

Economic Factors in the US Housing Market

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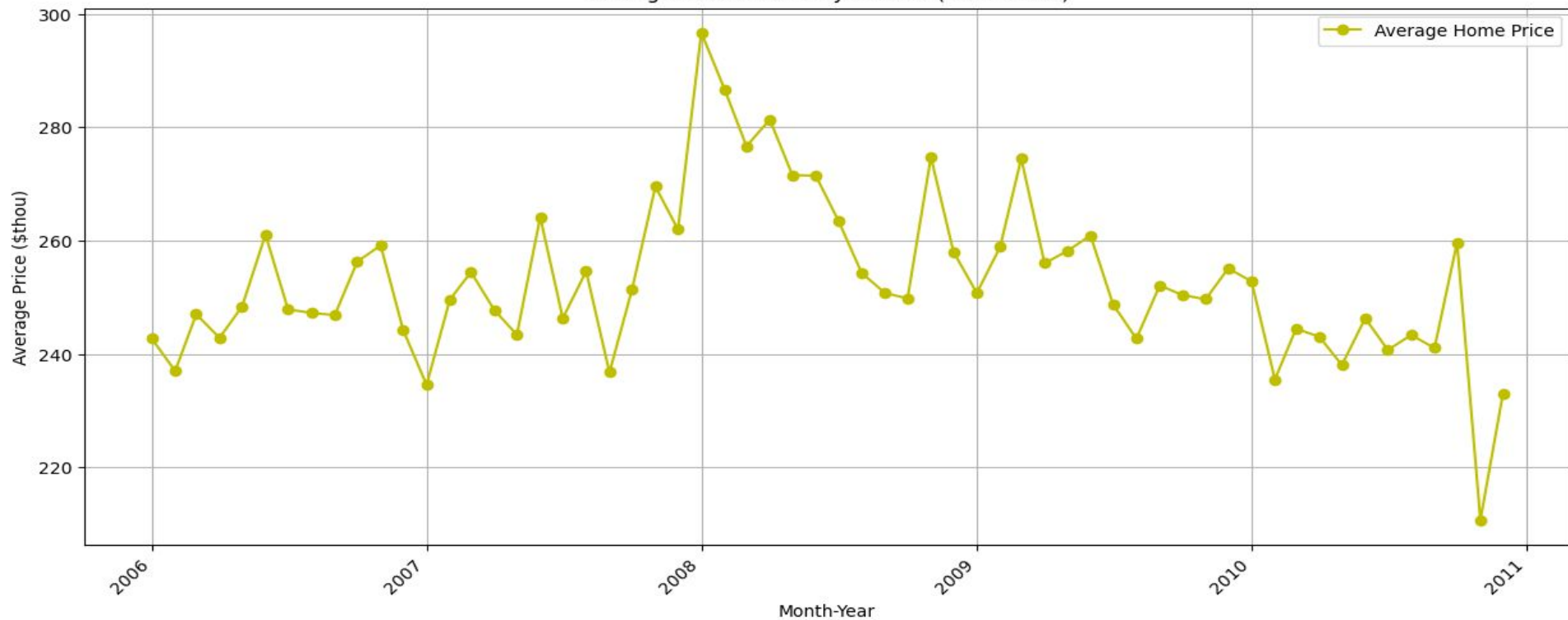
Project Overview

- Analysis of the relationship between:
 - Home prices
 - Mortgage rates
 - Treasury yield rate
 - Loan performance.
- Displaying changes in one factor can affect the others
- What causal 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
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- 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.
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- 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.

Average Home Prices by Months (2006-2010)

