

Task 3 Report: Backtesting Random Forest-Based Trading Strategy

Objective:

To evaluate the performance of a trading strategy based on Random Forest model predictions against a simple buy-and-hold benchmark.

Methodology:

- Used **Random Forest model’s binary predictions** (from Task 2) on test data to generate trading signals:
 - **Buy (1)** if model predicts price increase next day.
 - **Sell (0)** otherwise (stay in cash).
 - Calculated **strategy returns** as the product of next day log returns and predicted signal.
 - Accounted for **transaction costs** of 0.1% on signal changes to simulate realistic trading expenses.
 - Compared cumulative returns and risk-adjusted performance against a buy-and-hold strategy over the same period.
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Results:

Metric	Value
Cumulative Return	+2.48%
Sharpe Ratio	1.49
Maximum Drawdown	-1.22%

- The strategy generated a **positive cumulative return of 2.48%**, outperforming a passive buy-and-hold approach over the test period (exact buy-and-hold return not explicitly given but shown in plot).

- **Sharpe Ratio of 1.49** indicates a reasonable risk-adjusted return, suggesting the strategy's returns compensate well for the risk taken.
 - **Maximum Drawdown of only -1.22%** reflects controlled downside risk and better drawdown management compared to typical stock market behavior.
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Insights:

- The model-based strategy shows **promising risk-adjusted returns** and better downside protection versus buy-and-hold, despite the underlying classification model's modest predictive power.
 - Incorporation of transaction costs demonstrates the strategy remains viable after realistic trading frictions.
 - Low drawdown indicates the strategy could be useful for risk-averse investors who prefer limited downside exposure.
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Recommendations:

- Experiment with **more advanced models** (e.g., LSTM or XGBoost) and **ensemble strategies** to potentially improve prediction accuracy and trading performance.
- Consider **dynamic transaction costs** or slippage modeling for more robust backtesting.
- Extend the backtest to **longer time frames** and different market conditions to assess robustness.
- Analyze periods of **underperformance** to identify and mitigate risk factors.

VISUAL RESULTS:

