



Lighthouse Macro

# Macro & Markets

Exploring the relationship between financial markets and macroeconomic data.

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Data Science at BrainStation

# Project Overview

- Utilizing macroeconomic data and machine learning techniques to improve decision making throughout the investment process.
- To create sophisticated, data-driven investment models that are readily available for less technical investors.
- Democratize “Wall Street” quality research for those who may not have the money to hire a professional, nor time to research on their own.

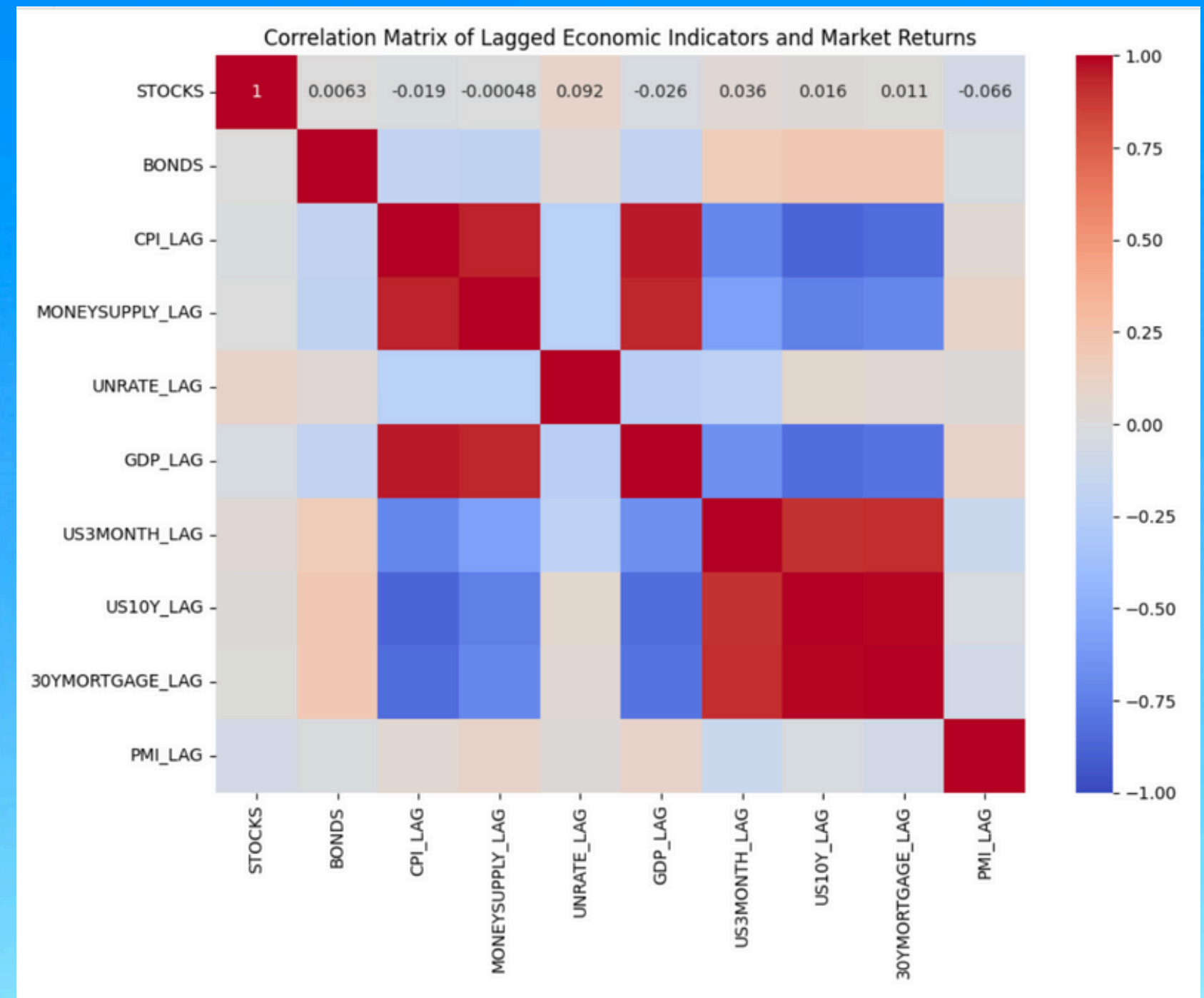
## Dataset & Preprocessing Overview:

- Macroeconomic variables such as GDP, unemployment rate, interest rates, inflation etc.
- Asset class returns.
- Time period: 1985 to 2024.