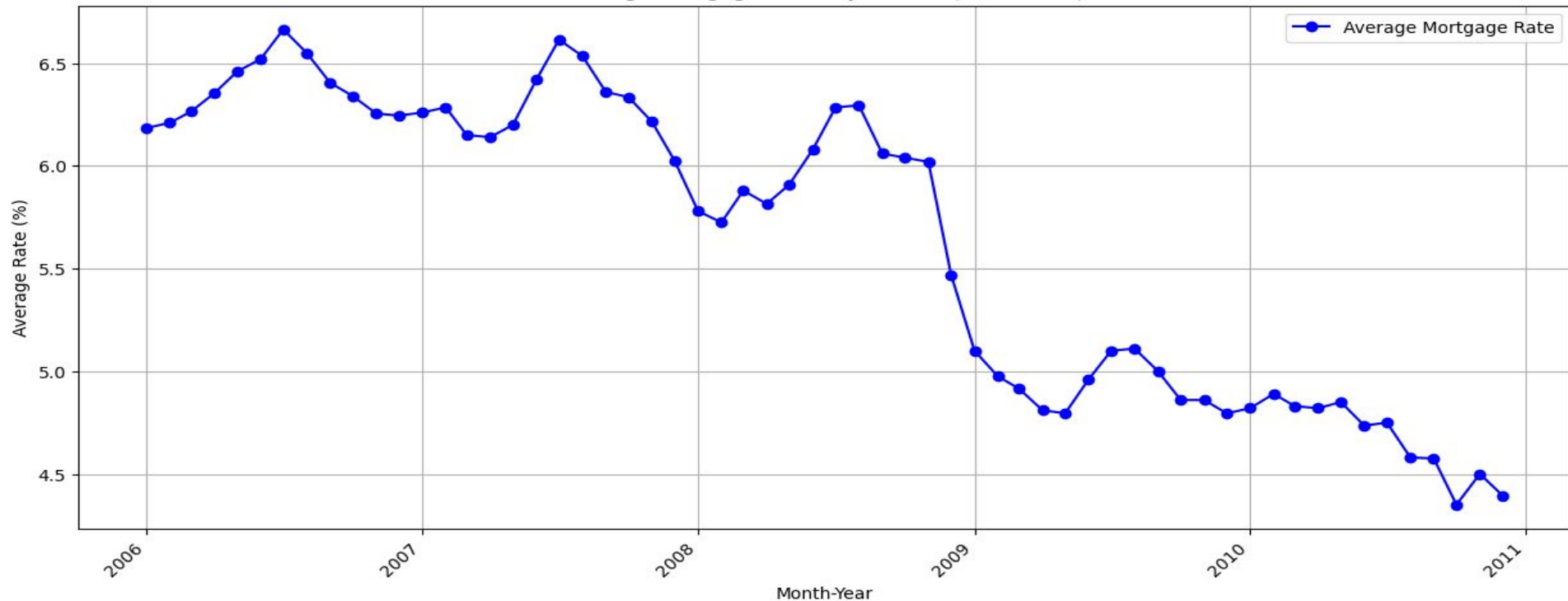


- Stable Trend (pre 2008)
- Sharp Increase in 2008
- Gradual Decrease (2008-2010)

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

Average Mortgage Rates by Months (2006-2010)



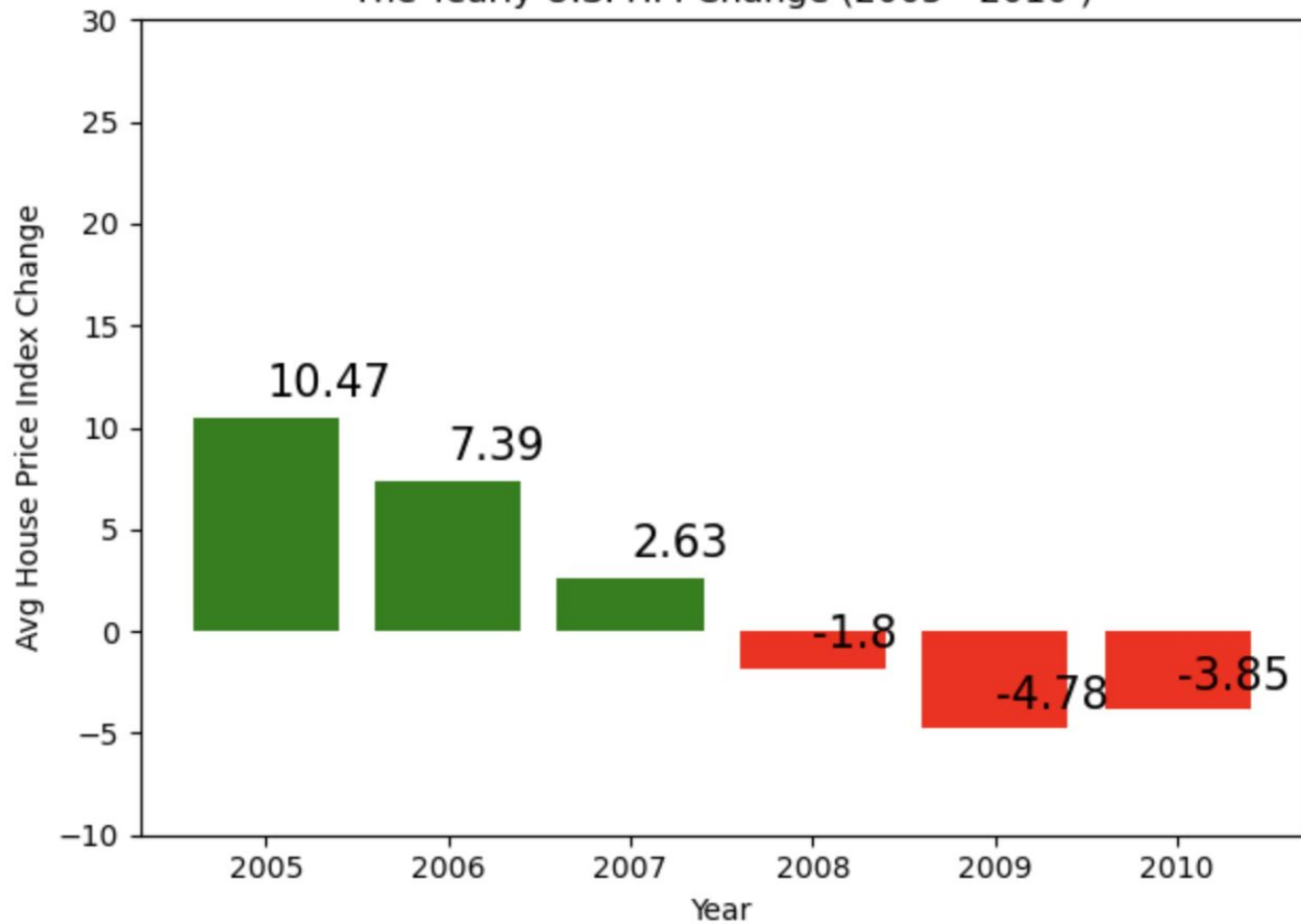
- Initial high rates (2006 at 6.2%)
- Jumps in the middle of each year except 2010
- Gradual decrease over the year

