SYMPHONY STRATEGIES

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01

Overview

Our Mission & Purpose

Symphony Strategies is a student run quantitative research initiative centered around finding top and bottom performers in the S&P 500

Why We're Doing This

- The stock market is **noisy**, emotional, and **inconsistent** we wanted a system that cuts through all of that.
- Most investors guess… we wanted to **measure**, rank, and predict using **real data**.
- We're building a framework that shows whether machine learning can actually **improve stock selection**.
- It's about proving that **better decisions** come from **better data**, not instinct.

Who It's For

- **Retail Investors** who want a disciplined, model-driven way to pick stocks instead of relying on gut feelings.
- **Portfolio managers / analysts** who need consistent ranking tools to support idea generation and stock selection.

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Dataset

- **Source:** Bloomberg Terminal
- **Universe:** Current S&P 500 constituents
- **Time Period:** 12/31/2005 - 11/30/2025
- **Sample Size:** 80,000+ data points
- **Target Variable:** *Next month's return*
- **Objective:** Rank stocks each month by expected returns (Recommend Top 20/Bottom 20)

Factor	Examples
Momentum	1, 3, 6 month momentum
Trend	Moving average slope and price distance (50 & 200 day)
Volatility & Risk	Beta & 30,60 day volatility, Debt to Equity
Value	Earnings Yield, book to price
Quality	ROE, operating and net margin
Size	Log market cap

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Data Cleaning Pipeline

- **Monthly Alignment**
  - All price and fundamental data aligned to month-end
  - Forward fill quarterly fundamentals
- **Lagging to Prevent Look-Ahead Bias**
  - Technical indicators lagged by **1 month**
  - Fundamental variables lagged by **2 months**
- **Time-Based Train/Test Split**
  - First 80% of time periods used for training
  - Final 20% reserved for out-of-sample testing
  - No shuffling
- **Cross-Sectional Preprocessing (Per Month)**
  - Winsorization at **1st / 99th percentiles**
  - Z-score normalization within each month
- **Missing Data Handling**
  - Rows with missing lagged features or target removed
- **Final Modeling Dataset**
  - Panel structure indexed by (Date, Ticker)

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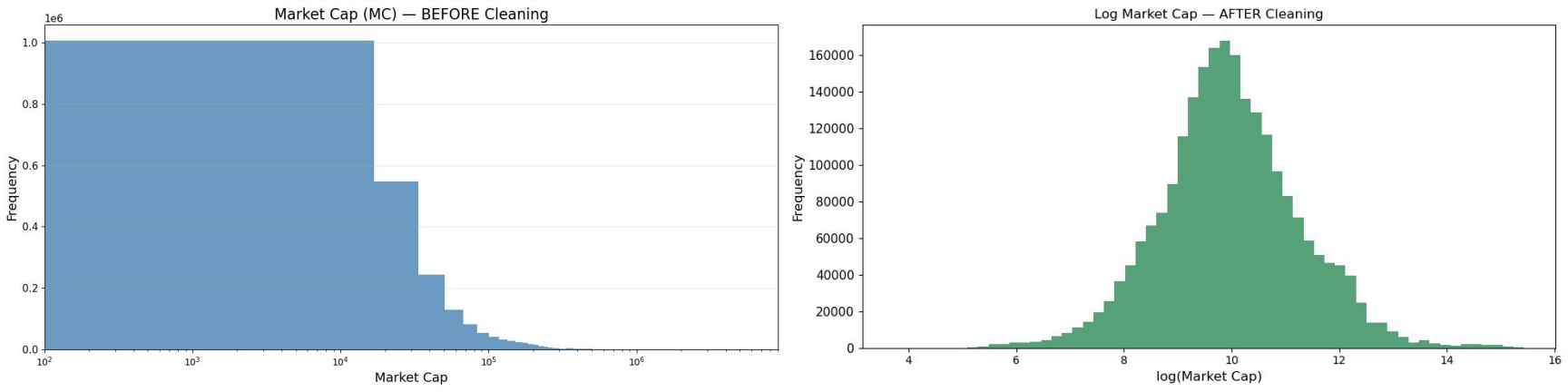
Log Market Cap Example