### Preprocessing:

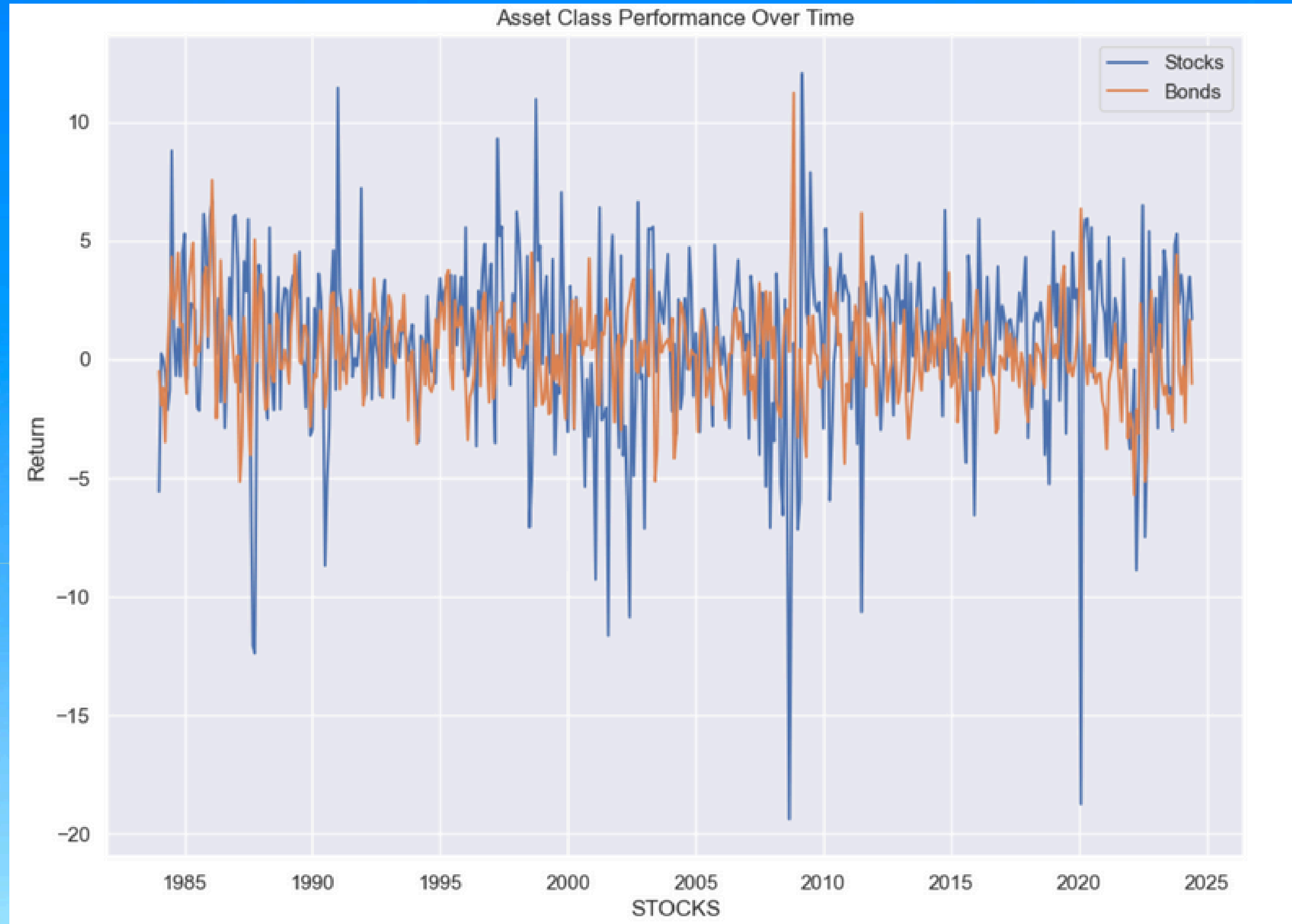
- Ensuring there were no null values
- Converting asset class returns to percentages
- Create new variables with lags and rolling means
- Converting data to datetime

- The economy has many moving parts. Rarely do they all move in unison.



