Lighthouse Macro

Macroeconomics & Markets

Exploring the relationship between financial markets and economic 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:

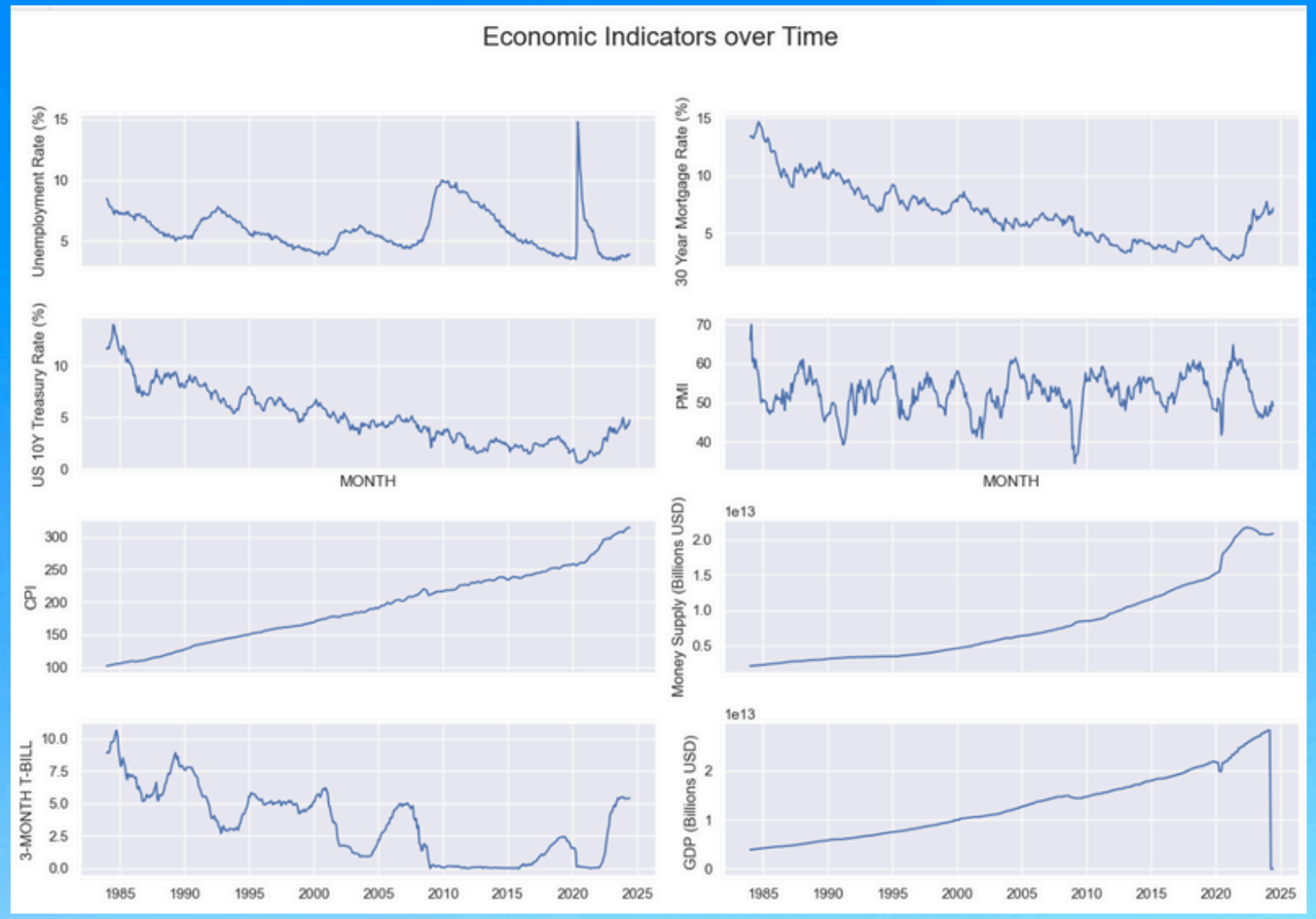
- Macroeconomic variables such as GDP, unemployment rate, interest rates, inflation etc.
- Asset class returns.
- Time period: 1985 to 2024.

