

Yield Curve Regime Clustering & Interest Rate Forecasting

P2 Preliminary Presentation
Team: Sajan Arora & Karan
Badlani



Project Goal

1

Identify yield
curve regimes
using clustering

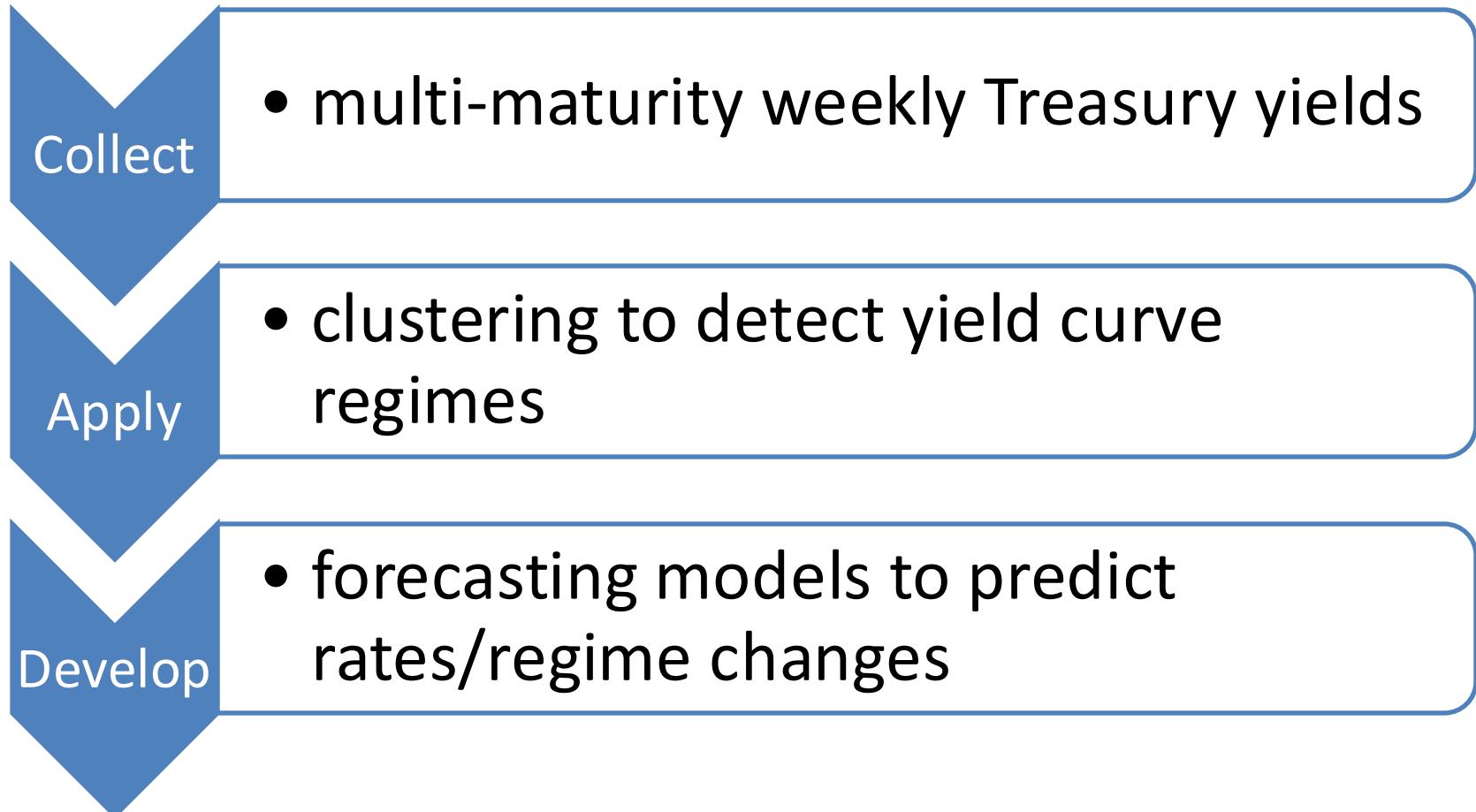
2

Forecast future
yield movements
and/or regime
transitions

3

Analyze
macroeconomic
interpretation of
curve shapes

Proposed Plan



Data Collection

- Federal Reserve Economic Data (FRED) <https://fred.stlouisfed.org/>
- We use weekly U.S. Treasury Constant Maturity yield rates to represent the yield curve.
- Maturities Included:
 - 3-Month Treasury Bill (TB3MS)
<https://fred.stlouisfed.org/series/TB3MS>
 - 2-Year Treasury Note (DGS2)
<https://fred.stlouisfed.org/series/DGS2>
 - 10-Year Treasury Note (DGS10)
<https://fred.stlouisfed.org/series/DGS10>
 - 30-Year Treasury Bond (DGS30)
<https://fred.stlouisfed.org/series/DGS30>
- Frequency: Weekly observations
- Time Span Used: ~25+ Years (covers multiple economic cycles)