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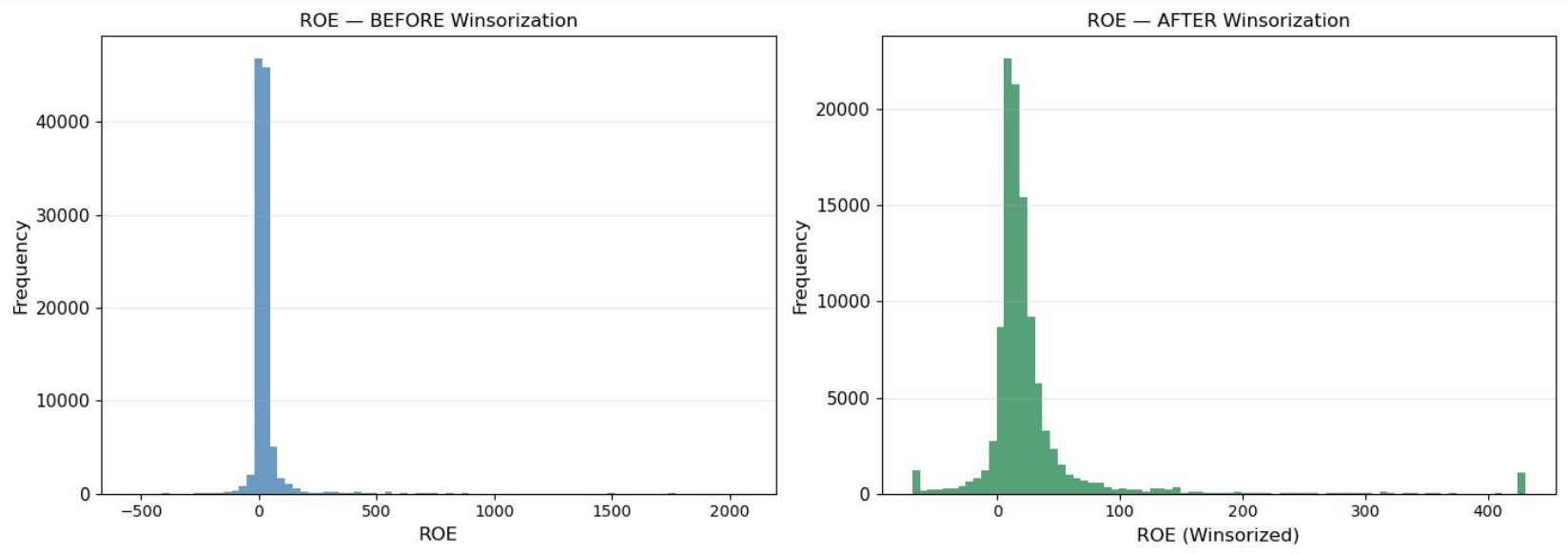
Pre and Post Winsorization



