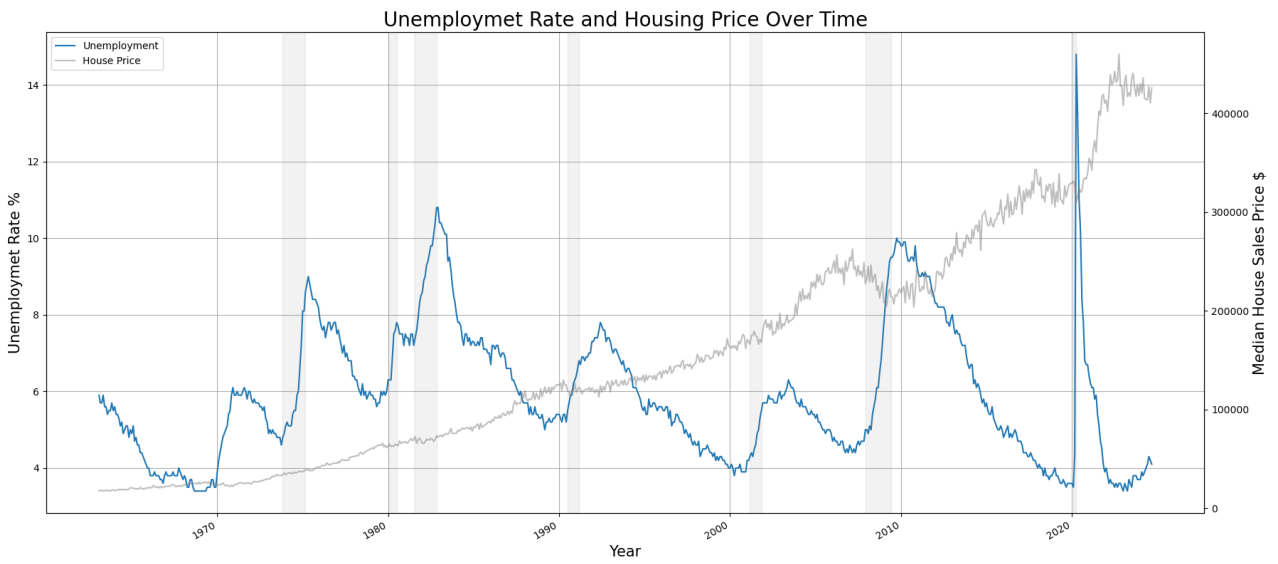
AGENDA

1. Problem Statement
2. Exploratory Analysis
3. Correlation and Lags
4. Result with Lags
5. Reporting Process
6. Example Reports

- Problem Statement:
  - Unemployment rate goes up in recessions
  - Housing Market usually goes down before or during recessions
  - **Q1: Would there be a negative correlation between them?**
  - **Q2: Would there be any lagging effect between the movement? If so, how many months would that be? (Housing Price is a Predictor for Unemployment Rate)**

Time Series Plot of Unemployment Rate vs. Median Housing Price (Bottom)