HPI Yearly Changes Throughout the U.S.

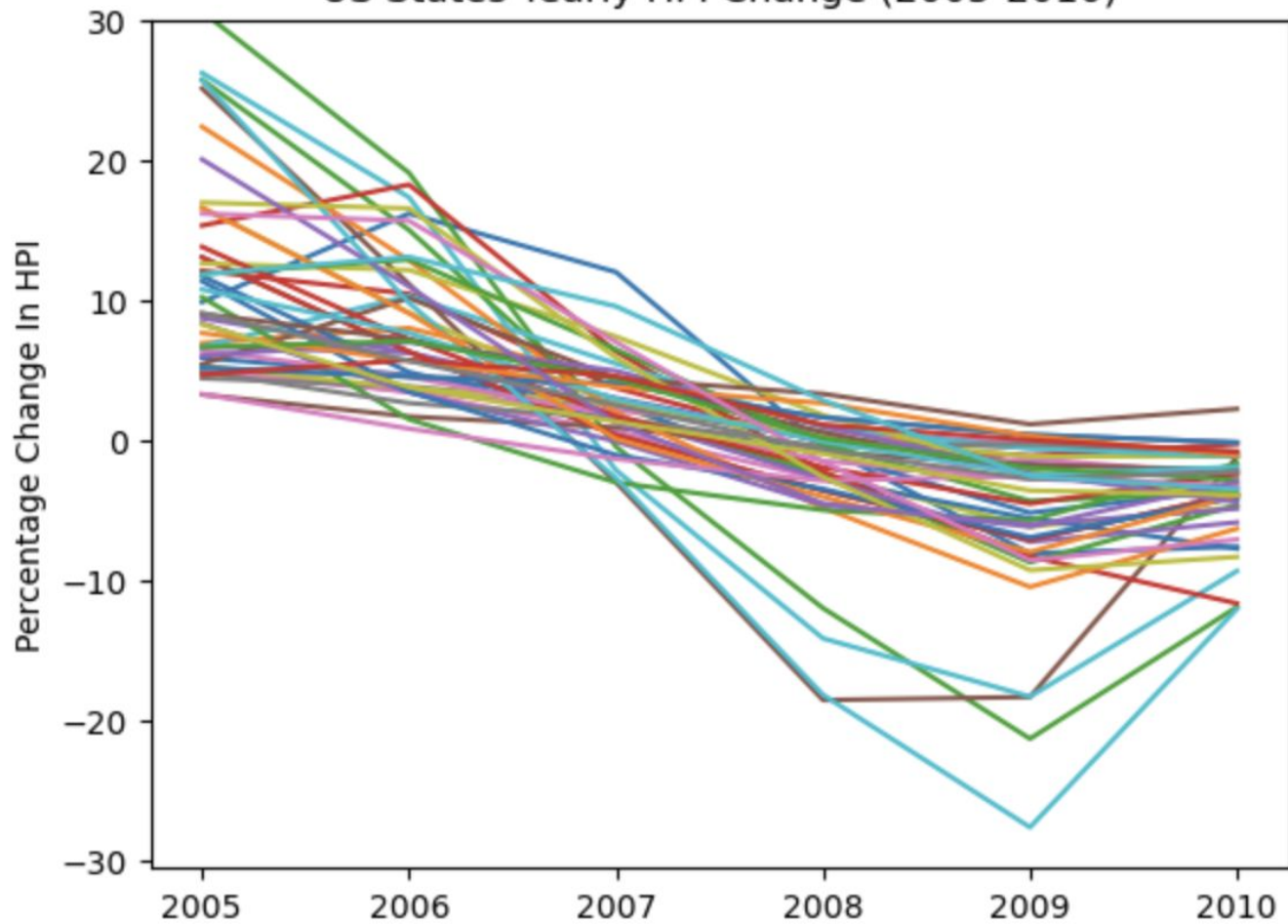
Questions:

- 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?