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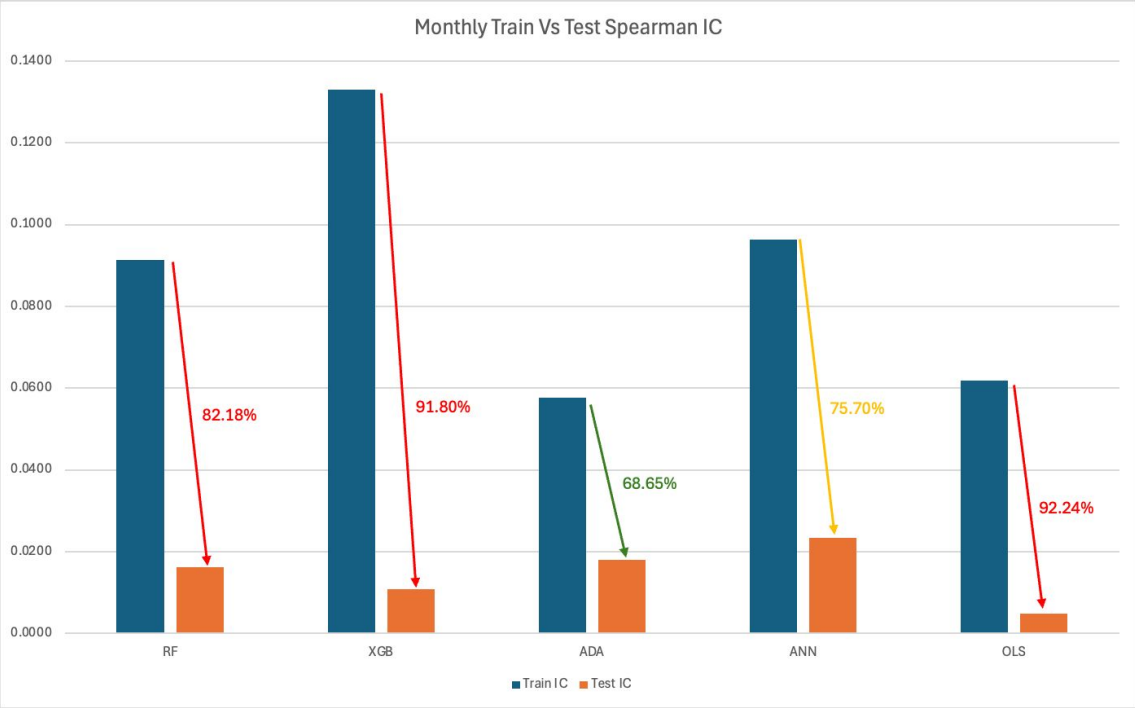
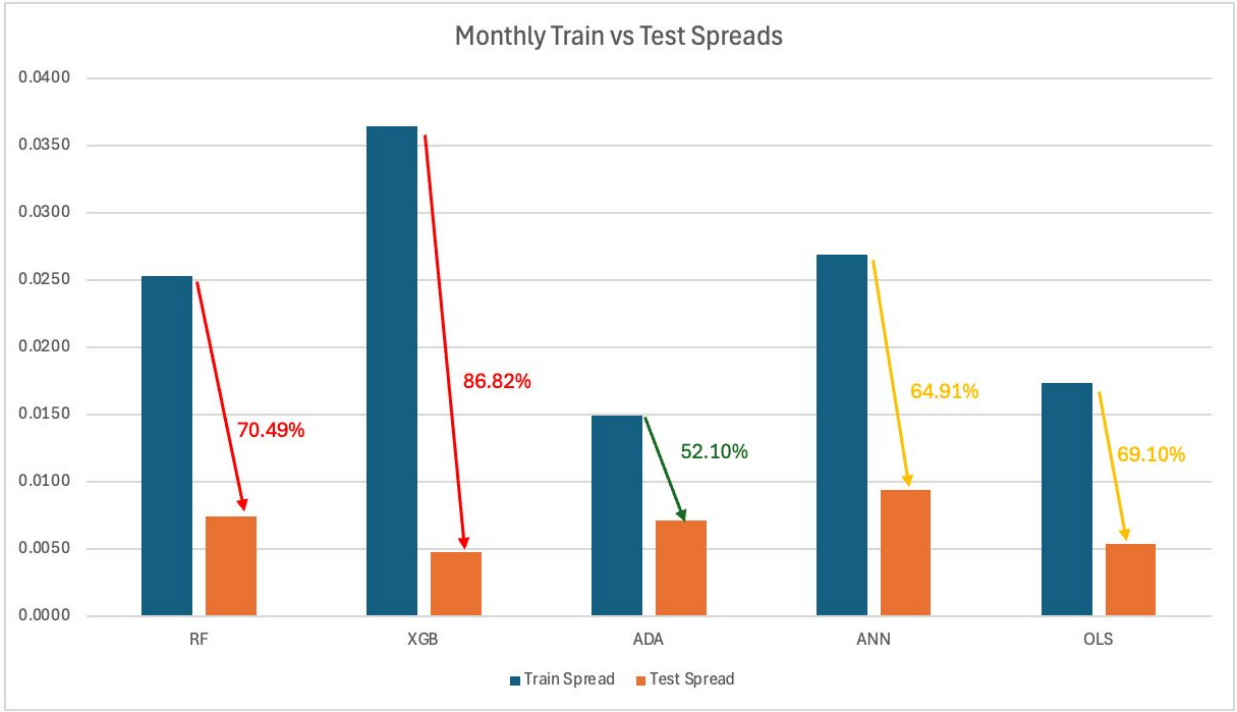
02 Model Selection & Performance

Model Selection



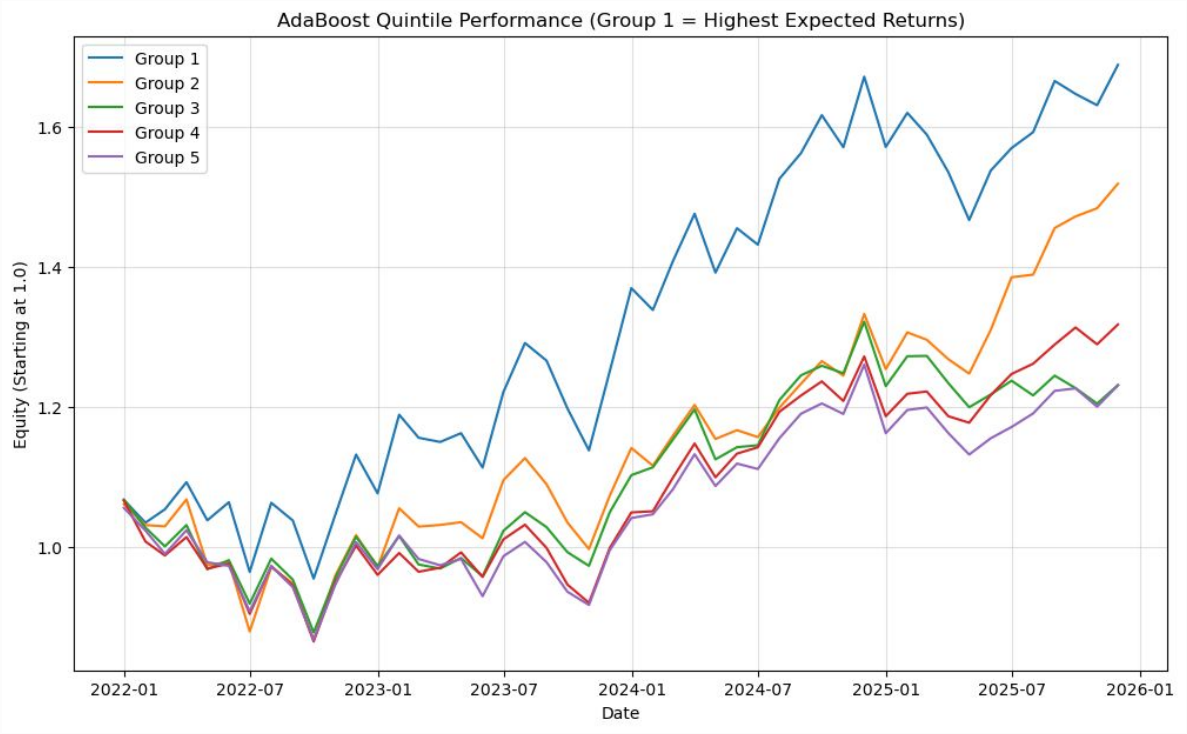
***Spearman IC:** Correlation between model's predicted ranking vs its actual performance ranking

