Predictive Modeling and Fixed Income

Jack Schlosser

Date

Oregon Quant Group

OQG

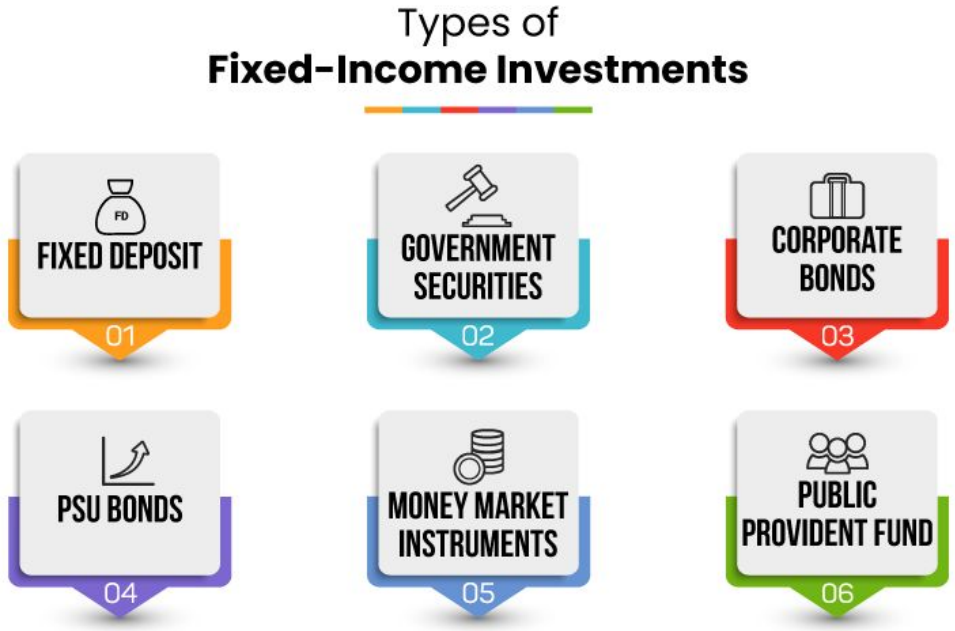
Agenda

OQG
OREGON QUANT GROUP

- Fixed Income Research
- Hypothesis
- Data Collection
- Model Creation
- Results
- Conclusion/Takeaways

Fixed Income Assets

- Cover a broad selection of assets designed to provide fixed payments over a certain period
- Often derive value from overall market conditions through demand
- Misconception that they are “safe”
- Individual assets priced based on yield vs risk



Thesis

OQG
OREGON QUANT GROUP

Goal Use various methods of predictive modeling to generate alpha through analysis of fixed income markets

Data

- FRED (macroeconomic data)
- The AGG, the gold standard for measuring the U.S. fixed income market

Process

- Machine learning (ElasticNet regression) to predict volatility
- Use predicted volatility as investment signal (Buy/hold or sell)

Optimization

- Optimized model hyperparameters (L1 & L2)
- 5-Fold Cross Validation
- RMSE optimized

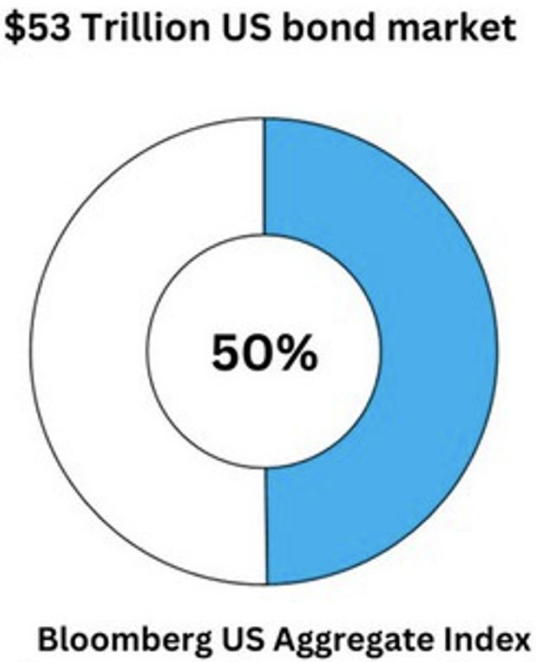
Final Signal deduced from strategy returns vs basic market returns

OQG
OREGON QUANT GROUP

FRED (Economic Data)

- Macro Economic Predictors: Interest rate, Inflation rate, Unemployment, Economic Output, Market Liquidity, Commodities pricing.

FRED®
ECONOMIC DATA | ST. LOUIS FED



Bloomberg Aggregate Index (AGG)

- Gold Standard for assessing the US Fixed Income market
- Tracks roughly half the overall bond Market (~28 Trillion estimated asset value today)
- Index is diversified across the various types of assets in the U.S. fixed income market

OQG
OREGON QUANT GROUP

ElasticNet Regularization:

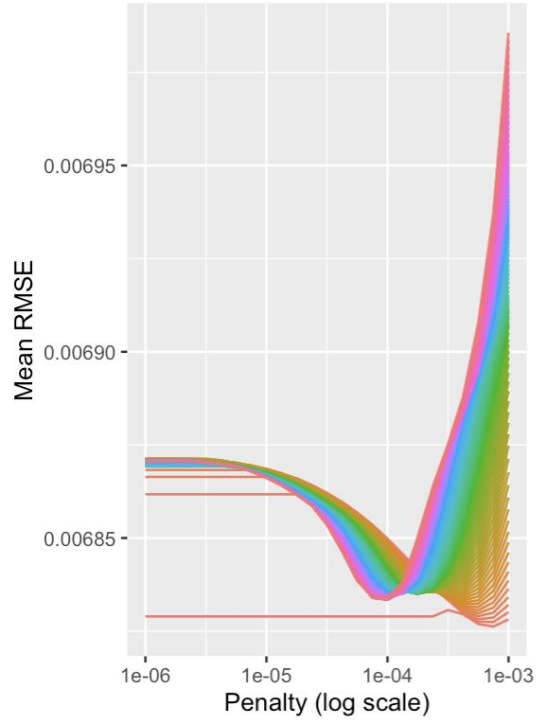
$$\frac{\sum_{i=1}^{n}(y_i - x_i^J \hat{\beta})^2}{2n} + \lambda \left(\frac{1-\alpha}{2} \sum_{j=1}^{m} \hat{\beta}_j^2 + \alpha \sum_{j=1}^{m} |\hat{\beta}_j| \right)$$

Volatility Prediction

- Model Predicts volatility for the AGG using time-series data and training data from FRED
- Uses ElasticNet Regularization to optimize volatility projections

Investment Strategy

- Select a volatility threshold from predicted values
- Signal investment if predicted value for that period is above threshold



Hyperparameters vs model performance visualisation

Result

OREGON QUANT GROUP

Strategy Returns

- Mean AGG return (Monthly): .007%
- Mean Strategy Returns (Monthly): .074%
- **Alpha: .067% Monthly**

Cumulative returns:

- AGG total return: 1.9%
- Strategy total return: 21.8%
- **Alpha: ~19.5%**

OQG
OREGON QUANT GROUP

Final Thoughts/Takeaways

- Volatility Prediction can be a powerful signal for market projection
- Even fixed income assets can be predicted and modeled

Shortcomings

- Volatility threshold was not fully optimized
- Only focused on overall market prediction rather than individual assets

Next Steps

- Predict individual assets within fixed income markets rather than the overall market
- Research the relationship between volatility and asset value for other asset types
- Research more on the role of fixed income assets

Thank You