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

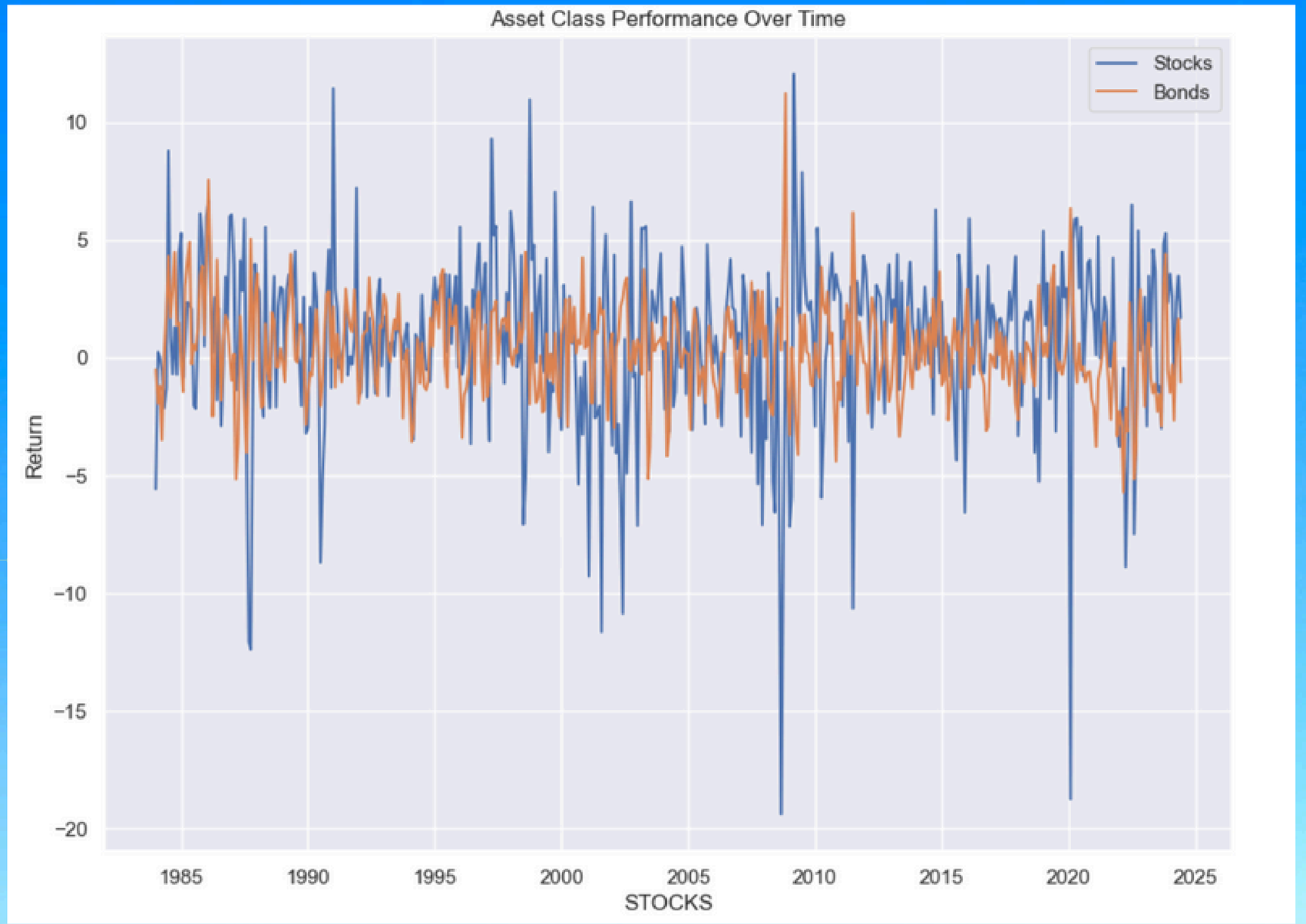
ECONOMIC INDCATORS

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



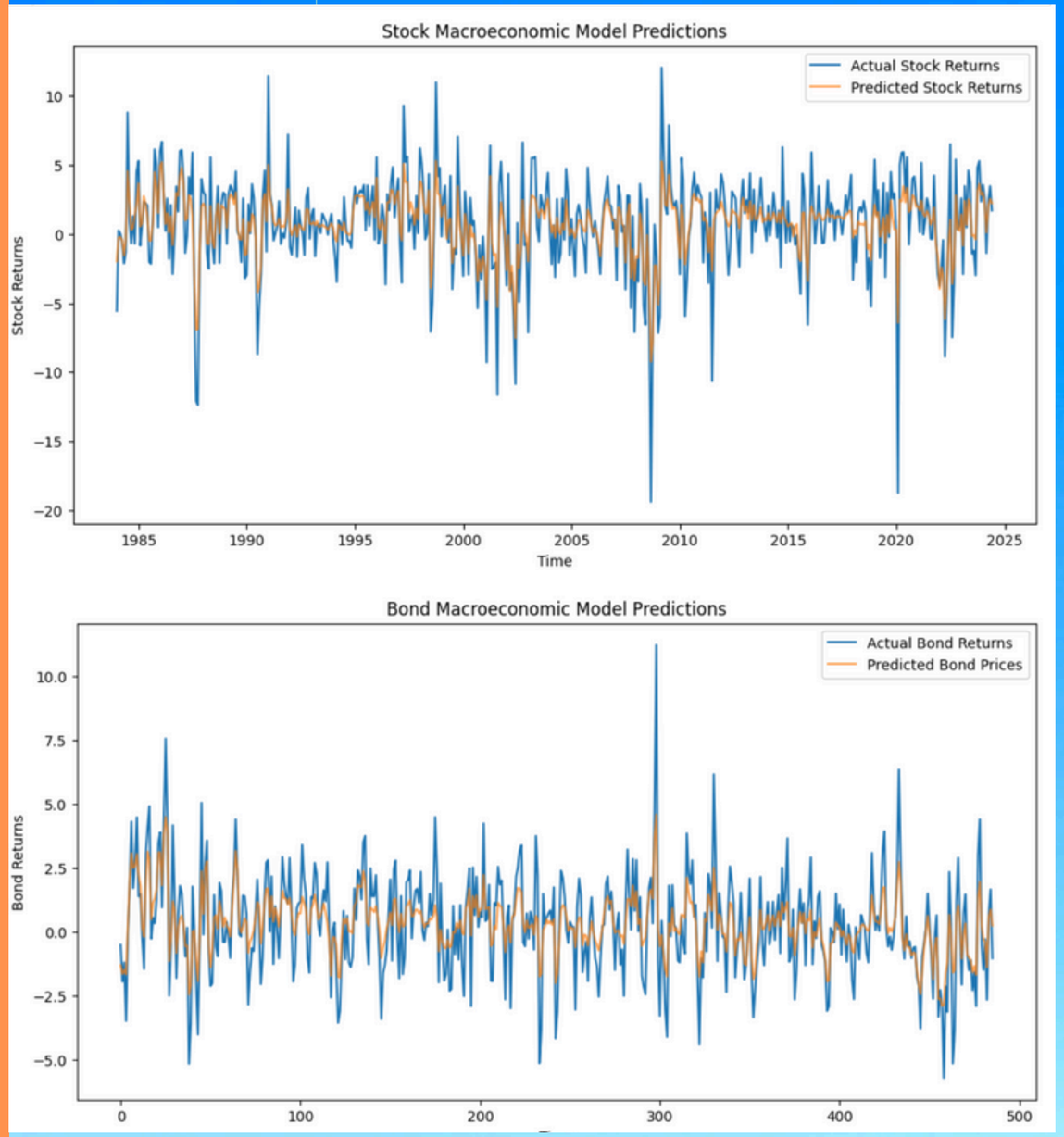