Model Selection



***Spread:** Difference in average returns between the top 20% and bottom 20% of stocks ranked by the model

Out of Sample Backtest



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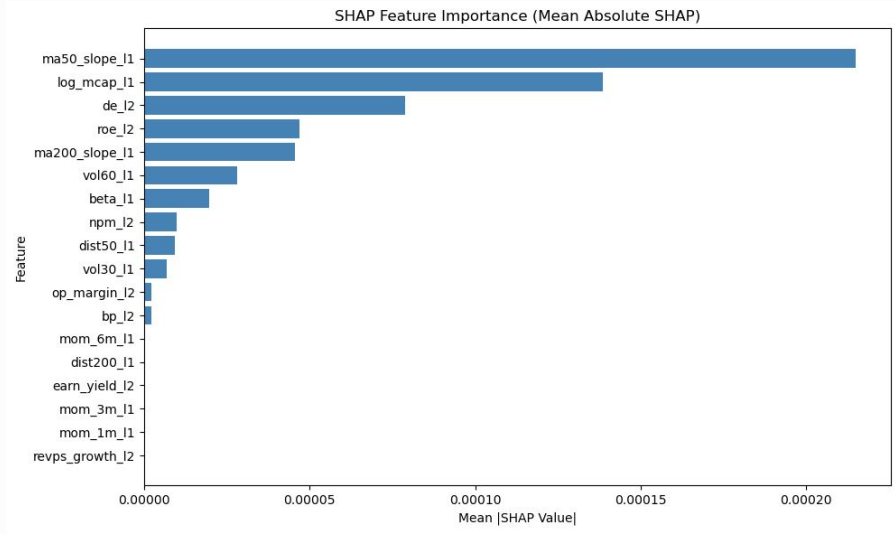
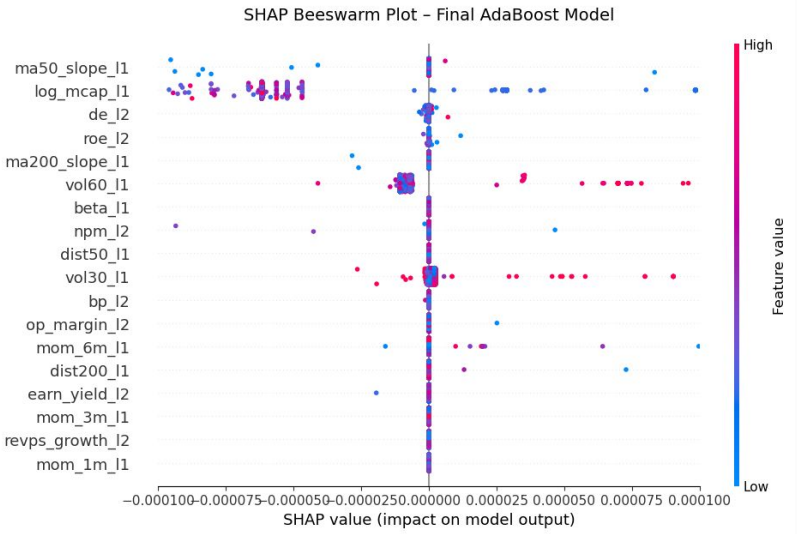
Interpretation





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Business Interpretation

Business Interpretation

- Financial markets are **intentionally hard to predict**, making even small improvements in ranking **valuable and non-trivial**
- Results show that machine learning can **extract structure from noisy environments** when applied systematically
- Even small improvements in ranking accuracy can translate into **meaningful portfolio performance**
- **Adaboost** displayed the best **generalization**
- Strong quintile spreads indicate the model can **separate potential winners from losers**
- Different models show a trade-off between **higher upside** and **more consistent performance**
- This approach supports **systematic, repeatable decision-making** that can complement discretionary stock picking

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Our Top Picks

Top 20 Ranked Stocks

Highest predicted ranks (1 = best).