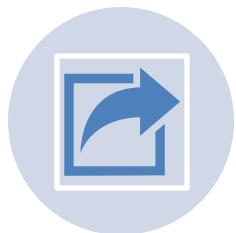
Pre-processing Steps



Retrieved weekly yield
data via FRED API



Standardized date
indexing



Forward-filled missing
values where
necessary



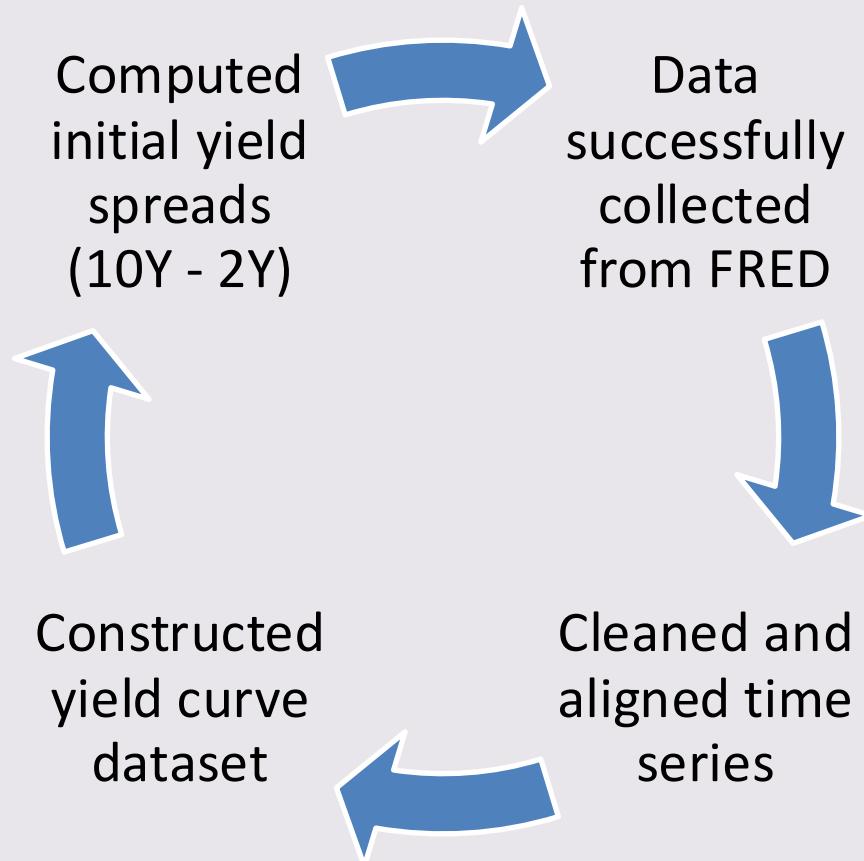
Constructed numerical
matrix representation
of yield curves

Data Overview

- Final dataset: Weekly U.S. Treasury yields (3M, 1Y, 2Y, 5Y, 10Y, 30Y)
- Time span: 1980–2025 (~1,300 weekly observations)
- Each row = weekly observation (indexed by date)
- Each column = yield at a specific maturity or spread metric
- Data is fully cleaned and merged