Similarly, asset classes don’t move in lockstop either.

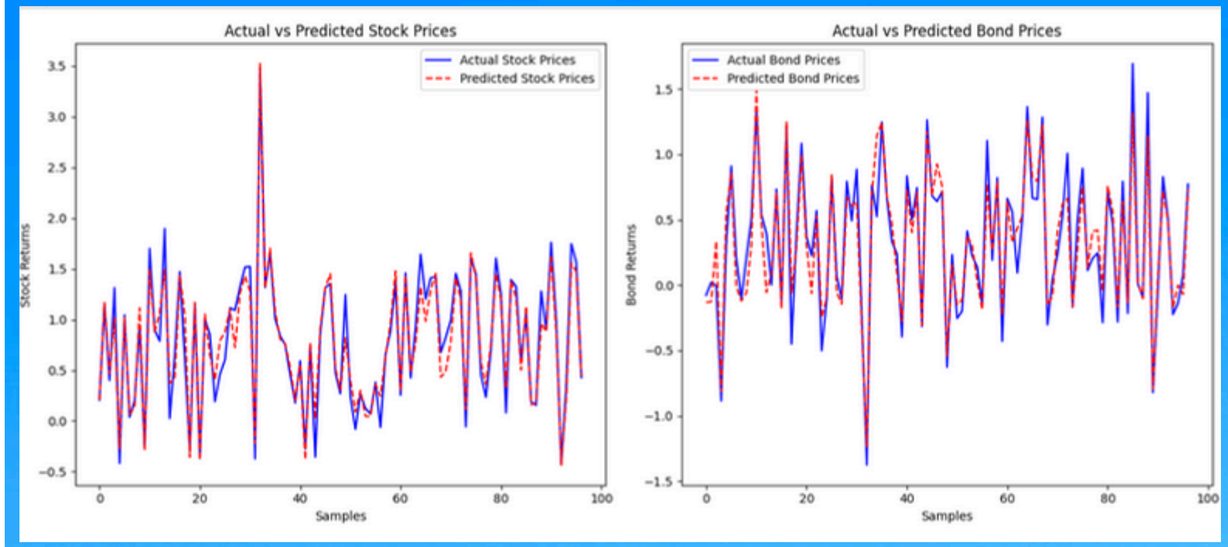
- Unique characteristics & economic influences create dispersion, and thus, opporutnity.