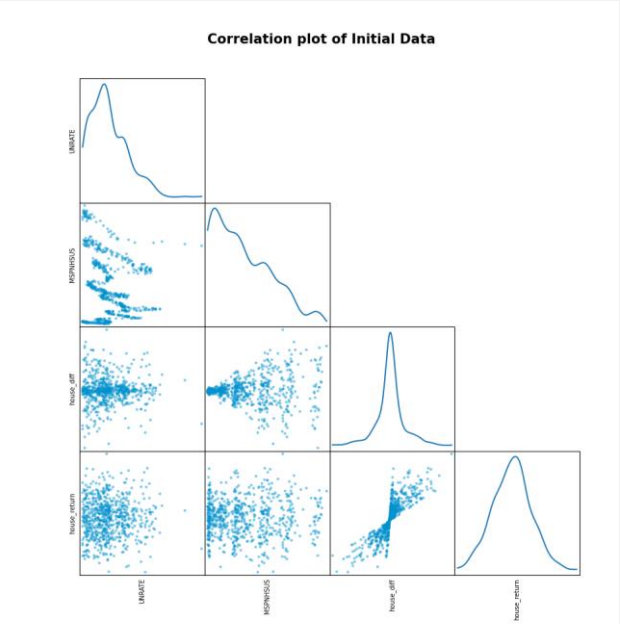
EXPLORATORY ANALYSIS

Stationary Summary Table

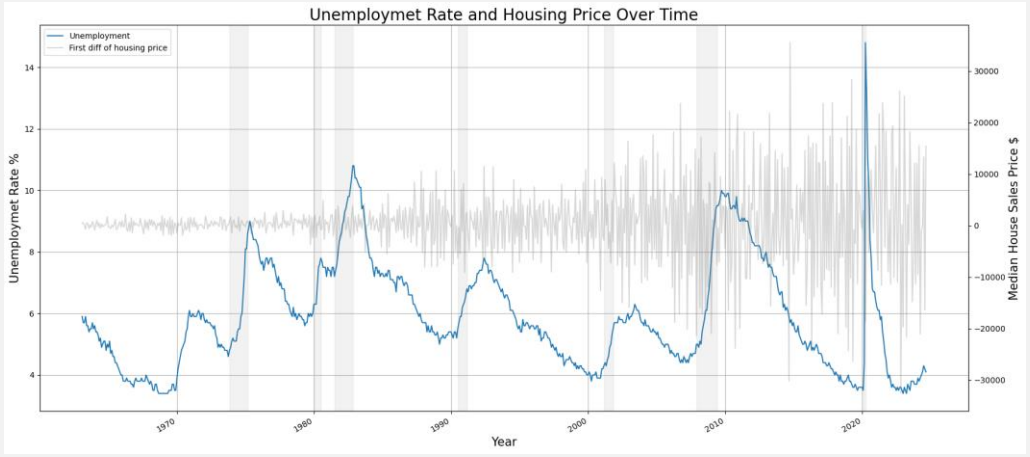
Description	P-Value	Result
Unemployment Rate	0.017	stationary
Median Housing Price Over Time	0.997	non-stationary
First diff of housing Price	0.000001	stationary
Return of housing Price	0.000023	stationary

Stationary Test:

- If P-Value < 0.05 ➔ Stationary
- Housing Price is not stationary, remove the trends and seasonality

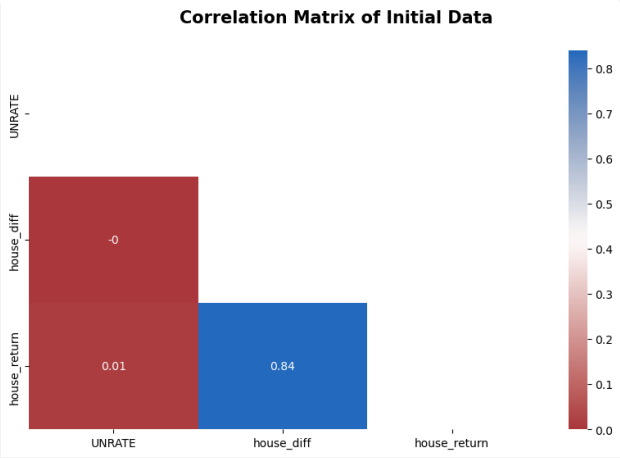


Time Series Plot of Unemployment Rate vs. Median Housing Price 1st Difference



Correlation of Stationary Data:

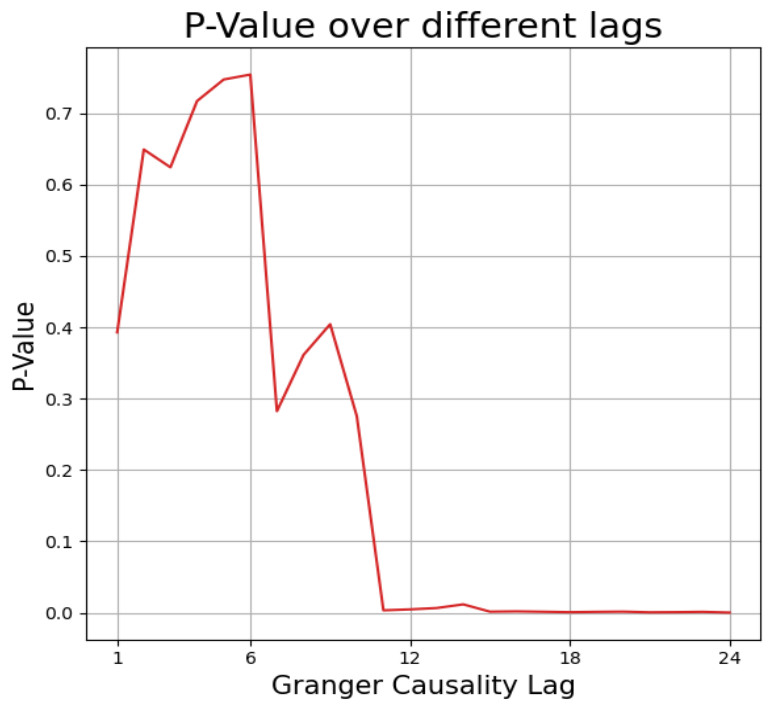
- No significant correlation can be found
- Correlation plot (Upper Right)
- Correlation Matrix (Lower Right)