# Similarly, asset classes don't move in lockstep either.

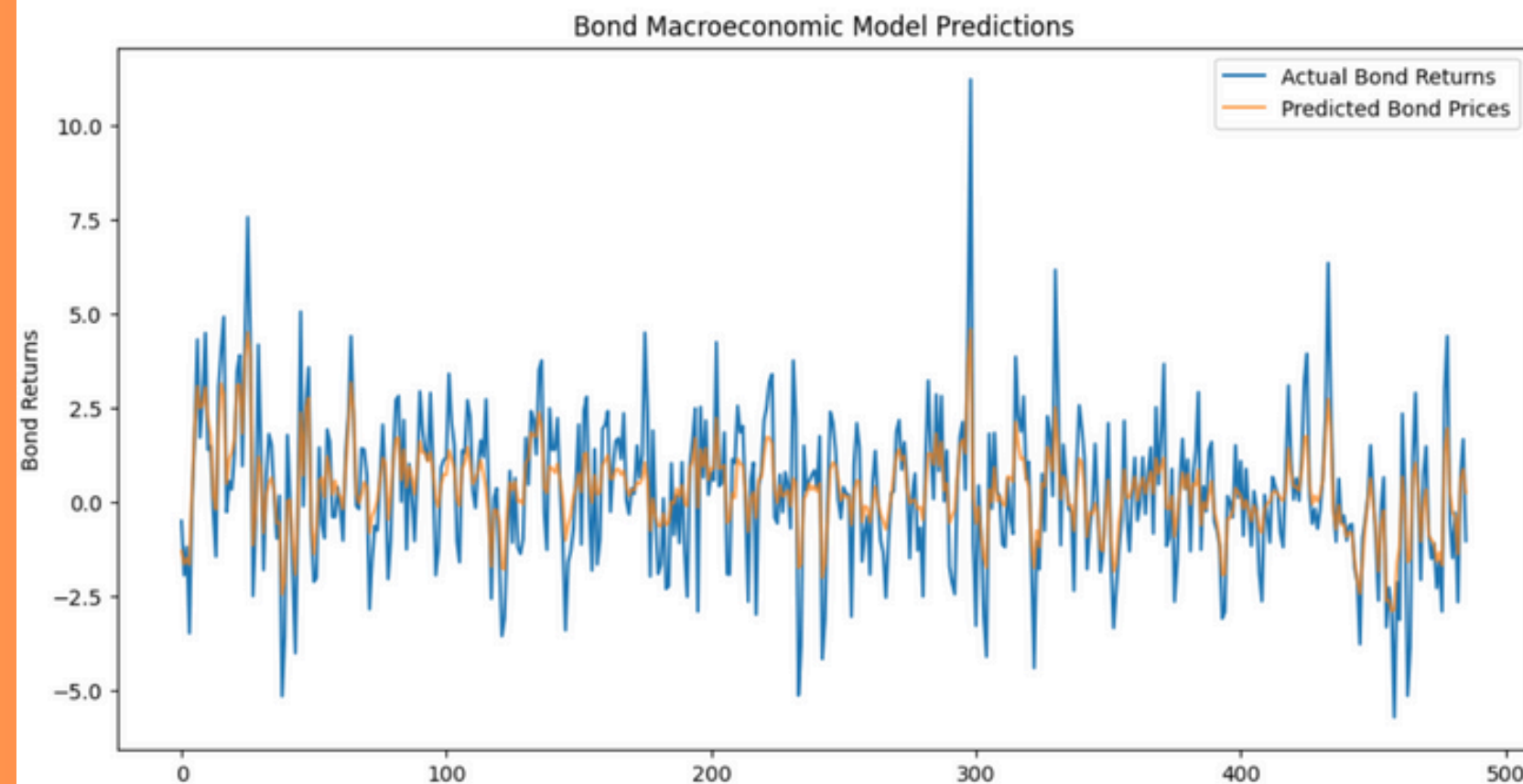