#	Ticker	Company	Rank
1	SMCI UW Equity	Super Micro Computer Inc	1
2	COIN UW Equity	Coinbase Global Inc	2
3	HOOD UW Equity	Robinhood Markets Inc	3
4	AVGO UW Equity	Broadcom Inc	4
5	ALB UN Equity	Albemarle Corp	5
6	APP UW Equity	Applovin Corp	6
7	MU UW Equity	Micron Technology Inc	7
8	SNDK UW Equity	SanDisk Corp	8
9	TER UW Equity	Teradyne Inc	9
10	EPAM UN Equity	EPAM Systems Inc	10
11	MRNA UW Equity	Moderna Inc	11
12	WBD UW Equity	Warner Bros Discovery Inc	12
13	DLTR UW Equity	Dollar Tree Inc	13
14	DG UN Equity	Dollar General Corp	14
15	ARE UN Equity	Alexandria Real Estate Equities Inc	15
16	SOLS UW Equity	Solaredge Technologies Inc	16
17	MOH UN Equity	Molina Healthcare Inc	17
18	PSKY UW Equity	Pure Storage Inc	18
19	DOW UN Equity	Dow Inc	19
20	DECK UN Equity	Deckers Outdoor Corp	20

Bottom 20 Ranked Stocks

Lowest predicted ranks (higher rank number = worse).

#	Ticker	Company	Rank
1	HPE UN Equity	Hewlett Packard Enterprise Co	484
2	HON UW Equity	Honeywell International Inc	485
3	HLT UN Equity	Hilton Worldwide Holdings Inc	486
4	HIG UN Equity	Hartford Financial Services Group Inc	487
5	HD UN Equity	Home Depot Inc	488
6	HCA UN Equity	HCA Healthcare Inc	489
7	HBAN UW Equity	Huntington Bancshares Inc	490
8	HAL UN Equity	Halliburton Co	491
9	GS UN Equity	Goldman Sachs Group Inc	492
10	GE UN Equity	General Electric Co	493
11	GRMN UN Equity	Garmin Ltd	494
12	GOOGL UW Equity	Alphabet Inc Class A	495
13	GOOG UW Equity	Alphabet Inc Class C	496
14	GM UN Equity	General Motors Co	497
15	GLW UN Equity	Corning Inc	498
16	GIS UN Equity	General Mills Inc	499
17	GILD UW Equity	Gilead Sciences Inc	500
18	GEHC UW Equity	GE HealthCare Technologies Inc	501
19	ZTS UN Equity	Zoetis Inc	502
20	CMG UN Equity	Chipotle Mexican Grill Inc	503

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Demo Time!

Thank You!
Questions?

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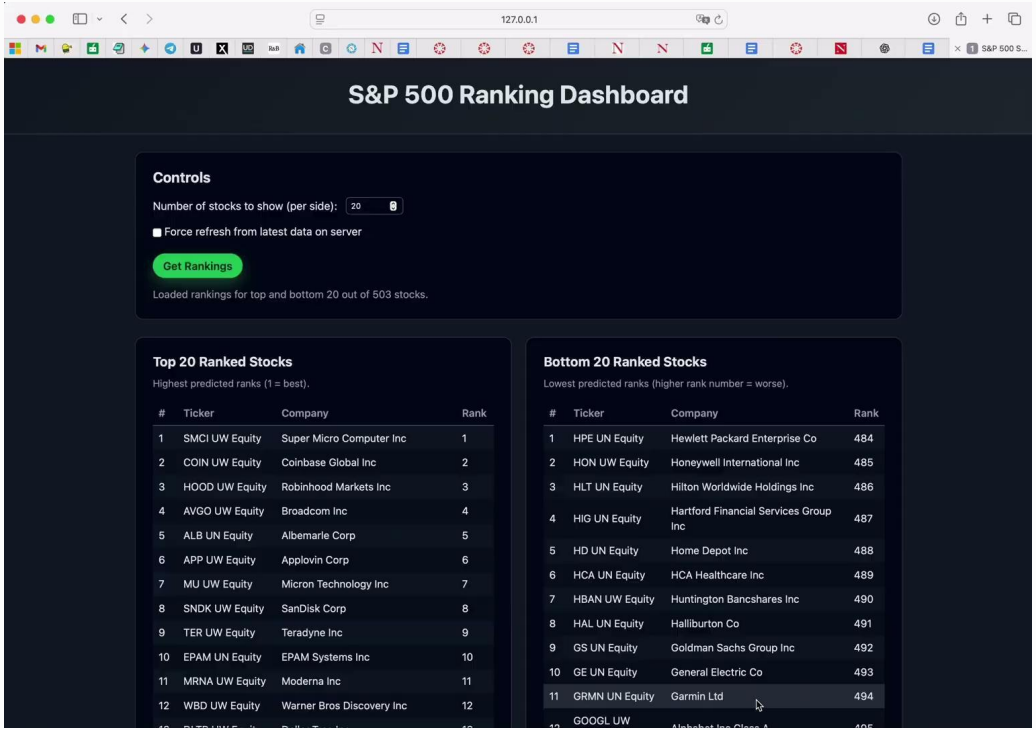
Appendix

