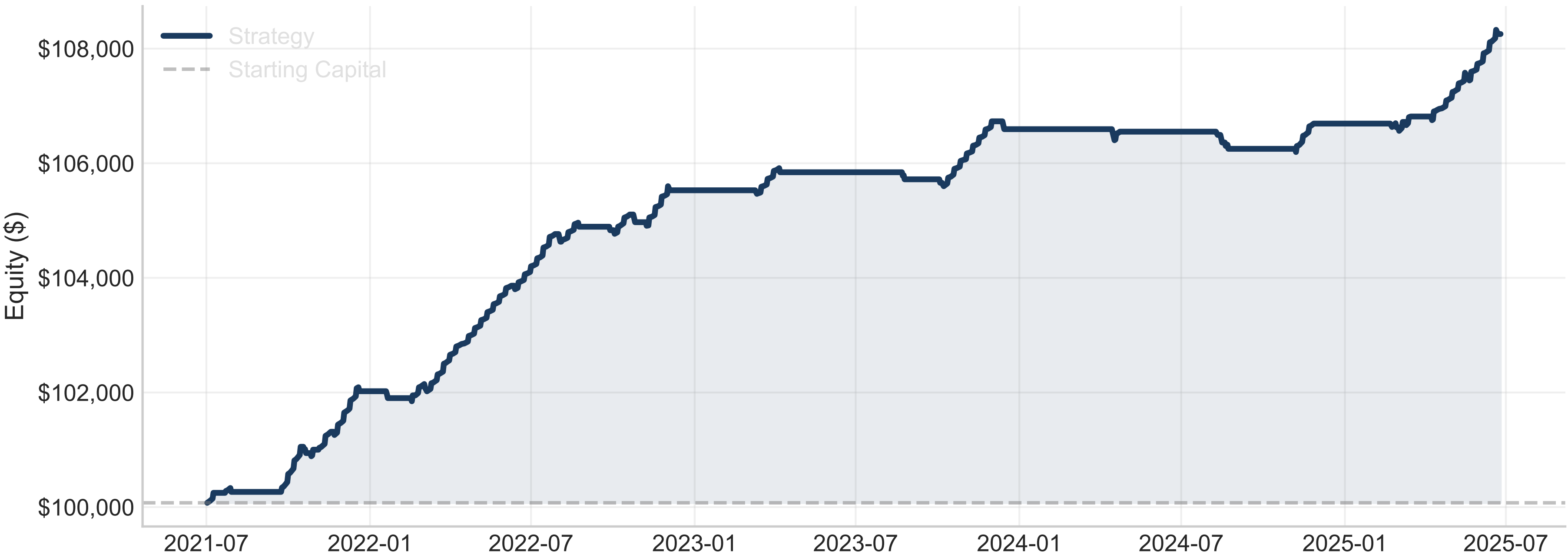
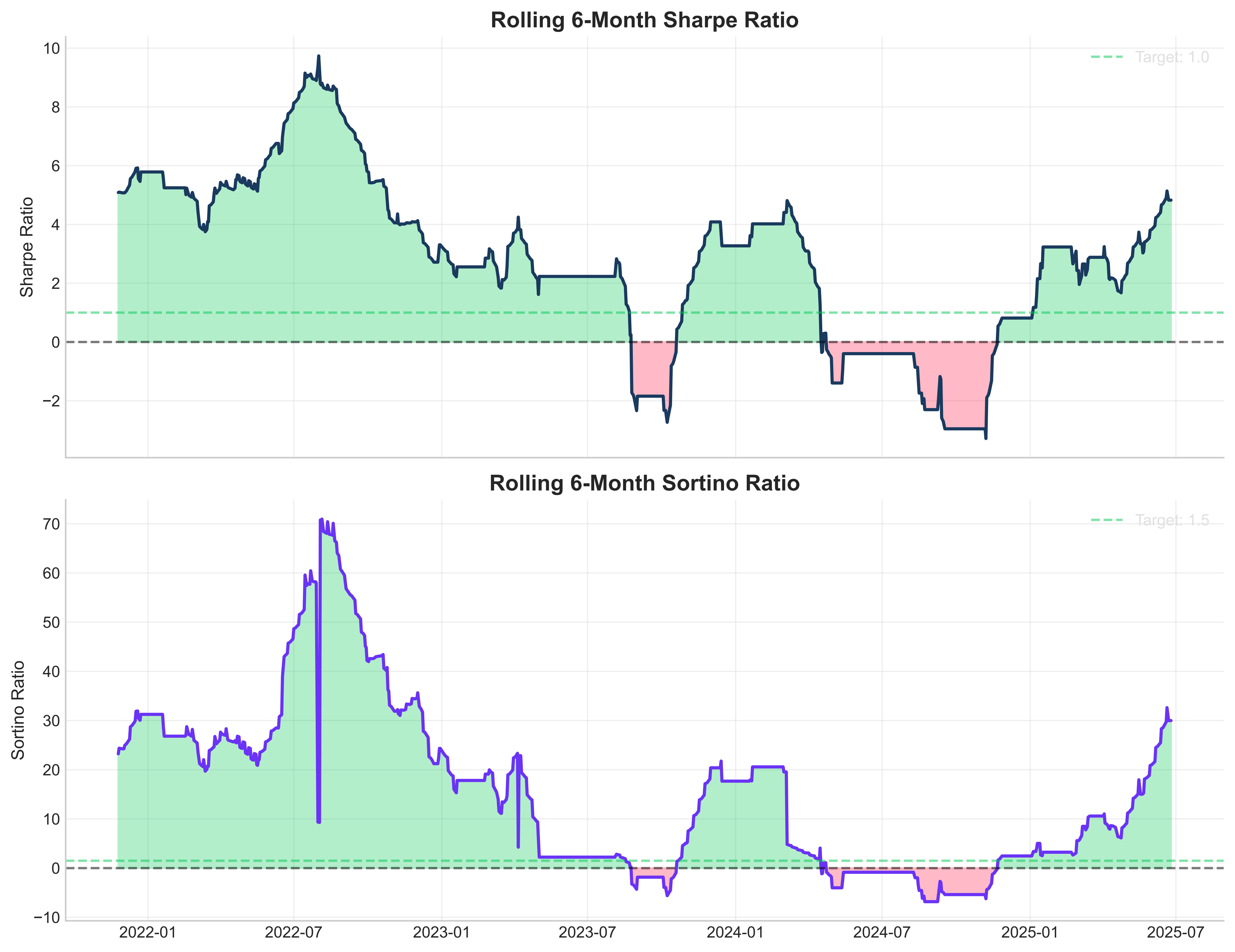
USTBOND