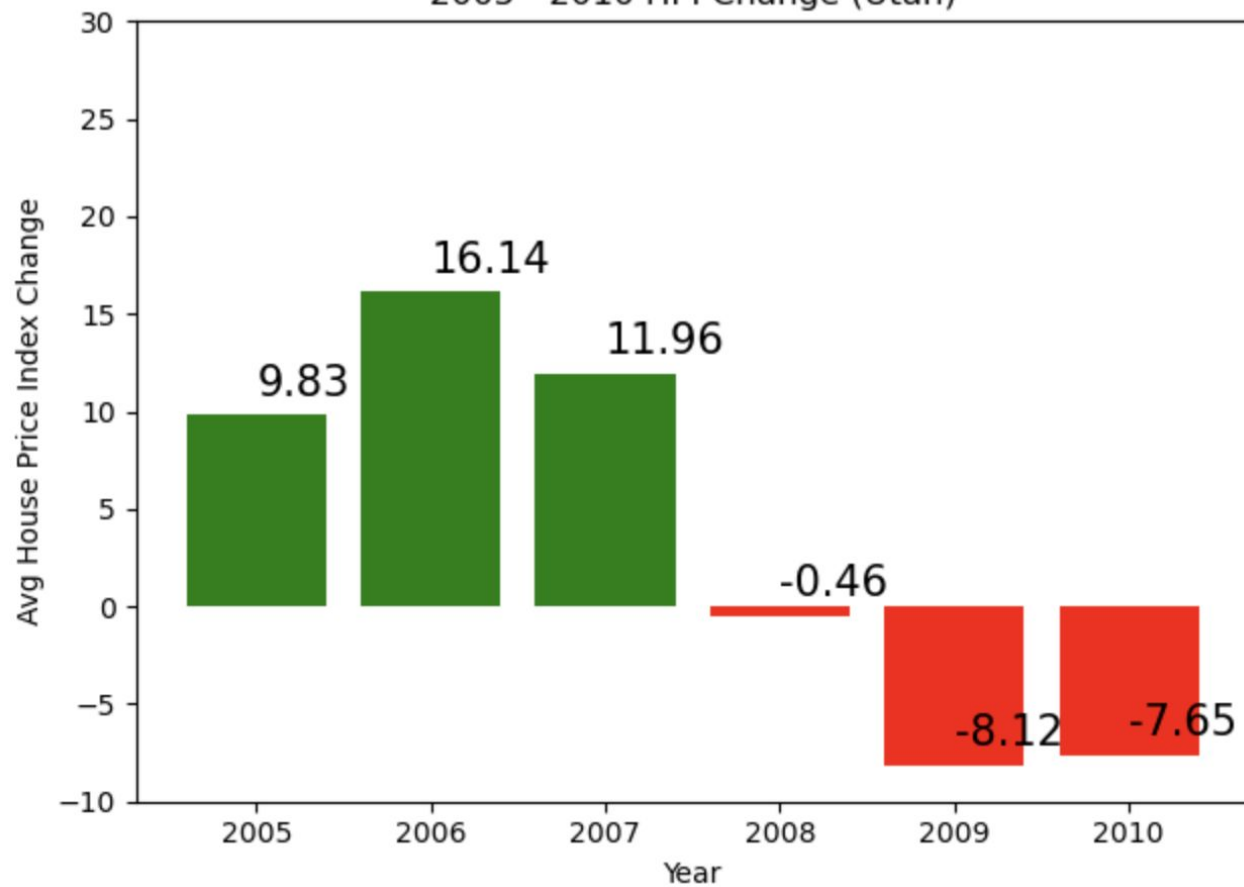
The Yearly U.S. HPI Change (2005 - 2010)



US States Yearly HPI Change (2005-2010)



2005 - 2010 HPI Change (Utah)