Demo Video



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GitHub Repo to Access Project

https://github.com/Rishi-R-Urs/S-P-500-Ranking-Dashboard.git

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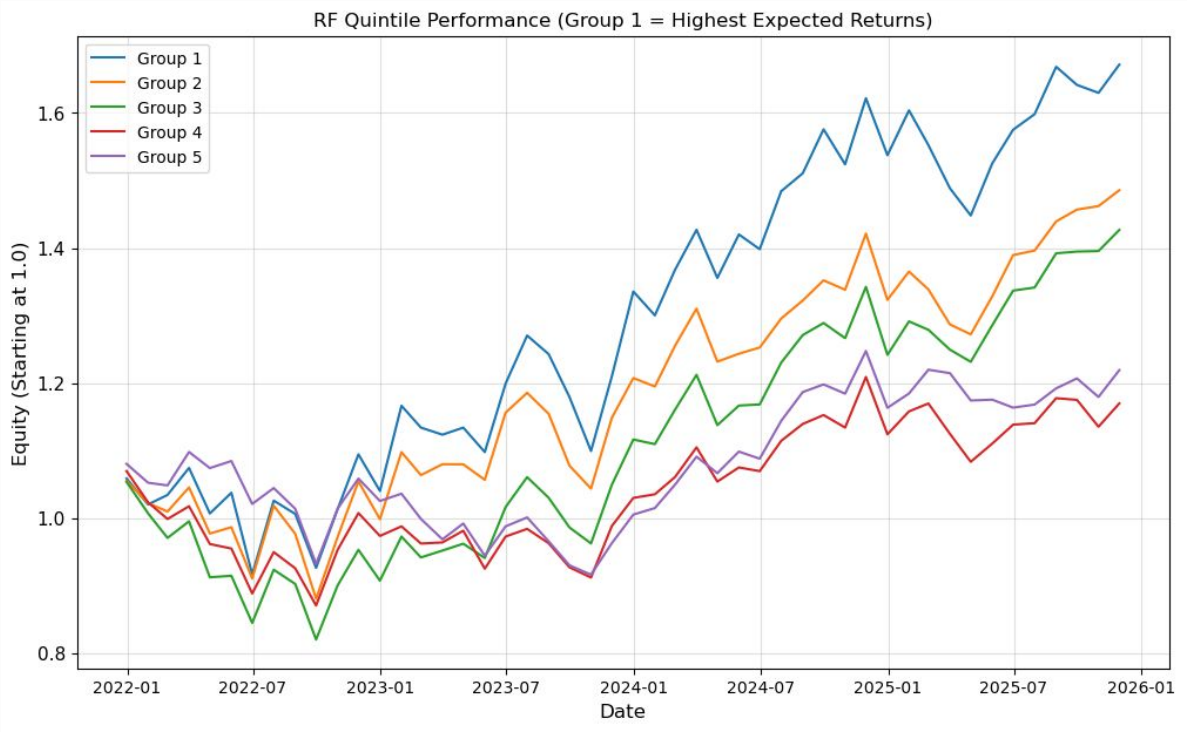
Variable Definitions

Variable Name	Definition	Formula / Explanation
mom_1m_l1	1-month momentum	(Price_today / Price_21_trading_days_ago) – 1
mom_3m_l1	3-month momentum	(Price_today / Price_63_trading_days_ago) – 1
mom_6m_l1	6-month momentum	(Price_today / Price_126_trading_days_ago) – 1
dist50_l1	Distance from 50-day moving average	(Price_today – MA50_today) / MA50_today
dist200_l1	Distance from 200-day moving average	(Price_today – MA200_today) / MA200_today
vol_30d_l1	30-day volatility	Standard deviation of **daily returns** over last 30 trading days
vol_60d_l1	60-day volatility	Standard deviation of **daily returns** over last 60 trading days
log_mcap_l1	Log market capitalization	log(market_capitalization)
beta_l1	Beta vs S&P 500	Cov(asset_returns, SPX_returns) / Var(SPX_returns) using last ~252 days
roe_l2	Return on Equity	TTM Net Income / Shareholder Equity
de_l2	Debt-to-Equity ratio	Total Debt / Total Equity
op_margin_l2	TTM Operating Margin	TTM Operating Income / TTM Revenue
npm_l2	TTM Net Profit Margin	TTM Net Income / TTM Revenue
earn_yield_l2	Earnings Yield	1 / trailing_PE
bp_l2	Book-to-Price ratio	Book Value per Share / Current Price
revps_growth_l2	Revenue per share growth	growth in trailing twelve month revenue per share