Scientific Options Framework v4.9 — Performance Report

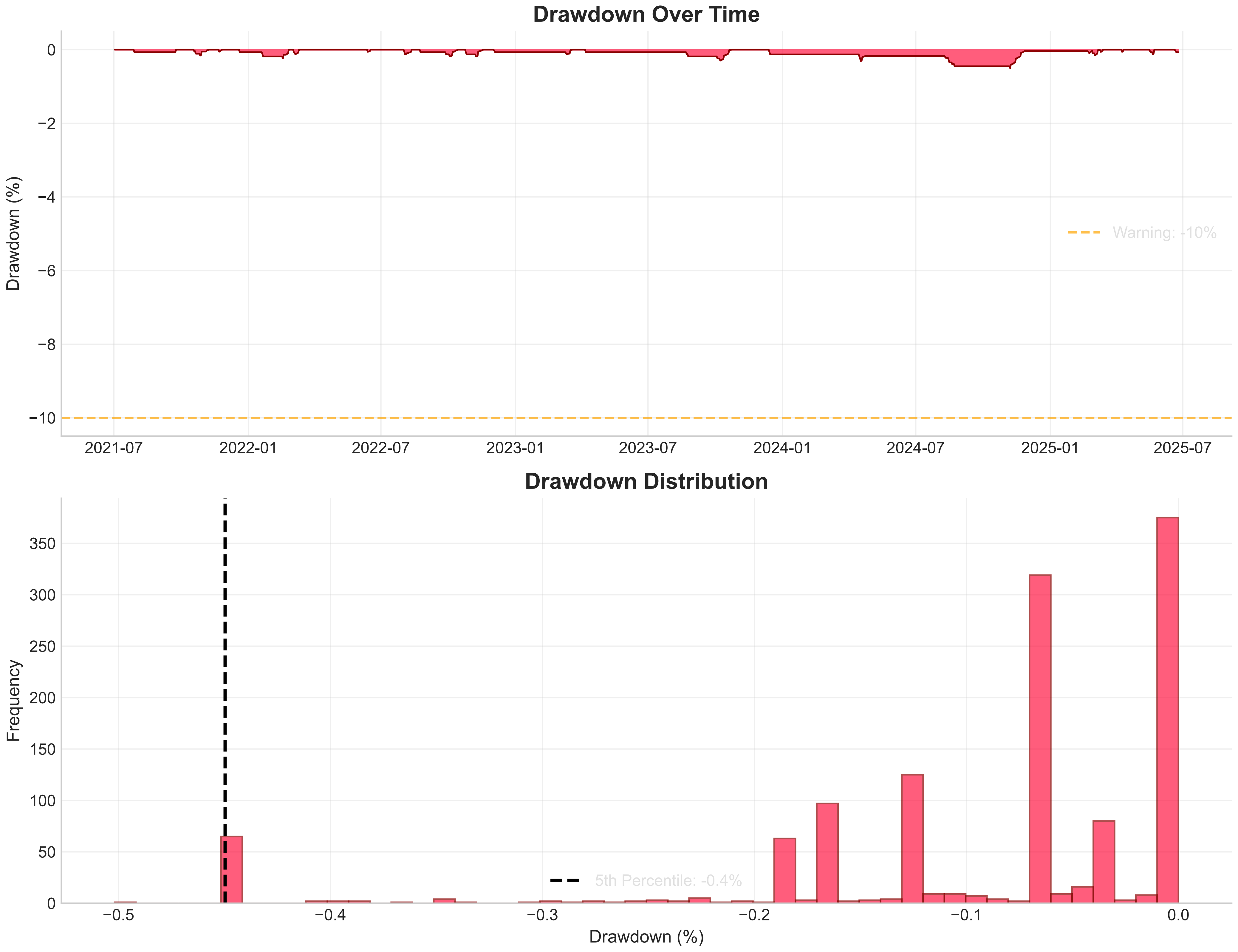
Cumulative Equity



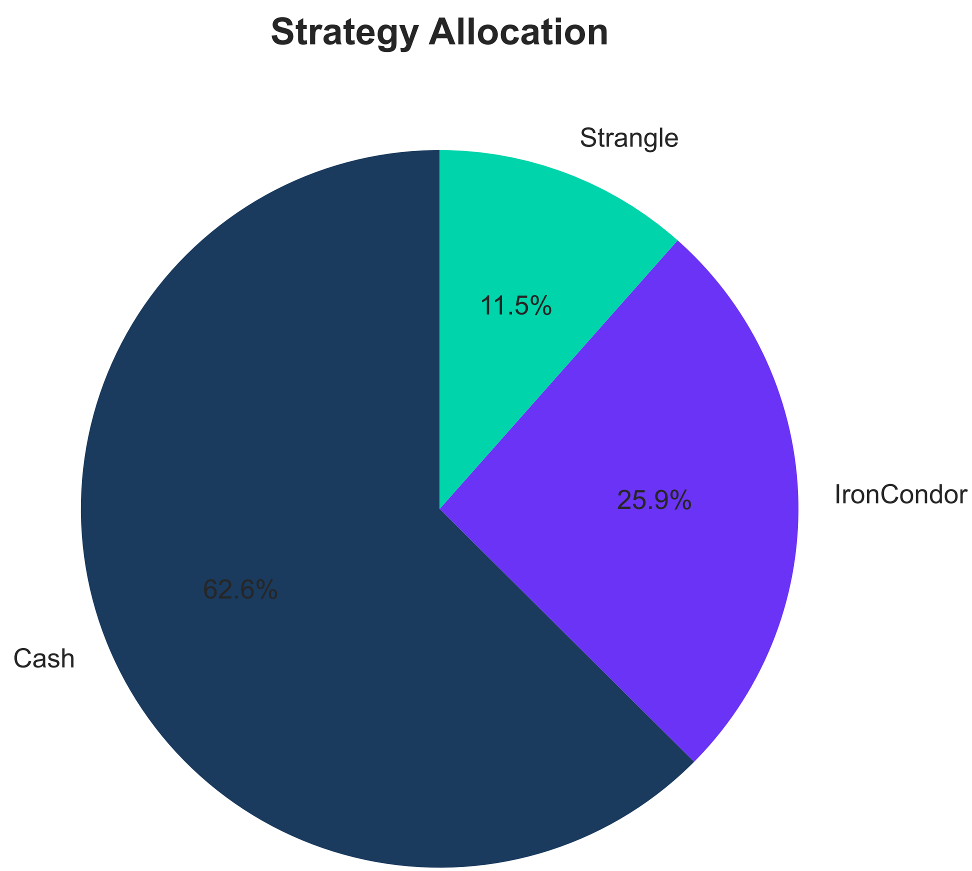
Sharpe Ratio	3.637 □	Sortino Ratio	17.863
Total Return	+8.17%	CAGR	+1.61%
Max Drawdown	-0.50%	Win Rate	89.9%
ML OOS AUC	0.5031	Sharpe p-value	0.0000