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



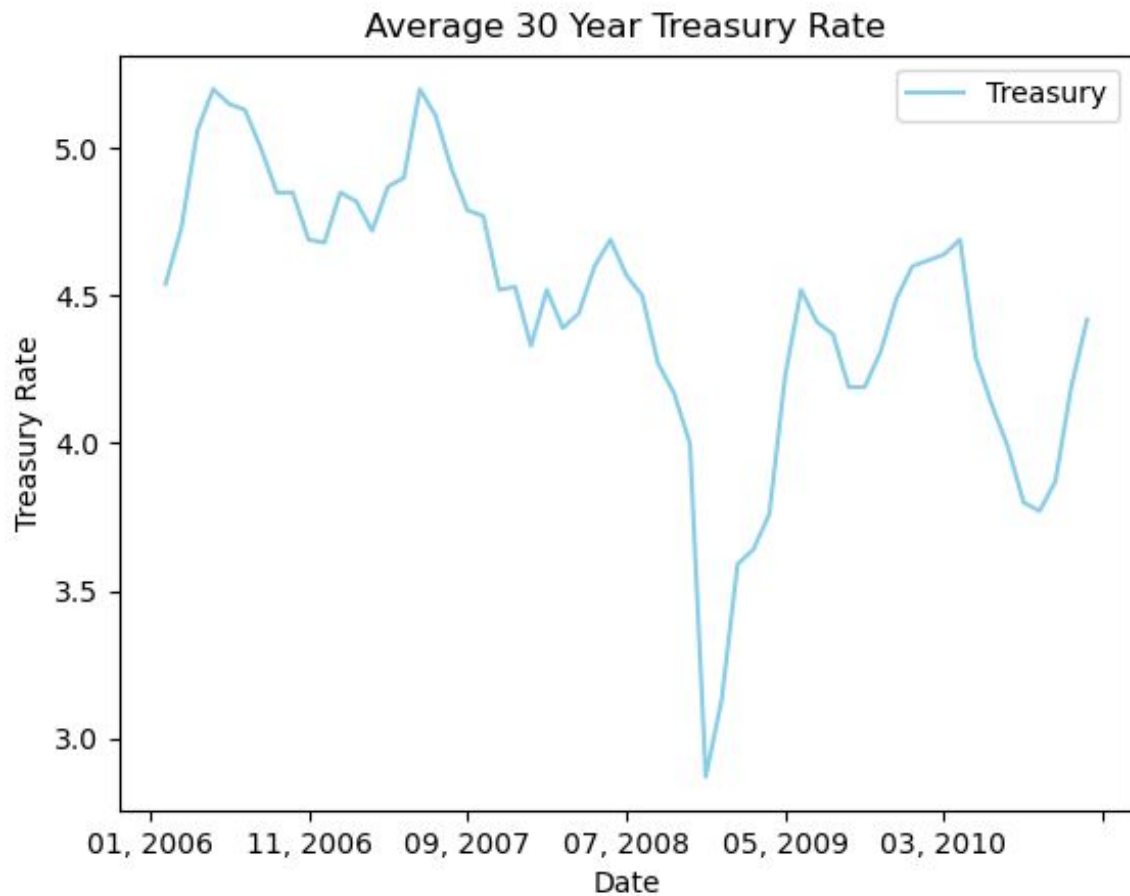
Treasury

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



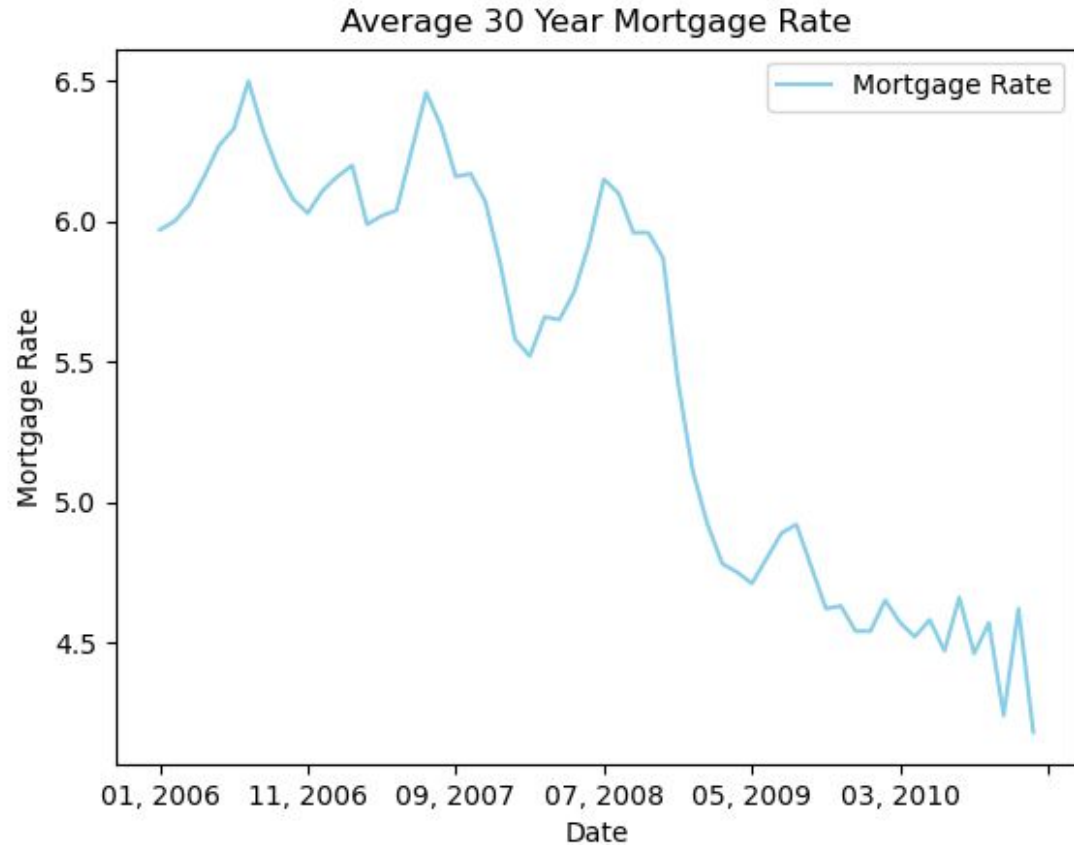