Building out the Model

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



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Performance Metrics for Stock Model:
MSE: 0.027272081804615 59
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
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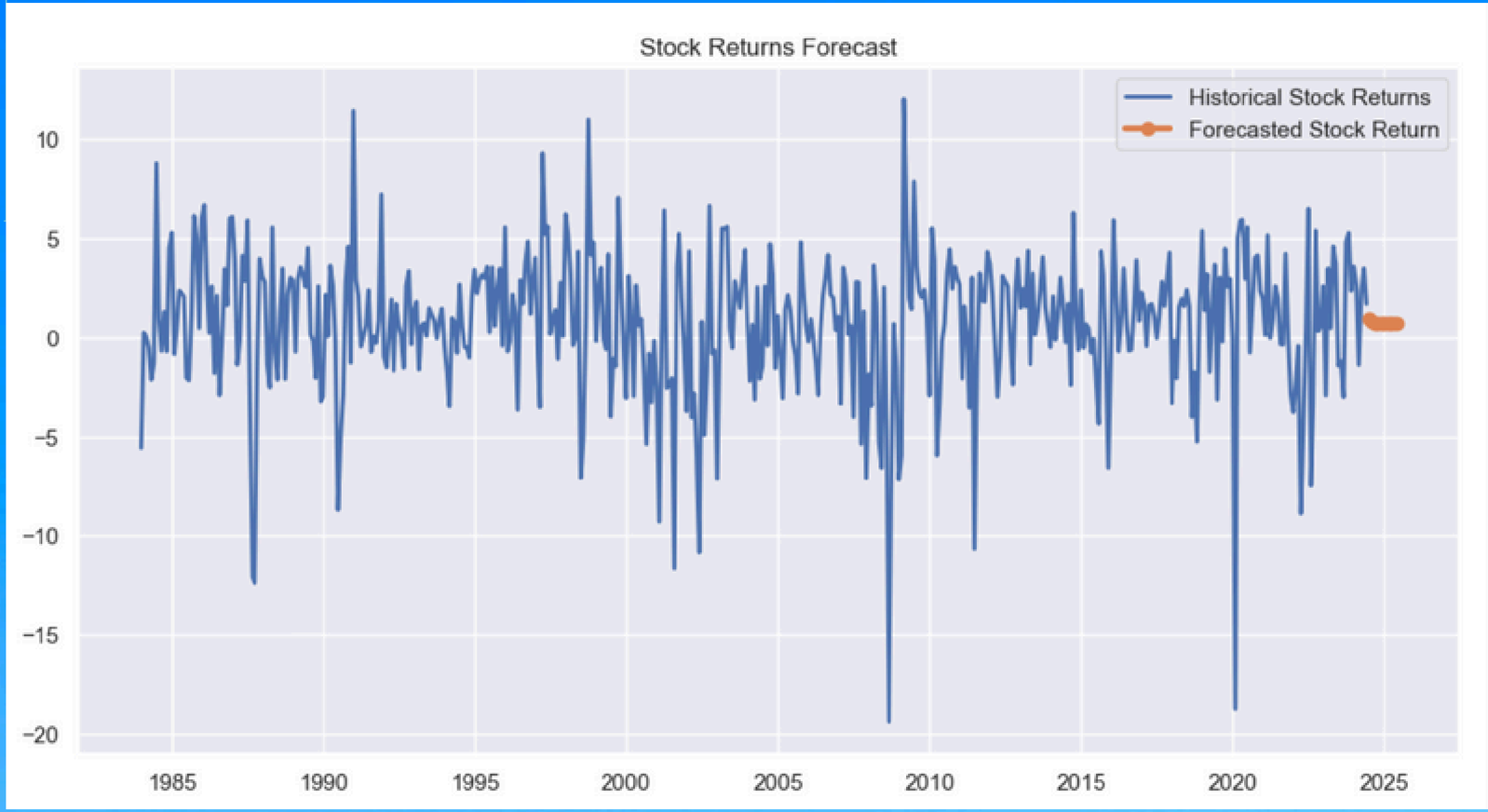
Using the model forecast to make the Asset Allocation decision