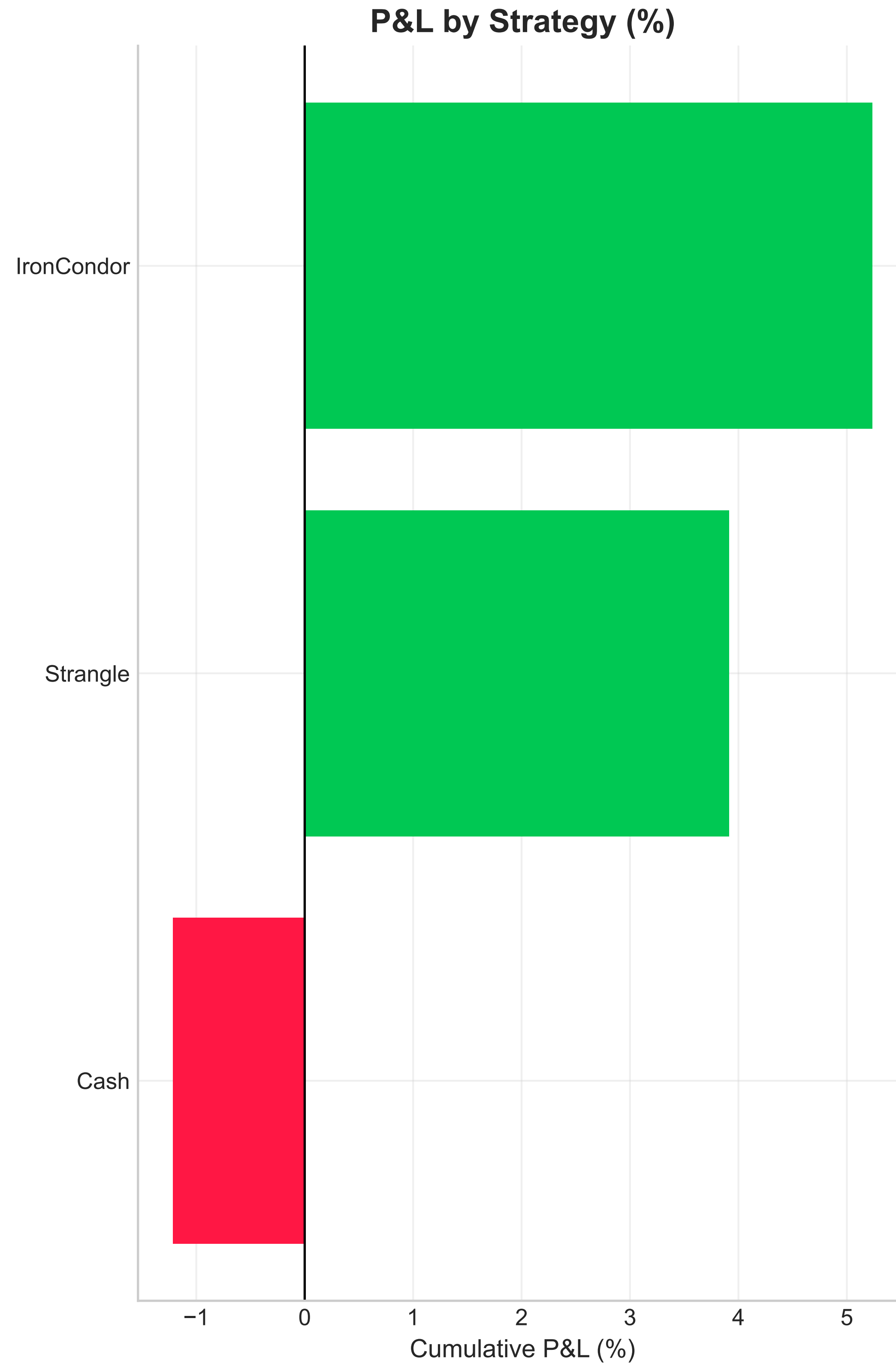


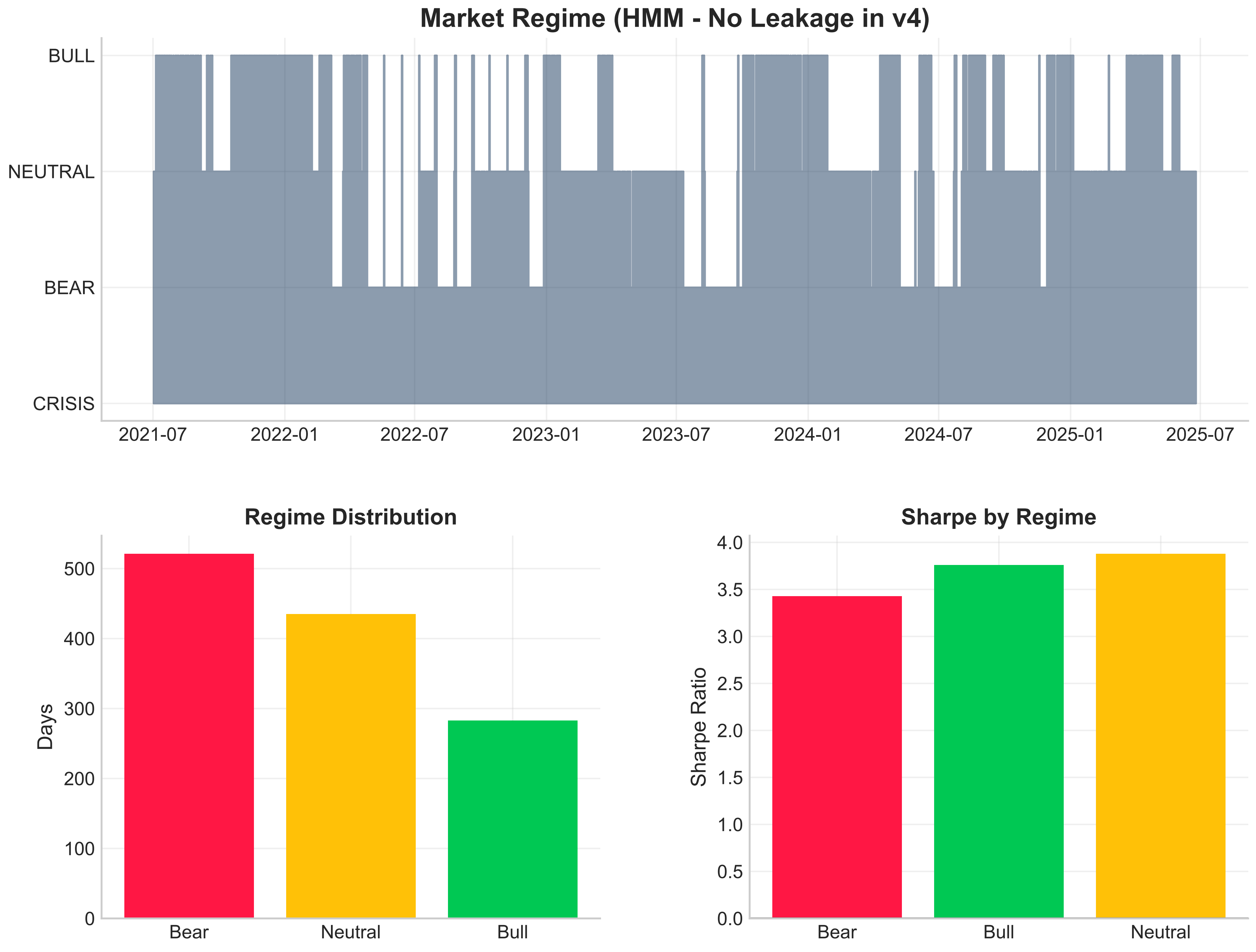
Rolling 6-Month Sharpe Ratio
Target: 1.0
Sharpe Ratio
10
8
6
4
2
0
−2
Rolling 6-Month Sortino Ratio
Target: 1.5
Sortino Ratio
70
60
50
40
30
20
10
0
−10
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07