RF



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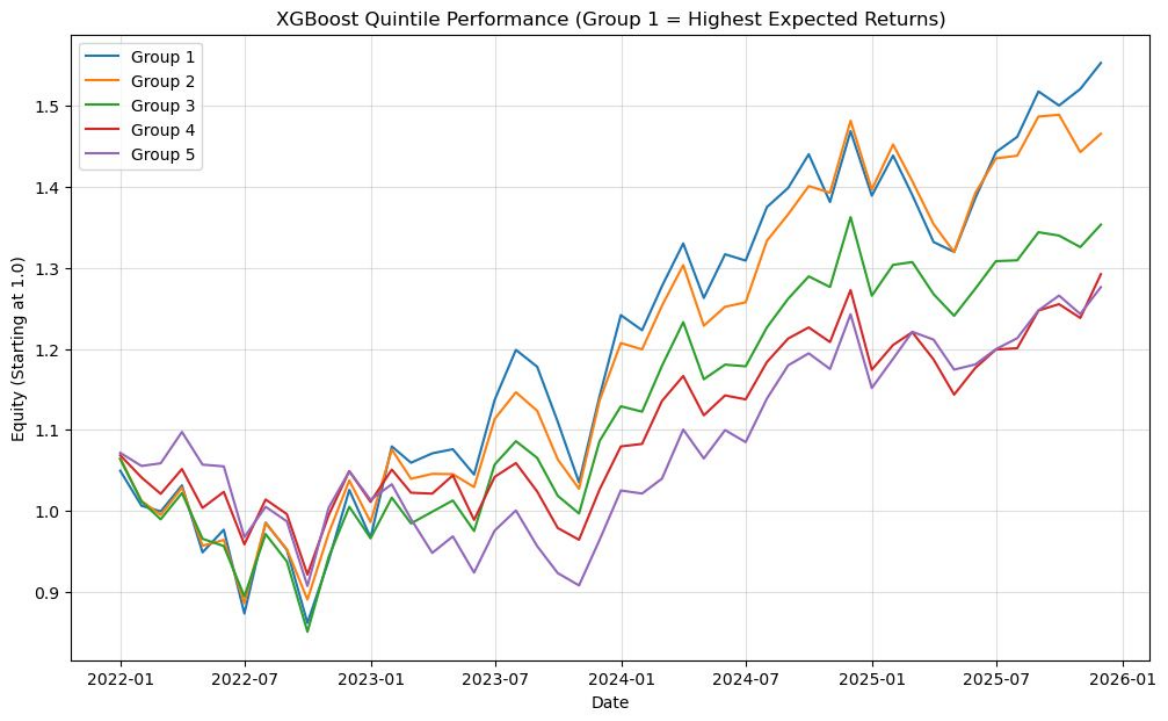
XGBoost



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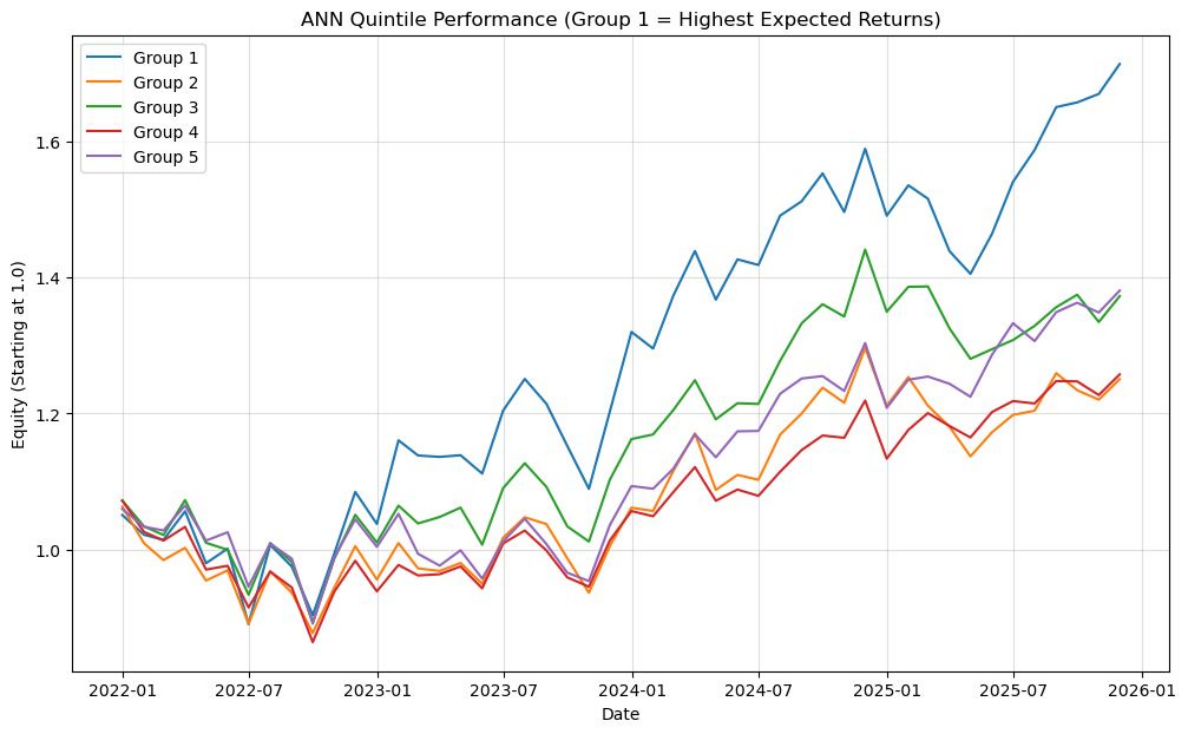
ANN