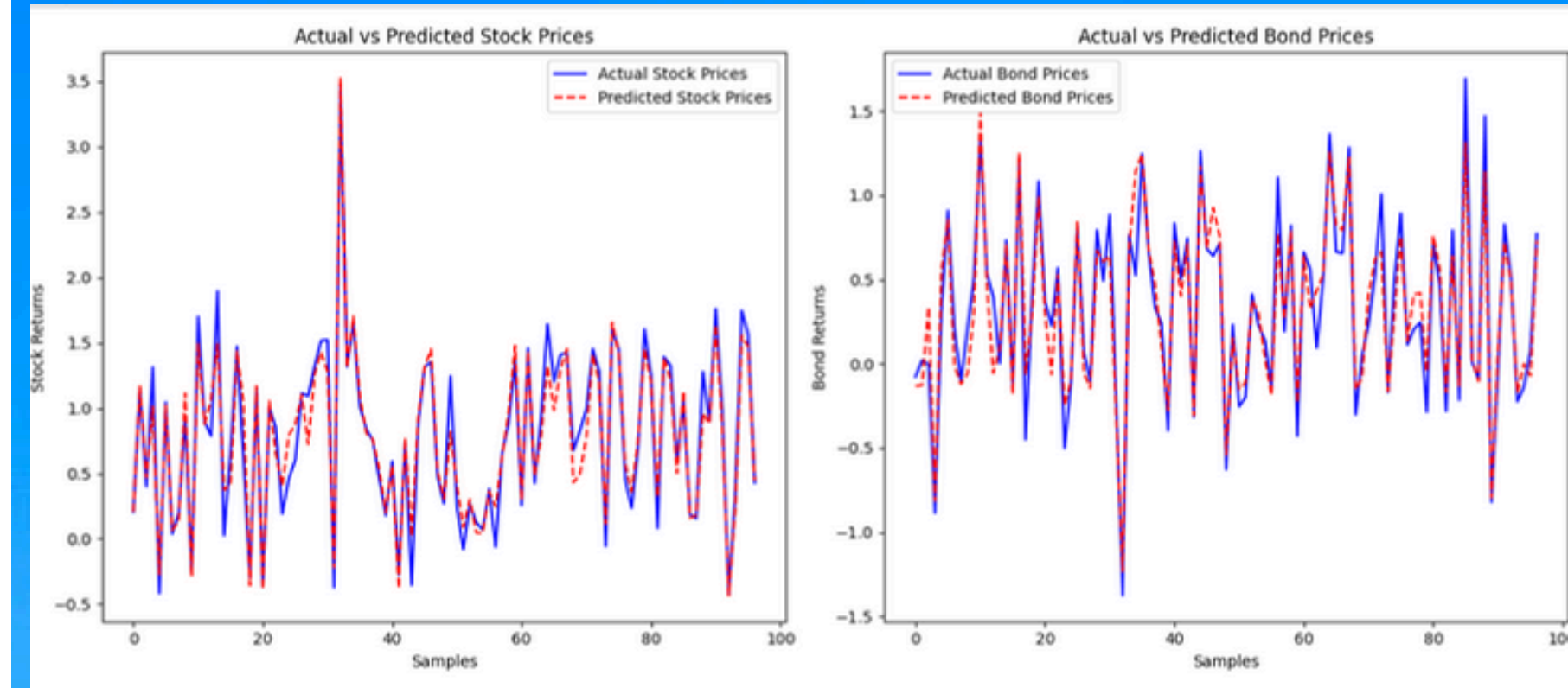
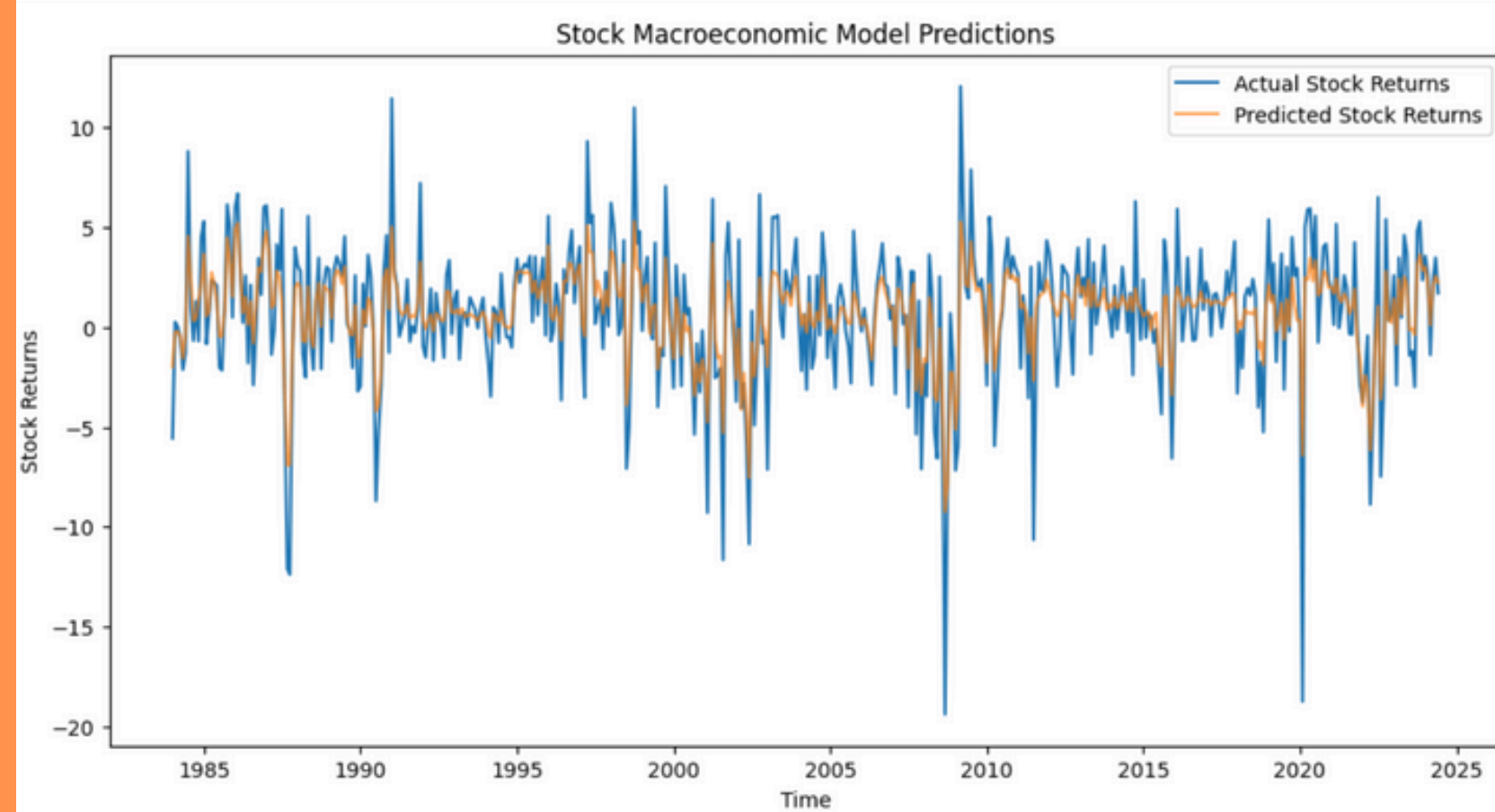
- Unique characteristics & economic influences create dispersion, and thus, opportunity.