CORRELATION AND LAGS

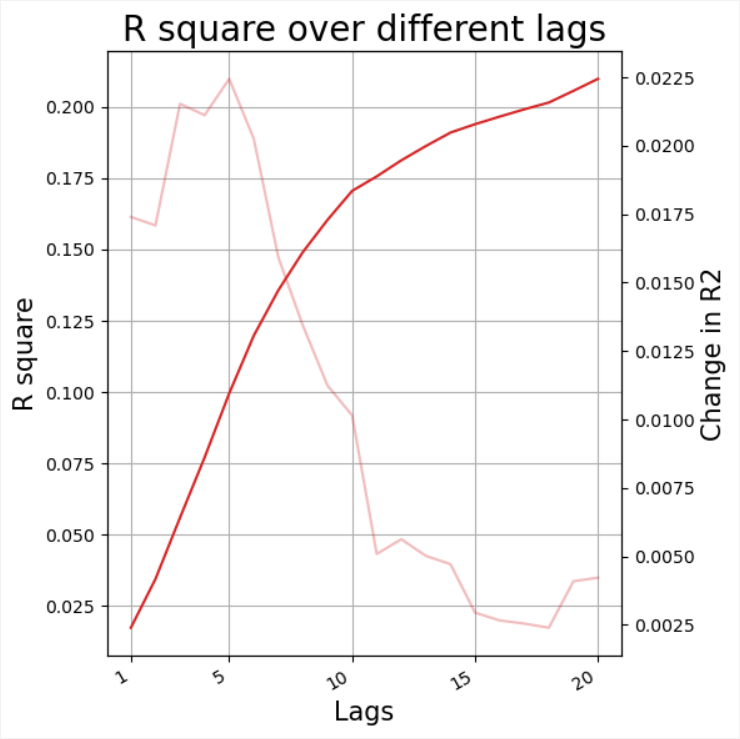
Granger Causality:

- H1: Past values of Housing Price have a statistically significant effect on the current value of Unemployment Rate
- Housing Price is the granger cause to Unemployment rate
- P-value<0.05 starting at 11th lags



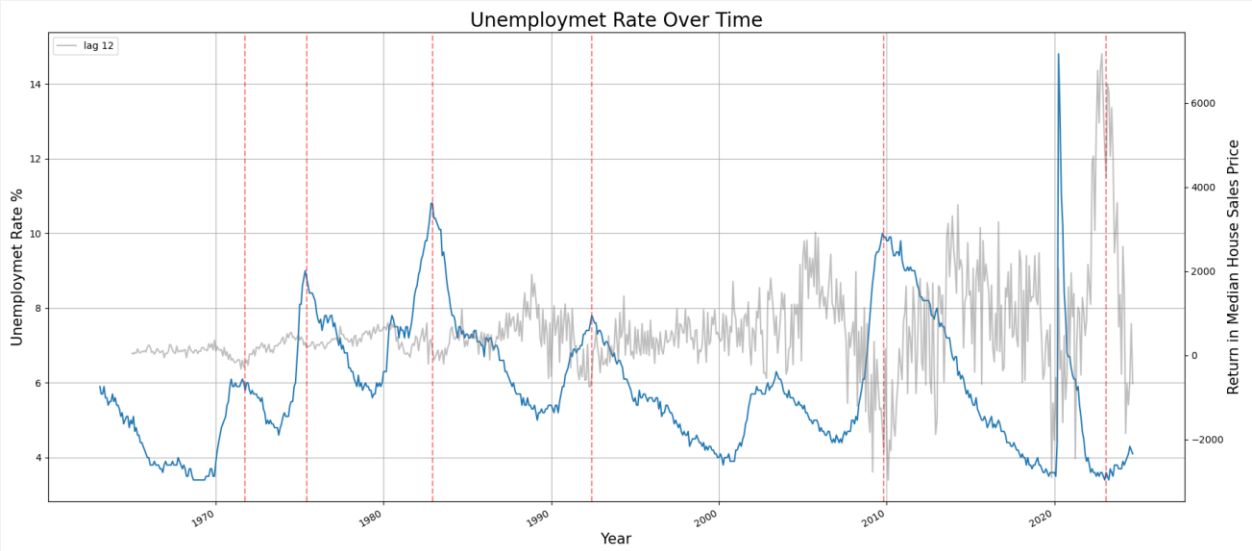
Regression Test:

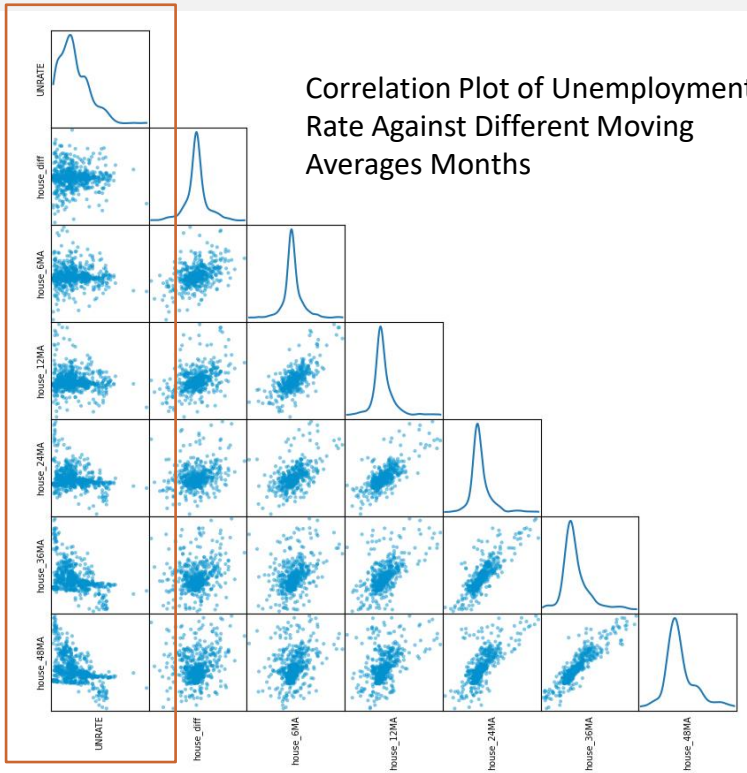
- Run Regression adding different # of lags
- Adding lags significantly increases the R2
- R2 is more flat and stable after 11 lags
- Change in R2 is minimal after 11 lags



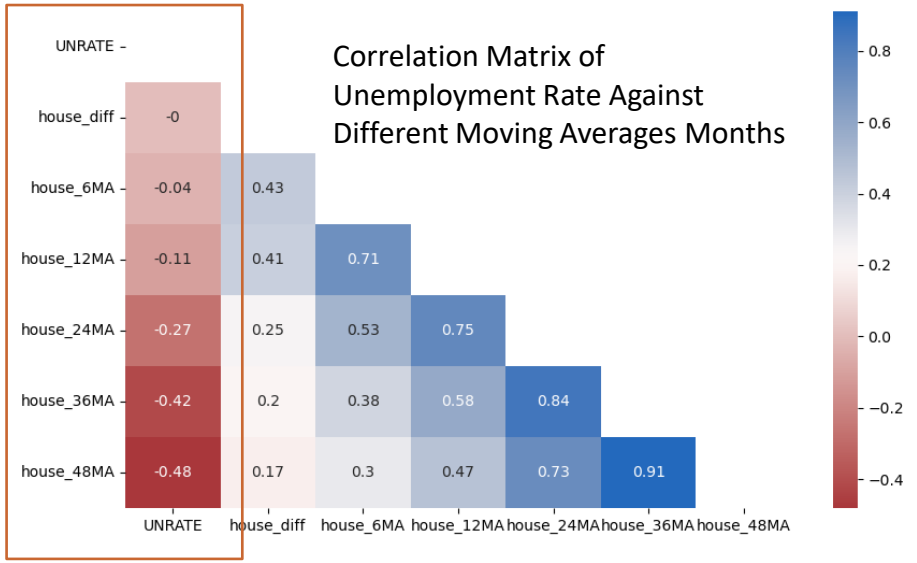
RESULT WITH LAGS

- Using Moving Averages to includes information from all past months:
  - 6 months, 12 months, 24 months, 36 months, 48 months
- Significantly Increase in Negative Correlation