Mortgage

Datasets

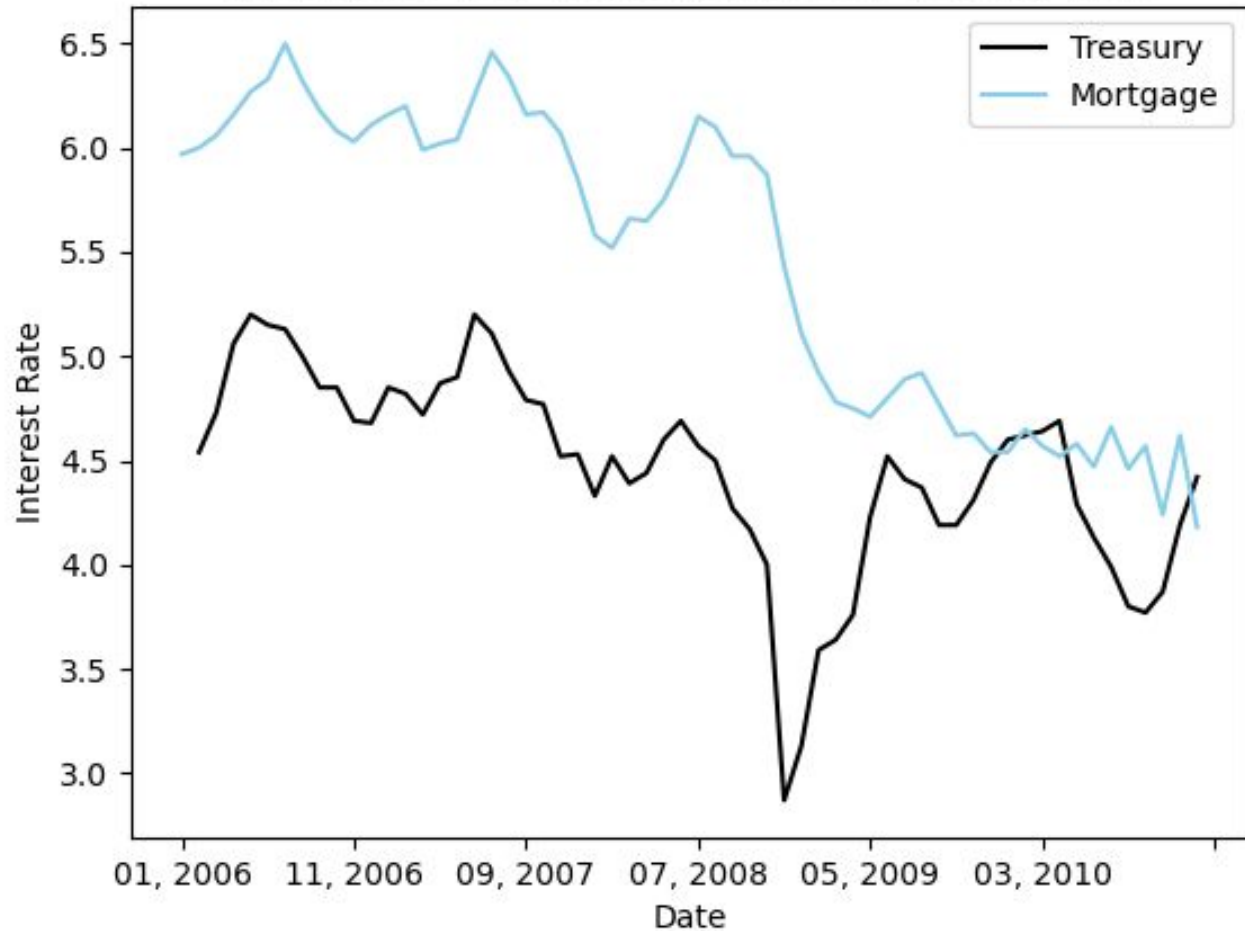
- Starting point: One dataset
- Cleanup involved:
 - Convert month to two digits with zfill
 - Create new column with combined month & year