# Building out the Model

- Combines Time Series, Regression Analysis, and Ensemble Learning (Random Forest)



## Performance Metrics for Stock Model:

MSE: 0.02727208180461559

R-squared: 0.9380803867363957

MAE: 0.12000243105986258

RMSE: 0.16514261050563417

## Performance Metrics for Bond Model:

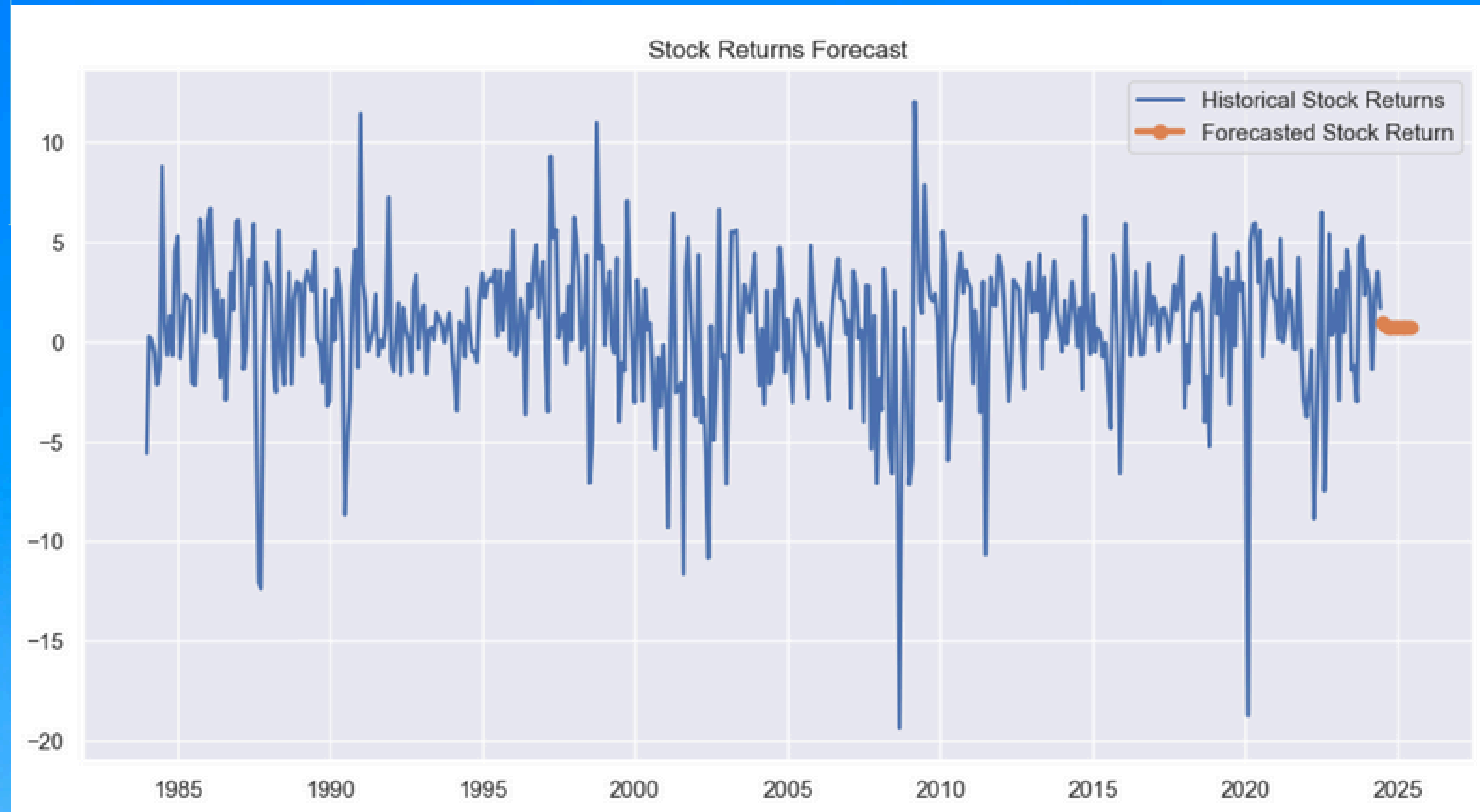
MSE: 0.02922386385630614

R-squared: 0.9051356186208226

MAE: 0.1288274153275489

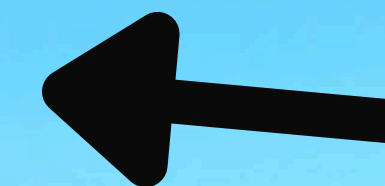
RMSE: 0.1709498869736571

# Using the model forecast to make the Asset Allocation decision



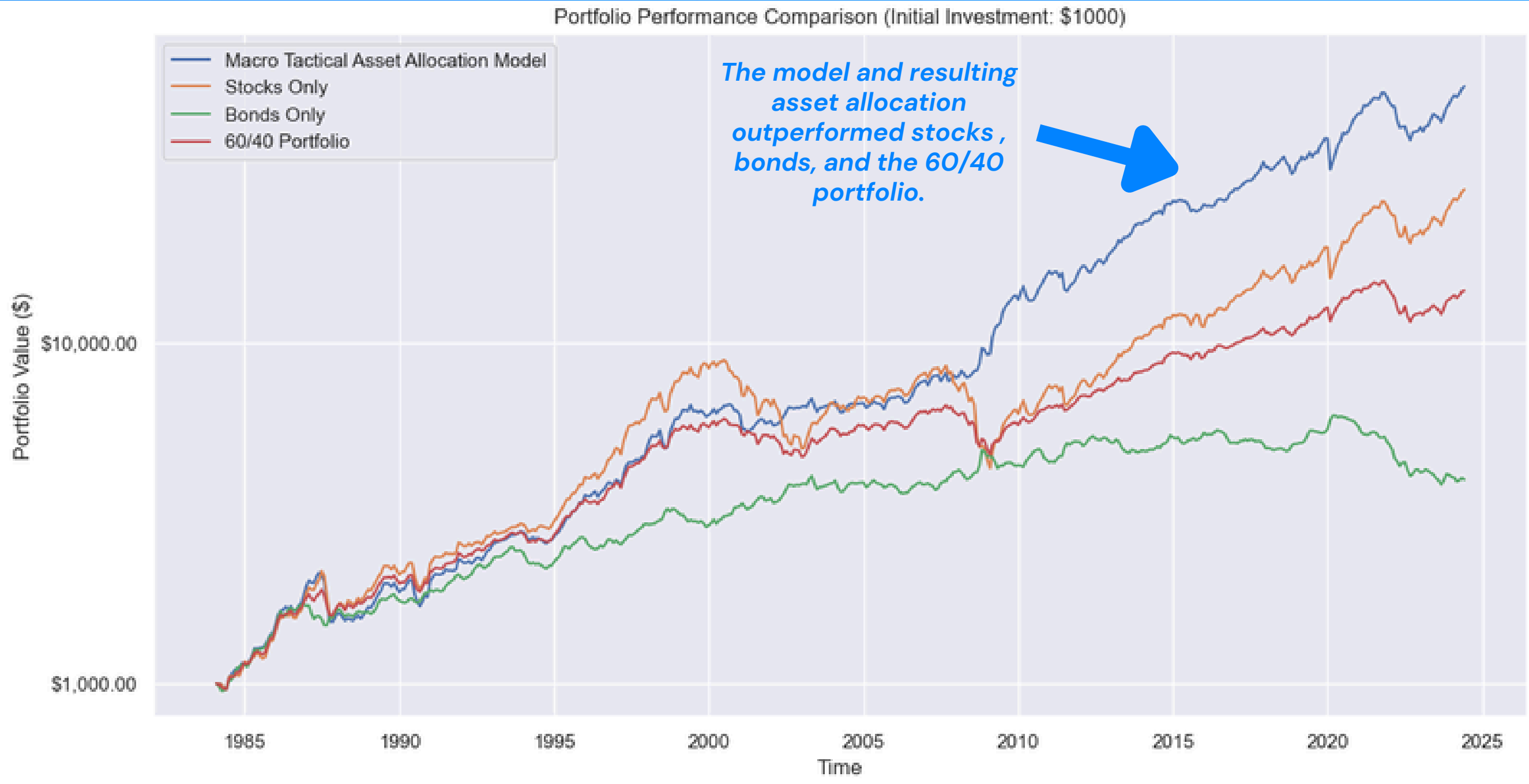
Optimal allocation for next month: 100% Stocks

Month	60_40	STOCKS	BONDS	Best_Allocation
1	0.236776	0.317939	0.117219	STOCKS
2	-0.460797	-0.631493	-0.204576	BONDS
3	-0.478272	-0.545499	-0.377543	BONDS
4	1.144141	1.803437	0.154729	STOCKS
5	1.132160	1.613454	0.410956	STOCKS
6	0.344953	0.947756	-0.560296	STOCKS
7	0.210712	0.783573	-0.647290	STOCKS
8	-0.339238	0.007169	-0.858254	STOCKS
9	0.266542	1.063294	-0.928453	STOCKS
10	0.128096	0.746374	-0.799472	STOCKS



**According to the model, we want to remain allocated in stocks next month.**

By tactically shifting the portfolio allocation, the model is able to produce higher returns with less risk.



	Annual Returns (%)	Volatility (%)	Sharpe Ratio
Macro Tactical	11.030617	10.644792	1.036245
60/40 Portfolio	7.115273	7.938312	0.896321
Stocks Only	9.707996	12.376736	0.784374
Bonds Only	3.602620	6.930967	0.519786

Sharpe Ratio:

- Measure of Risk vs. Reward of an investment.
- $\text{Sharpe} > 1$  = reward is greater than risk.



# Next Steps

- Gather more data for additional Macro factors.
- Add more asset classes to the model & resulting portfolio allocations.
- Build easy-to-use dashboard with monthly allocation decisions.

**Thank You!**