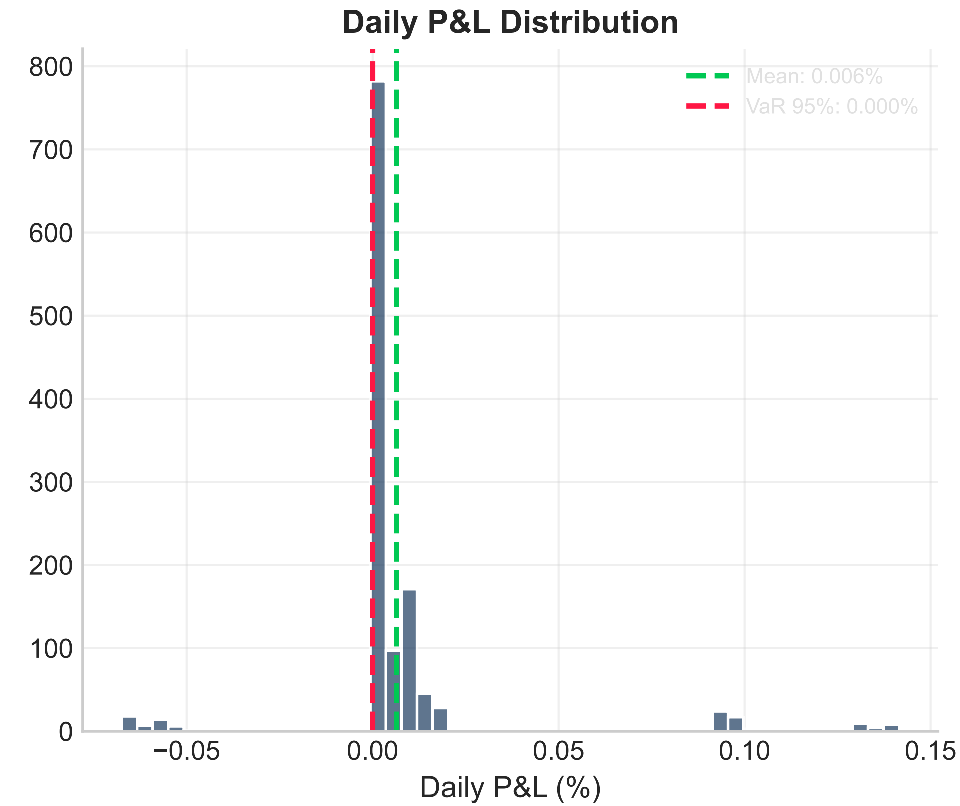


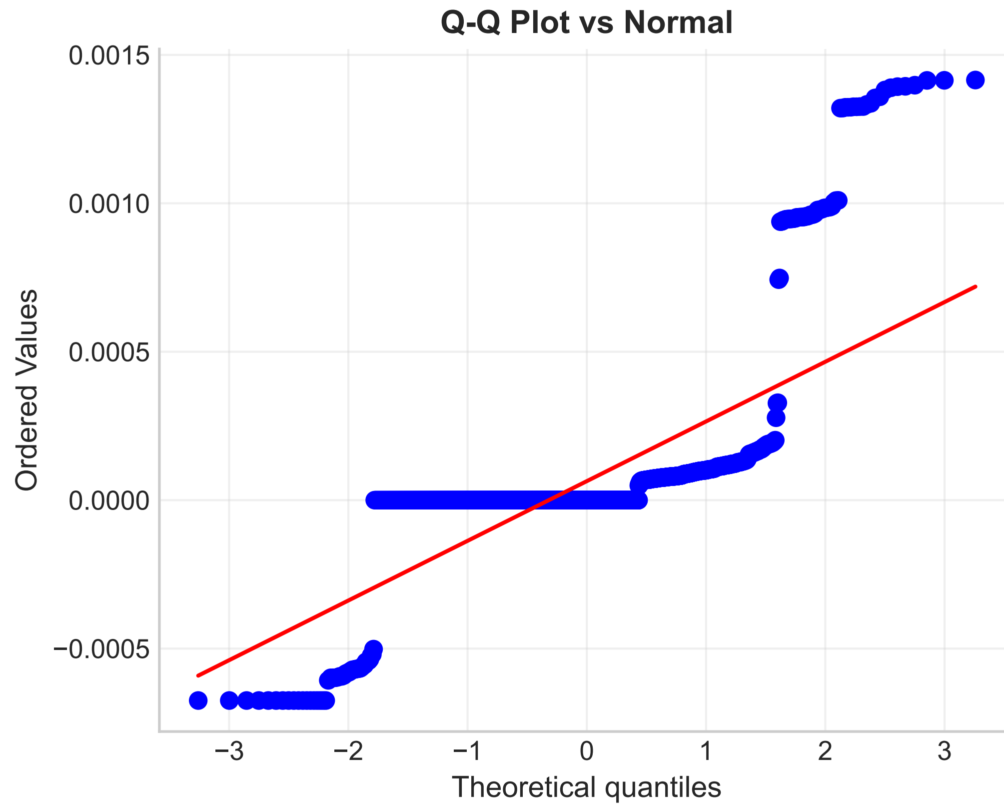
Drawdown Over Time
Drawdown (%)
0
−2
−4
−6
−8
−10
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07
Warning: -10%
Drawdown Distribution
Frequency
350
300
250
200
150
100
50
0
−0.5
−0.4
−0.3
−0.2
−0.1
0.0
Drawdown (%)
5th Percentile: -0.4%