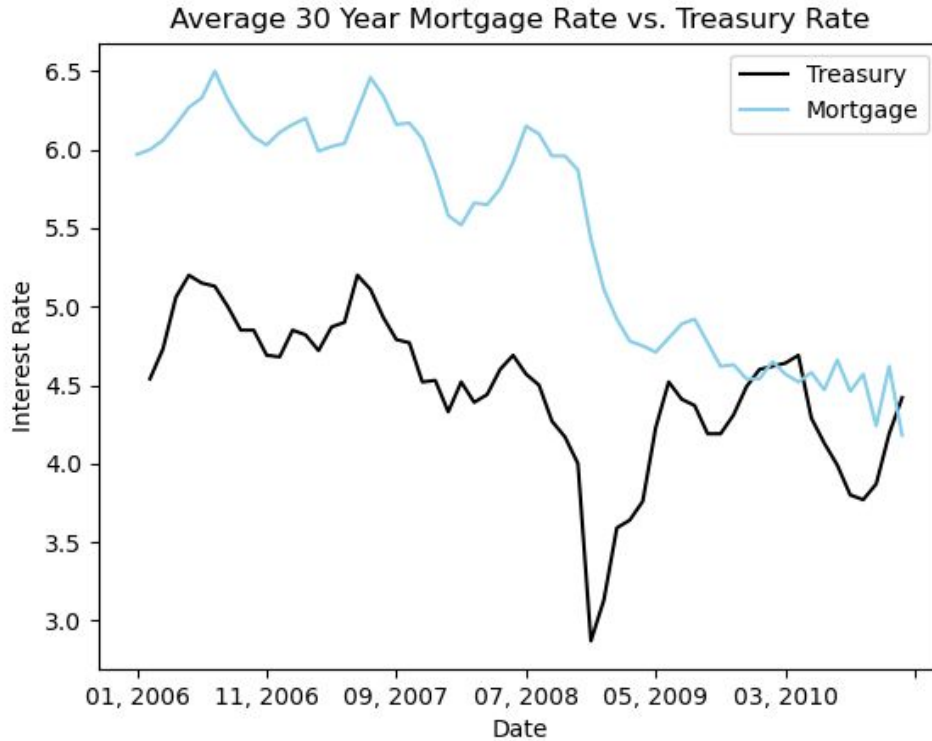
Mortgage Rates



Average 30 Year Mortgage Rate vs. Treasury Rate



Comparison



Ttest

- pvalue=3.417893260344795e-20
- df=99.1509613941911

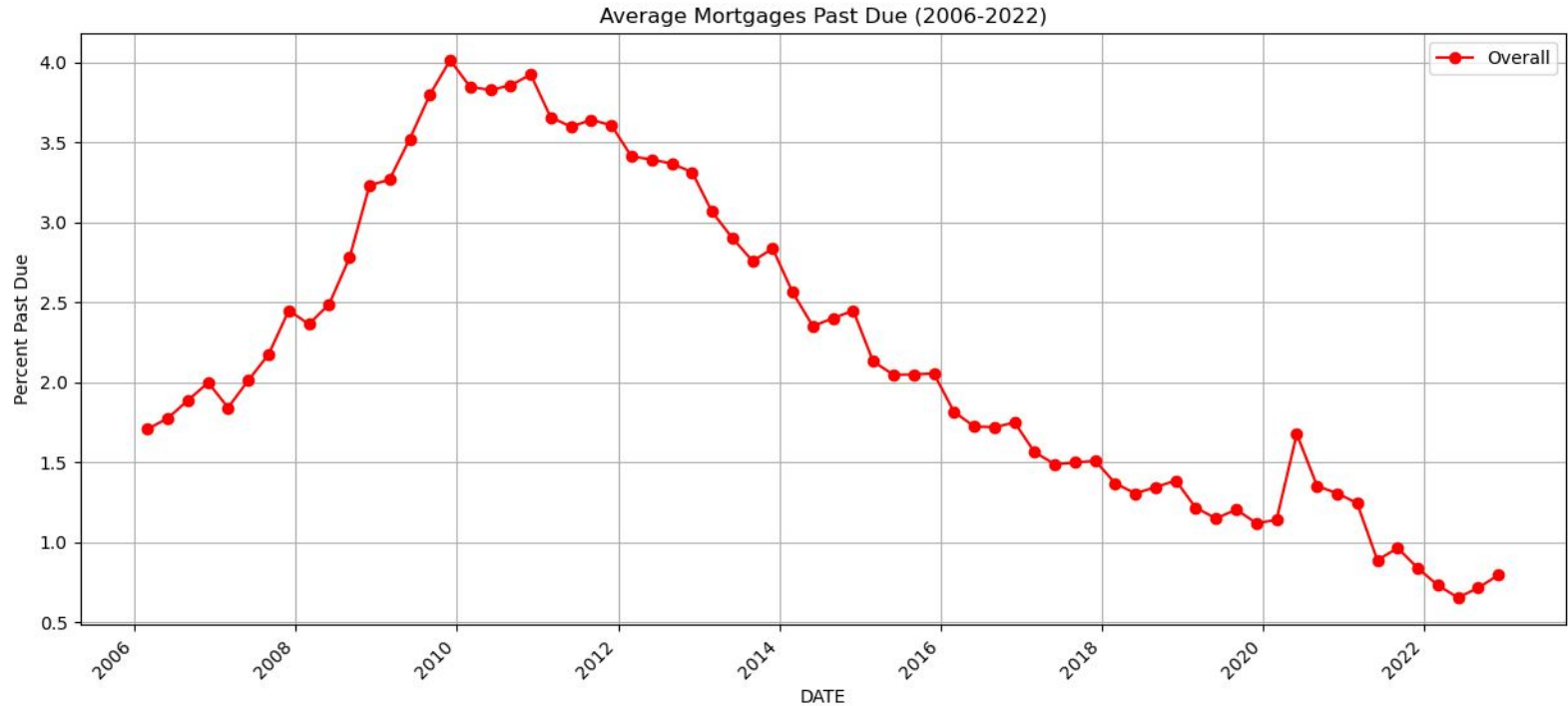
Mortgage Performance

Rate of Past Due Mortgages 2006-2022

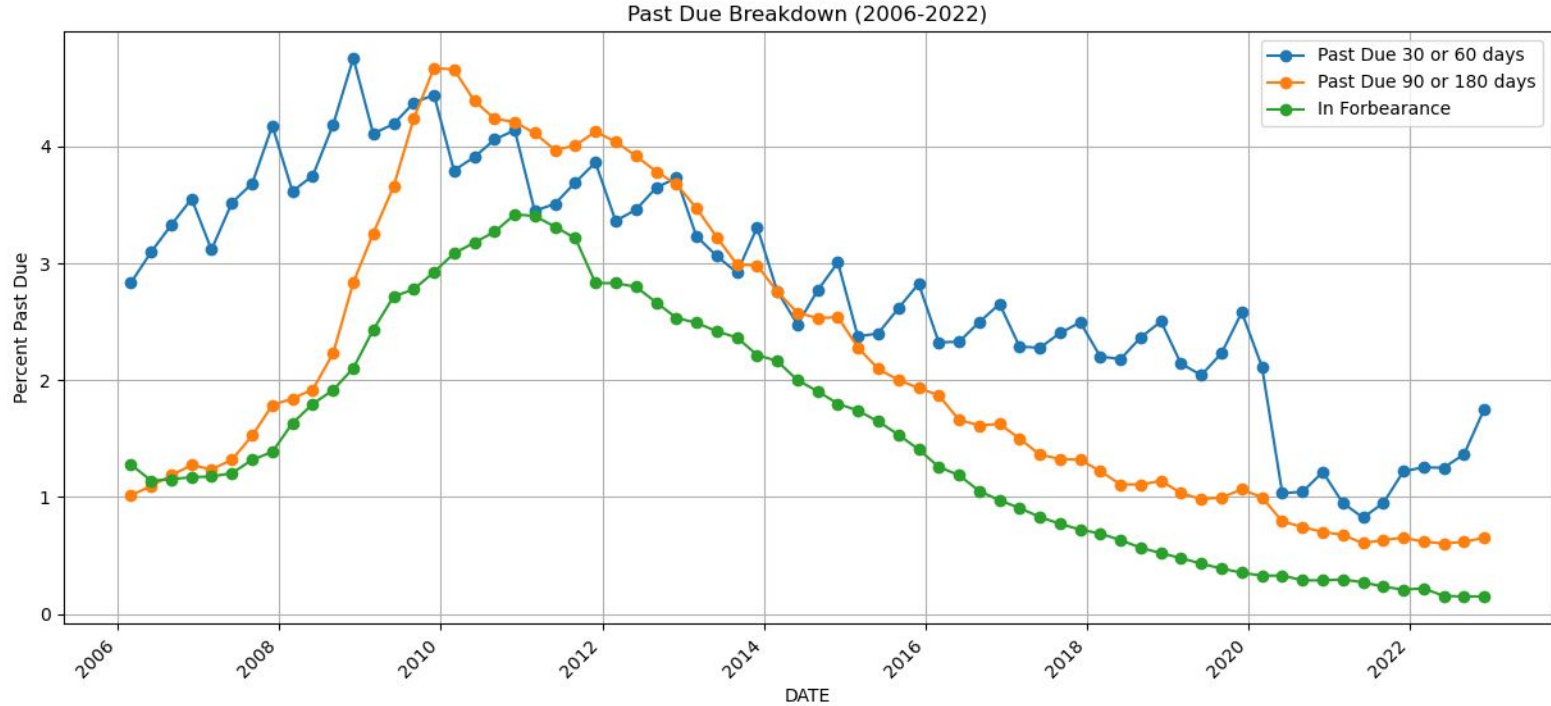
- What correlations between mortgage rate and performance can be observed?
- Is one's ability to stay current on their mortgage impacted by rate or other factors?

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

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](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)