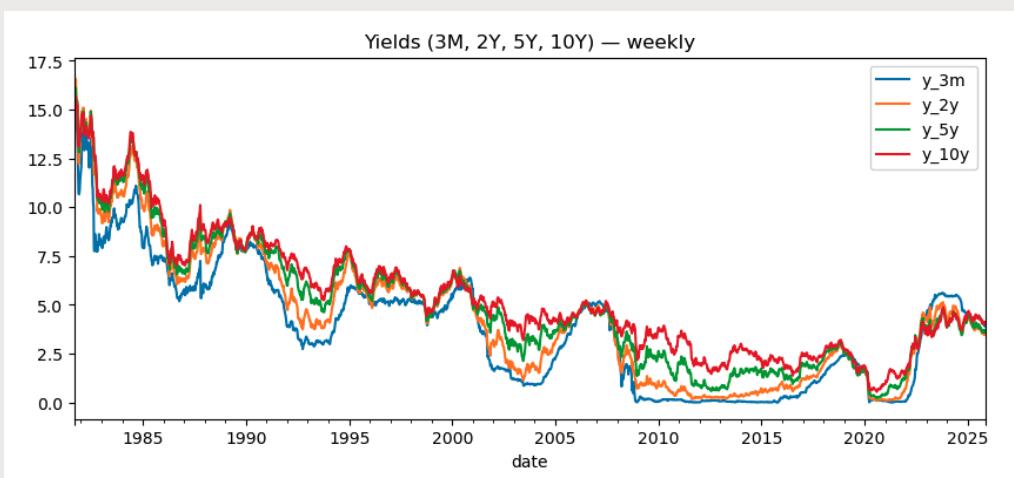
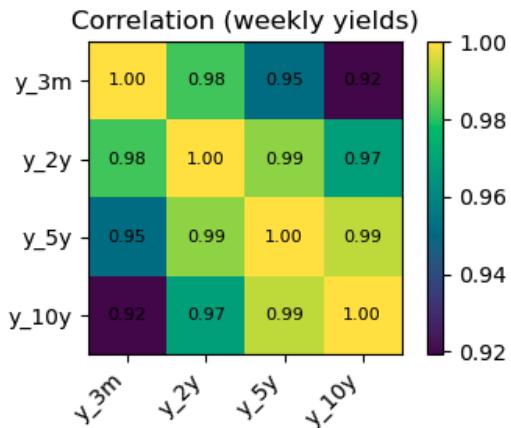
| | y_3m | y_1y | y_2y | y_5y | y_10y | y_30y | spr_10y_3m | spr_10y_2y |
|------------|------|------|------|------|-------|-------|------------|------------|
| date | | | | | | | | |
| 2025-10-24 | 3.95 | 3.57 | 3.46 | 3.58 | 4.00 | 4.57 | 0.05 | 0.54 |
| 2025-10-31 | 3.90 | 3.66 | 3.55 | 3.67 | 4.06 | 4.61 | 0.16 | 0.51 |
| 2025-11-07 | 3.95 | 3.67 | 3.59 | 3.71 | 4.12 | 4.70 | 0.17 | 0.53 |

What We Have Done (Week 1)

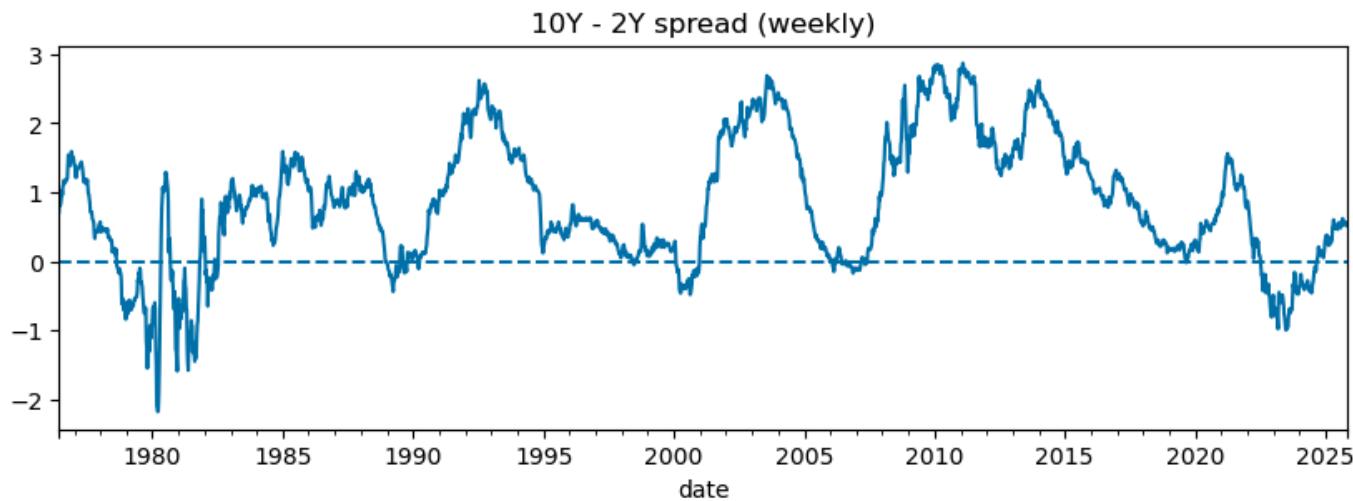


Exploratory Data Analysis

High correlation among maturities confirms smooth yield curve structure and suitability for dimensionality reduction.



Yields across maturities follow similar long-term downward trends, reflecting multiple rate cycles since the 1980s



Exploratory Data Analysis

- The 10Y–2Y spread turns negative before major recessions, highlighting yield curve inversion as a predictive feature.

Next Steps

- Week 2 – Apply PCA to reduce dimensions & perform K-Means clustering.
- Week 3 – Train forecasting models (ARIMA / VAR).
- Week 4 – Evaluate models & prepare final presentation.