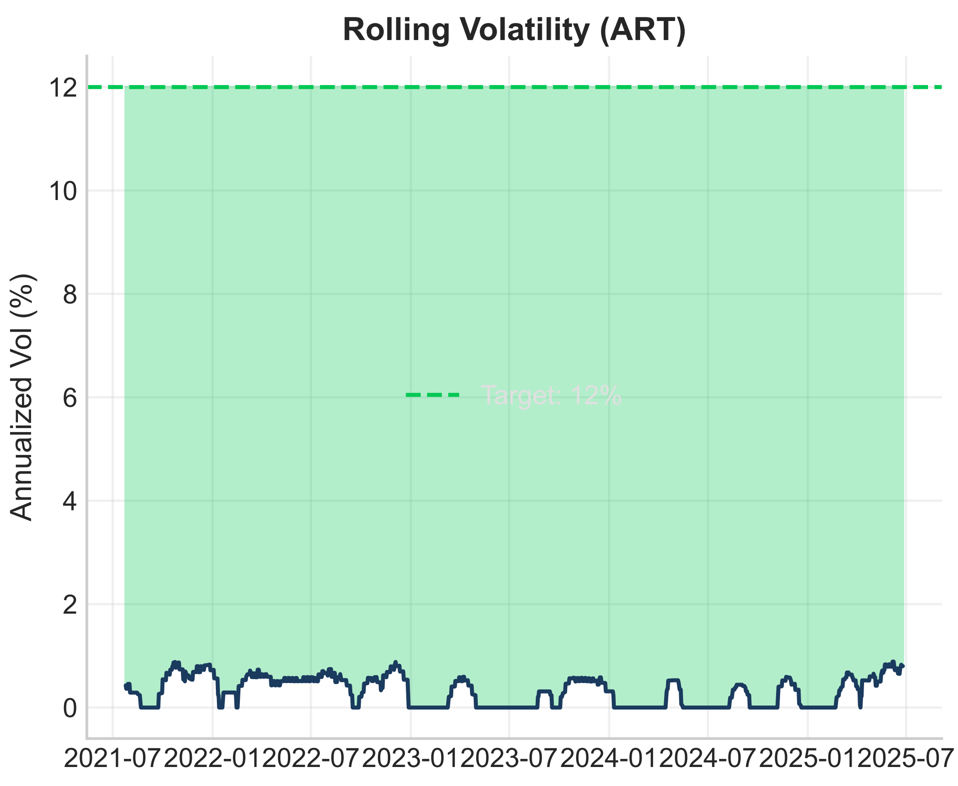

Strategy Allocation
Strangle
11.5%
25.9%
IronCondor
62.6%
Cash


P&L by Strategy (%)
IronCondor
Strangle
Cash
−1
0
1
2
3
4
5
Cumulative P&L (%)


Market Regime (HMM - No Leakage in v4)
BULL
NEUTRAL
BEAR
CRISIS
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07
Regime Distribution
Days
0
100
200
300
400
500
Bear
Neutral
Bull
Sharpe by Regime
Sharpe Ratio
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Bear
Bull
Neutral







Metric	Value
VaR 95%	0.000%
ES 95%	-0.003%
Skewness	2.353
Kurtosis	10.006
Omega Ratio	3.830
Profit Factor	3.830

Monthly Returns Heatmap (%)
Year
2021
2022
2023
2024
2025
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
0.3 0.0 0.2 0.6 0.5 0.5
-0.1 0.2 0.4 0.6 0.6 0.4 0.6 0.1 -0.1 0.1 0.5 0.1
0.0 0.0 0.3 -0.0 0.0 0.0 0.0 -0.1 0.0 0.3 0.5 -0.0
0.0 0.0 0.0 -0.0 0.0 0.0 0.0 -0.3 0.0 0.0 0.4 0.0
0.0 -0.1 0.2 0.3 0.6 0.5
Monthly Return (%)
0.6
0.4
0.2
0.0
−0.2

Top 10 Winners & Losers

Rank	Strategy	P&L (%)
1	IronCondor	+1.2935%
2	Strangle	+0.7821%
3	Strangle	+0.5287%
4	IronCondor	+0.4877%
5	IronCondor	+0.4819%
6	IronCondor	+0.3832%
7	IronCondor	+0.3168%
8	IronCondor	+0.2990%
9	IronCondor	+0.2785%
10	IronCondor	+0.2405%
B1	Strangle	-0.0536%
B2	IronCondor	-0.0566%
B3	IronCondor	-0.0568%
B4	IronCondor	-0.0570%
B5	IronCondor	-0.0575%
B6	IronCondor	-0.0585%
B7	IronCondor	-0.0594%
B8	IronCondor	-0.0597%
B9	IronCondor	-0.0598%
B10	IronCondor	-0.0607%

v4.9 Fixes & Improvements Dashboard

Improvement	Metric	Status
1. Robust ML (Lasso Logistic)	OOS AUC: 0.5031	□□
2. HMM Regime (No Leakage v4)	Fixed: Train-only fitting	□
3. Parkinson/GK Vol Estimators	Using High-Low data	□
4. Vol Percentile (renamed)	Accurate nomenclature	□
5. Auto-Regressive Risk Targeting	Realized: 0.4%	□□
6. Weekend Theta WIRED	Avg Adj: 1.9191	□
7. Strategy Leverage Diff	Per-strategy scaling	□
8. OOS AUC Reporting	Test AUC, not train	□