Correlation Plot of Unemployment Rate Against Different Moving Averages Months

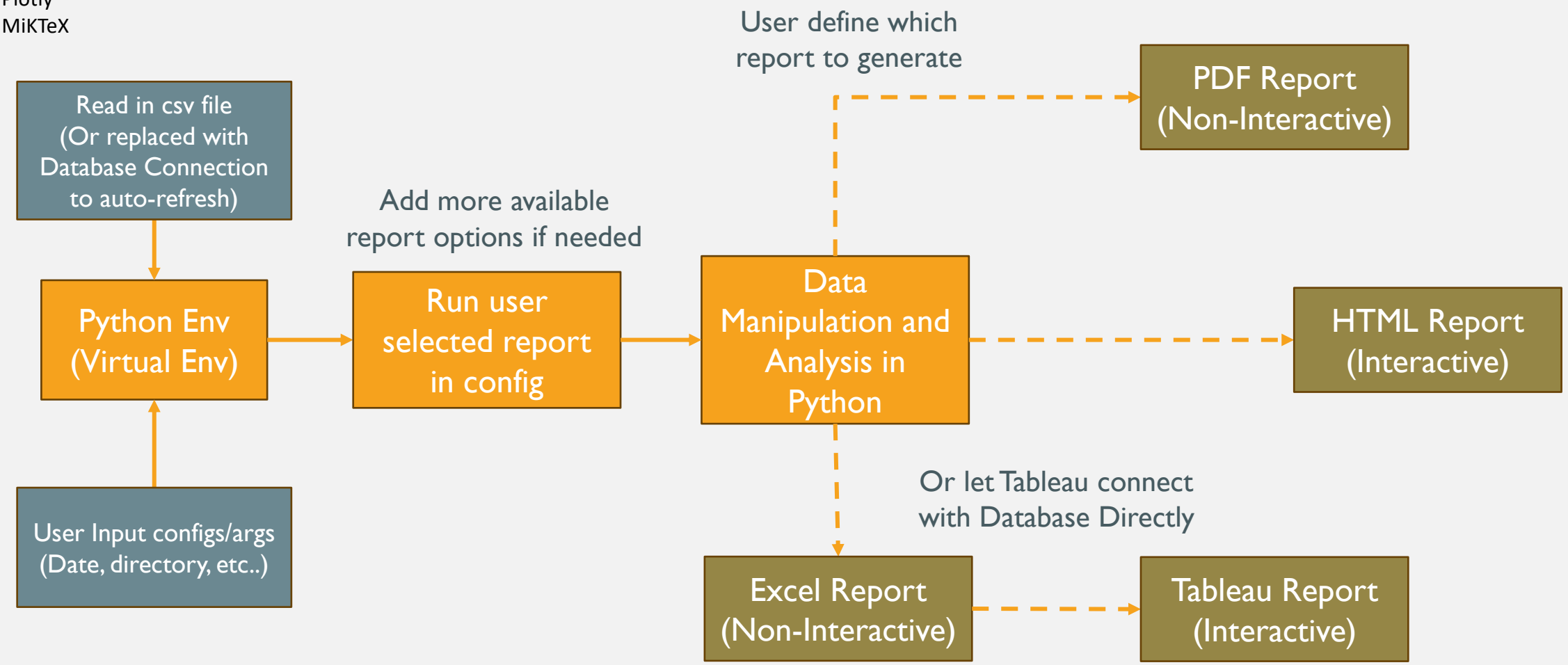


Correlation Matrix of Unemployment Rate Against Different Moving Averages Months

- Housing Price with 12 months lags (Smoothed) over unemployment rate
- Unemployment rate peaks matches the housing price trough

Package Used:
Numpy
Pandas
Matplotlib
Statsmodels
Seaborn
Plotly
MiKTeX

REPORTING PROCESS



Check All Examples at My GitHub: https://github.com/hanlulu-0201/Unemployment_House