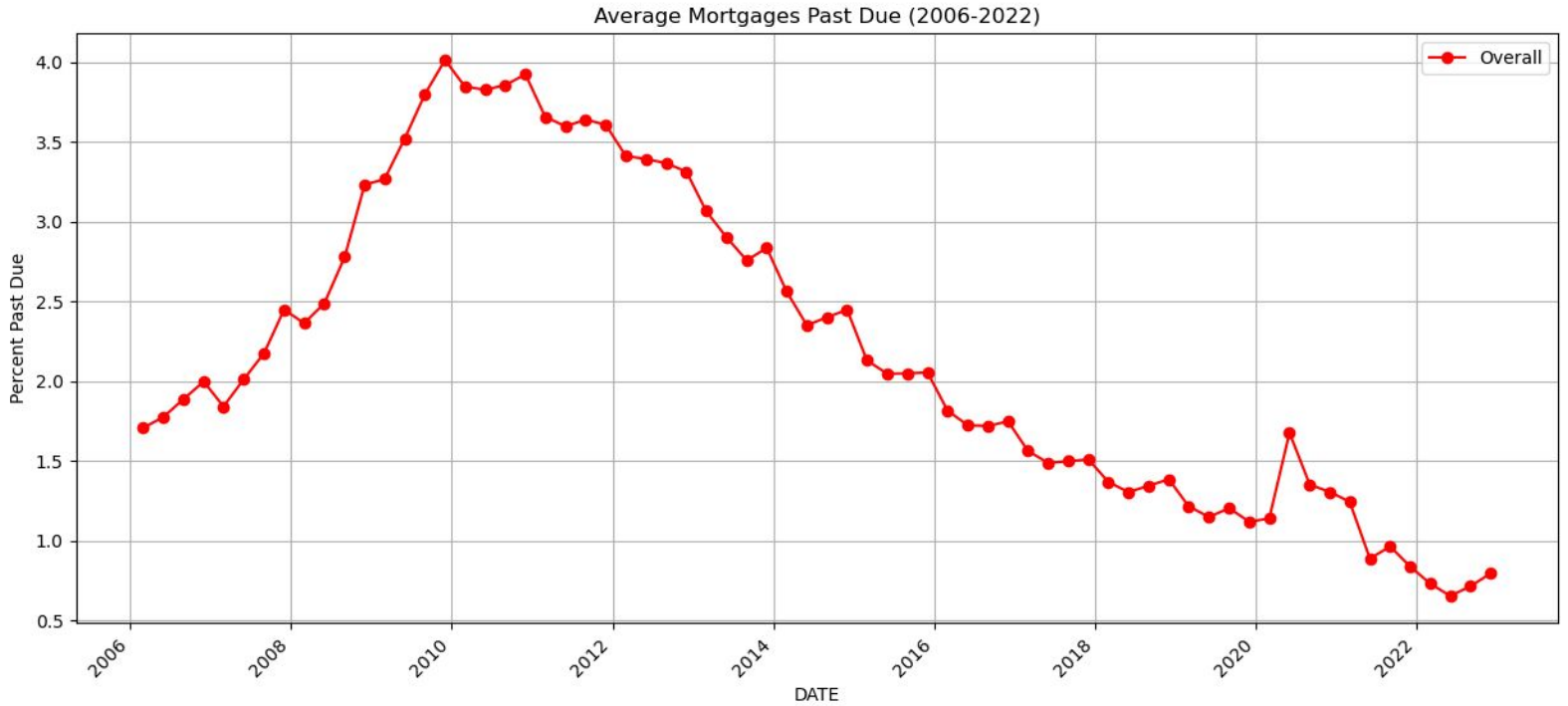
Rate of Past Due Mortgages 2006-2022

- What correlations between mortgage rate and performance can be observed?
- Is one’s ability to stay current on their mortgage impacted by rate or other factors?