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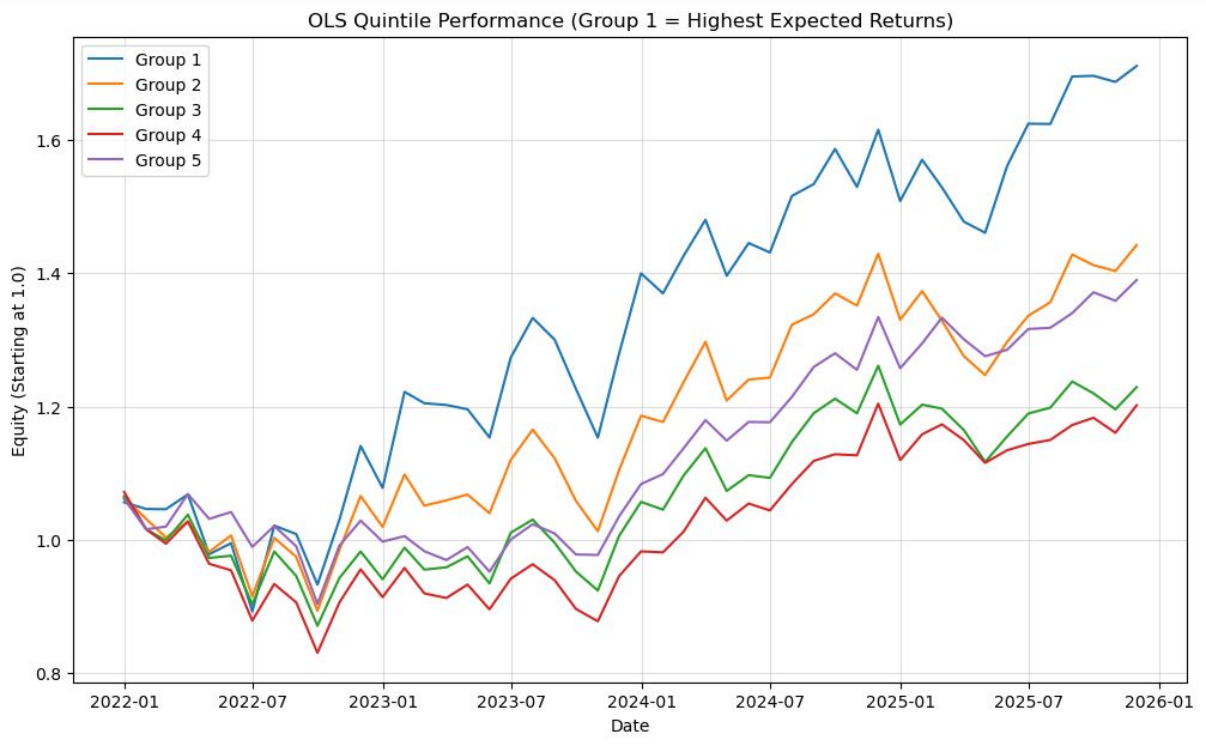
OLS



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Hyperparameter Tuning

```
# 3) RF Hyperparameter grid tuned
param_grid = {
    "n_estimators": [300],
    "max_depth": [6, 9, 12],
    "min_samples_leaf": [5, 10],
    "max_features": ["sqrt"]
}
```

```
# 3) XGB Hyperparameter grid
param_grid = {
    "n_estimators": [400],
    "max_depth": [3, 5],
    "learning_rate": [0.05, 0.1],
    "subsample": [0.8],
    "colsample_bytree": [0.8, 1.0],
    "min_child_weight": [5]
}
```

```
# 3) AdaBoost Hyperparameter grid
param_grid_ada = {
    "n_estimators": [100, 300],
    "learning_rate": [0.01, 0.05, 0.1],
    "estimator__max_depth": [2, 3, 4]
}
```

```
# ---------- 2) ANN Hyperparameter grid ----------
param_grid_ann = [
    {"hidden_units": 32, "dropout_rate": 0.0, "lr": 1e-3, "batch_size": 256, "epochs": 30},
    {"hidden_units": 64, "dropout_rate": 0.0, "lr": 1e-3, "batch_size": 256, "epochs": 30},
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]
```

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