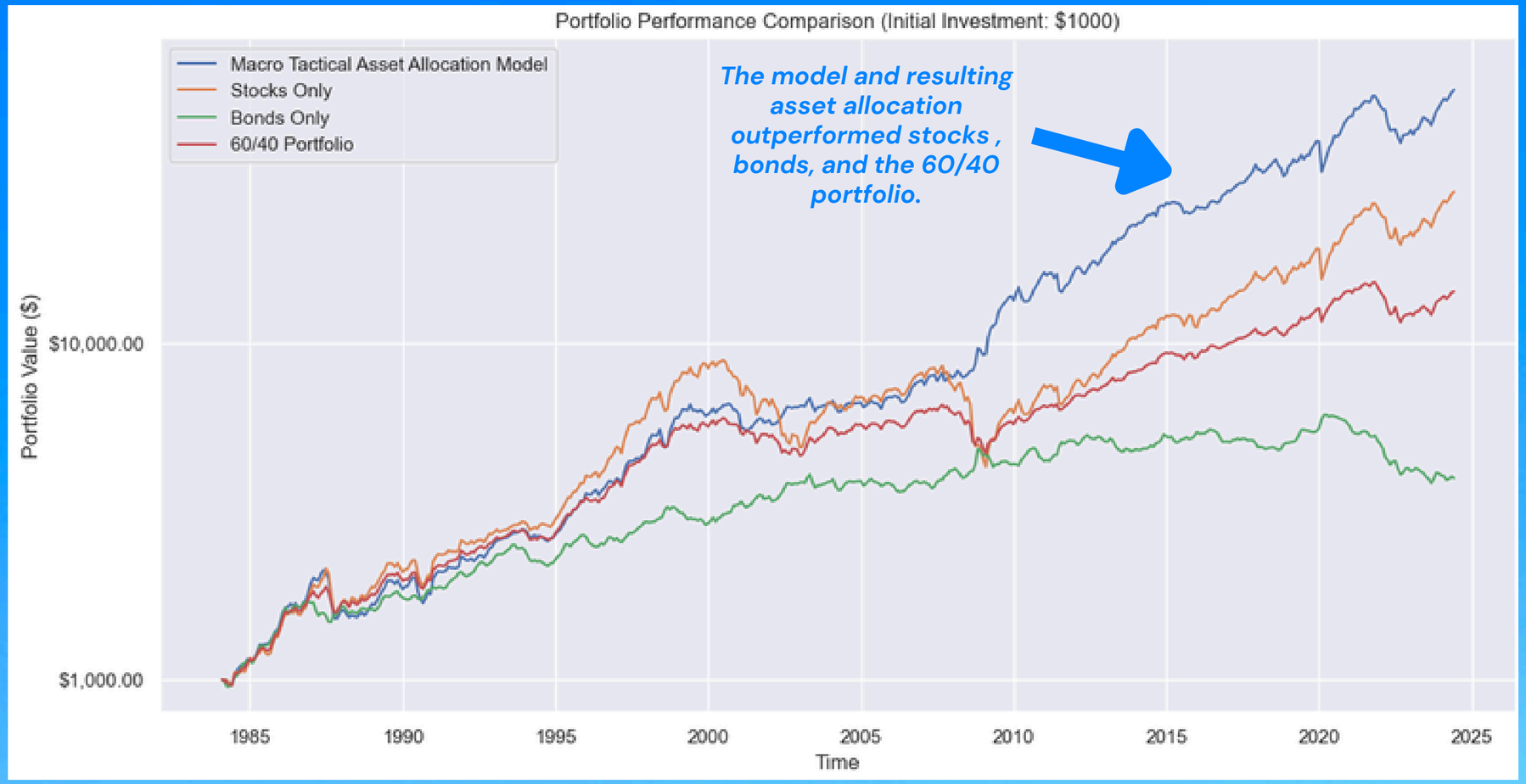


Optimal allocation for next month: 100% Stocks

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.*
- *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!