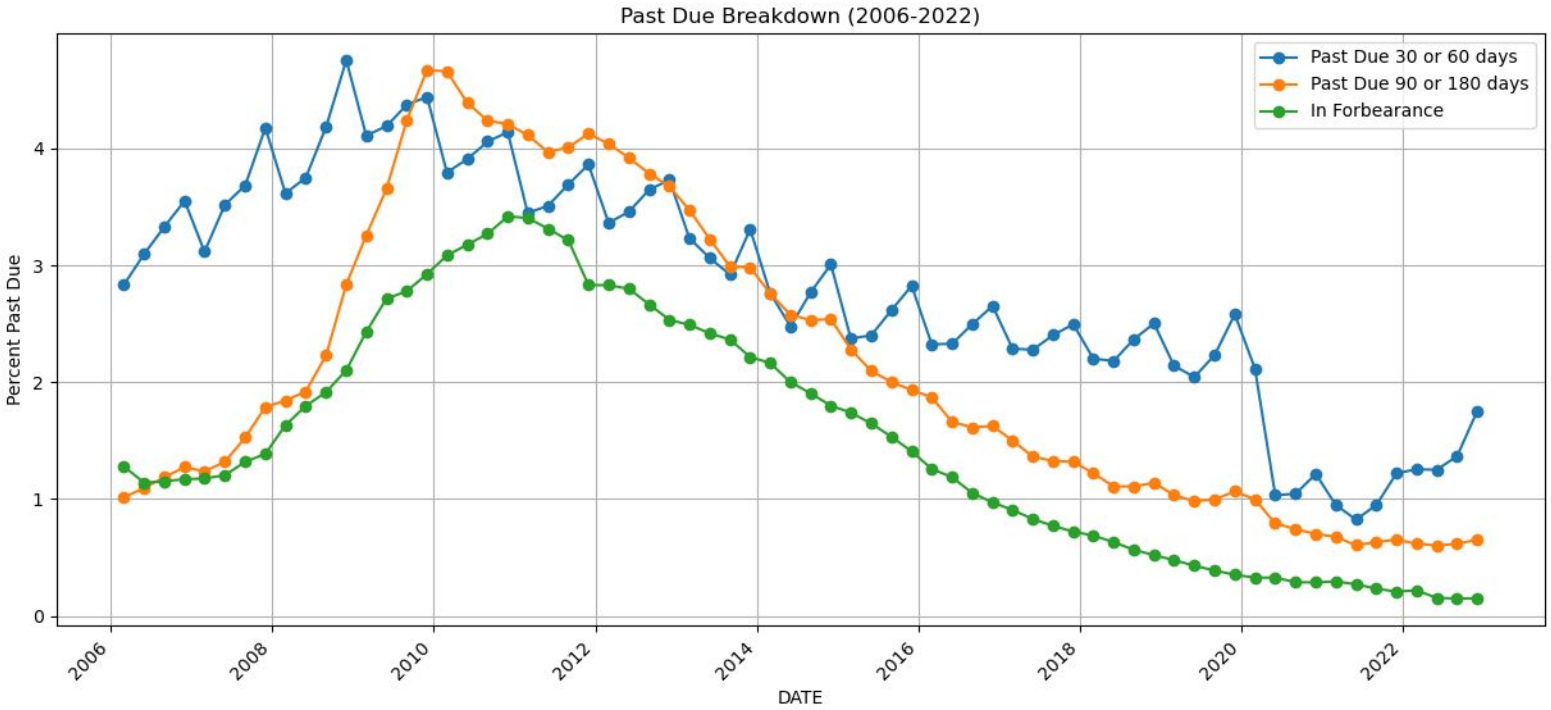
To answer these questions, we took a look at mortgages with past due payments from 2005 to 2022 and compared these numbers to rate.

Figures show percentage of overall mortgages past due as well as a breakdown containing percentage of mortgages 30 or 60 days past due, 90 or 180 days past due, or in forbearance heading towards foreclosure.

Mortgage Performance - Figure 1



Mortgage Performance - Figure 2



Conclusions

- (Dmitriy) The mortgage rate history exhibits stability pre-2008, followed by a sharp increase during the crisis. Post-crisis, rates gradually decrease from 2008 to 2010, marked by periodic jumps in the middle of each year. Despite intermittent increases, an overall trend of gradual decrease emerges, emphasizing the dynamic nature of economic factors shaping mortgage rates over time.

- (Erica)There is a causative relationship between treasury rates and mortgage rates. That relationship stays consistent through normative financial periods. However, in time of great financial upheaval, that correlation can be weakened for a period of time. The typical relationship was not restored for years after the Great Financial Crisis.

- (Graciela) Throughout the years 2005 - 2010, the United States average HPI change shows us that prices of homes through 2005 - 2007 increased but as soon as we hit 2008, house prices started to decrease. This shows us that the best time for buyers was 2009-2010 and the best time for sellers was 2005-2006.

- (Jaxon) While there was not much correlation between mortgage rates and percent of mortgages past due, there is a clear impact to both of these metrics during times of economic crisis. Figure 1 clearly shows that mortgages past due drastically increased throughout the 2008 housing crisis while the Treasury rates were reduced to help combat the negative impact. Something similar is observed at the beginning of the COVID crisis until protections were put in place. Again, Treasury rates were dropped as low as .99% in an effort to mitigate impact to the broader economy.

Data sets

Mortgage Rates & Home Prices
https://www.fhfa.gov/DataTools/Downloads/Pages/Monthly-Interest-Rate-Data.aspx

- Table26-2019-by-Month.csv

Treasury Rates
https://home.treasury.gov/resource-center/data-chart-center/interest-rates/TextView?t[…]daily_treasury_yield_curve&field_tdr_date_value_month=202310

- 2006-daily-treasury-rates
- 2007-daily-treasury-rates
- 2008-daily-treasury-rates
- 2009-daily-treasury-rates
- 2010-daily-treasury-rates

House Price Index Datasets
https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index-Datasets.aspx

Mortgage Performance
https://www.fhfa.gov/DataTools/Downloads/Pages/National-Mortgage-Database-Aggregate-Data.aspx (Residential Mortgage Performance Statistics - National, Census Regions, and Census Divisions CSV)