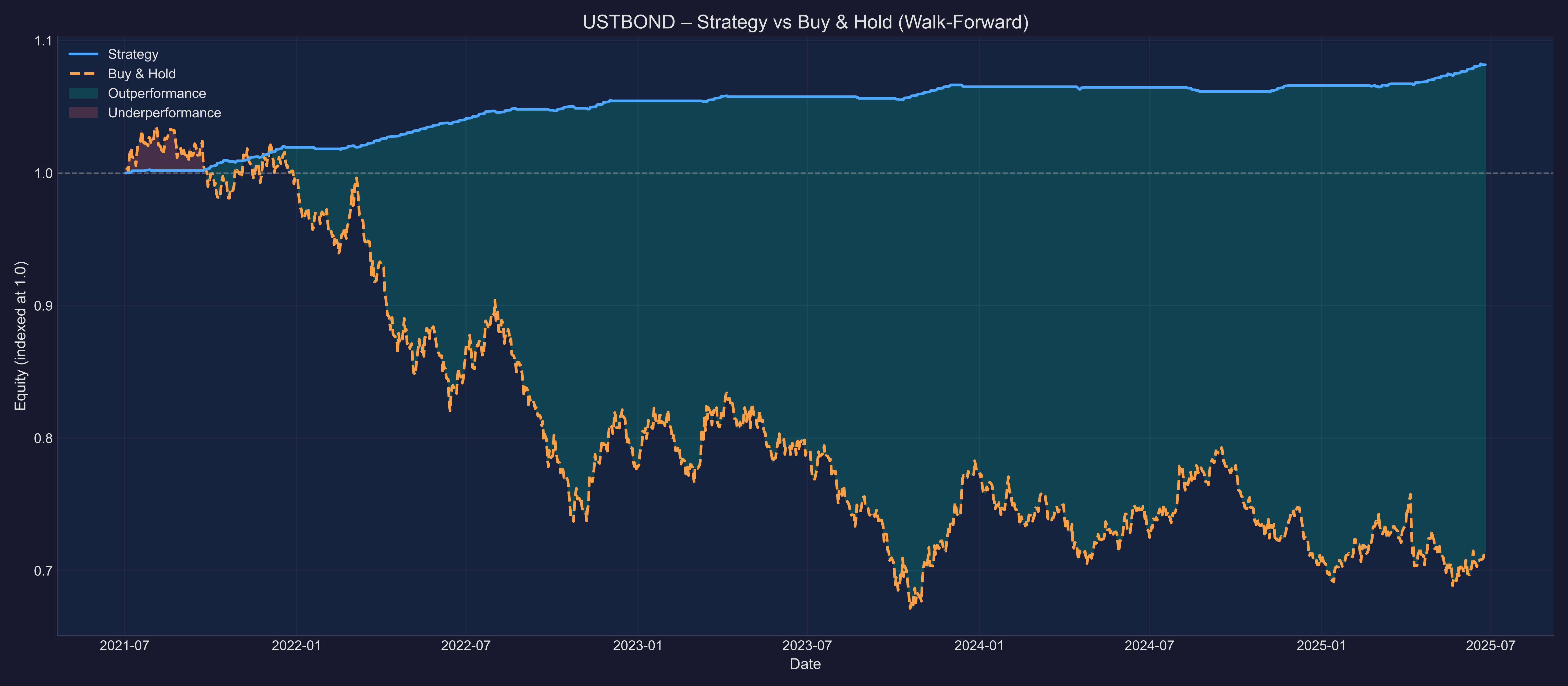
USTBOND - FINAL SUMMARY (v4.9)

Core Metrics:
- Sharpe Ratio: 3.6372
- Sortino Ratio: 17.8629
- Total Return: +8.17%
- Max Drawdown: -0.50%

Statistical Significance:
- t-stat: 22.6191
- p-value: 0.000000
- 95% CI: [2.9303, 4.3252]
- Significant: Yes

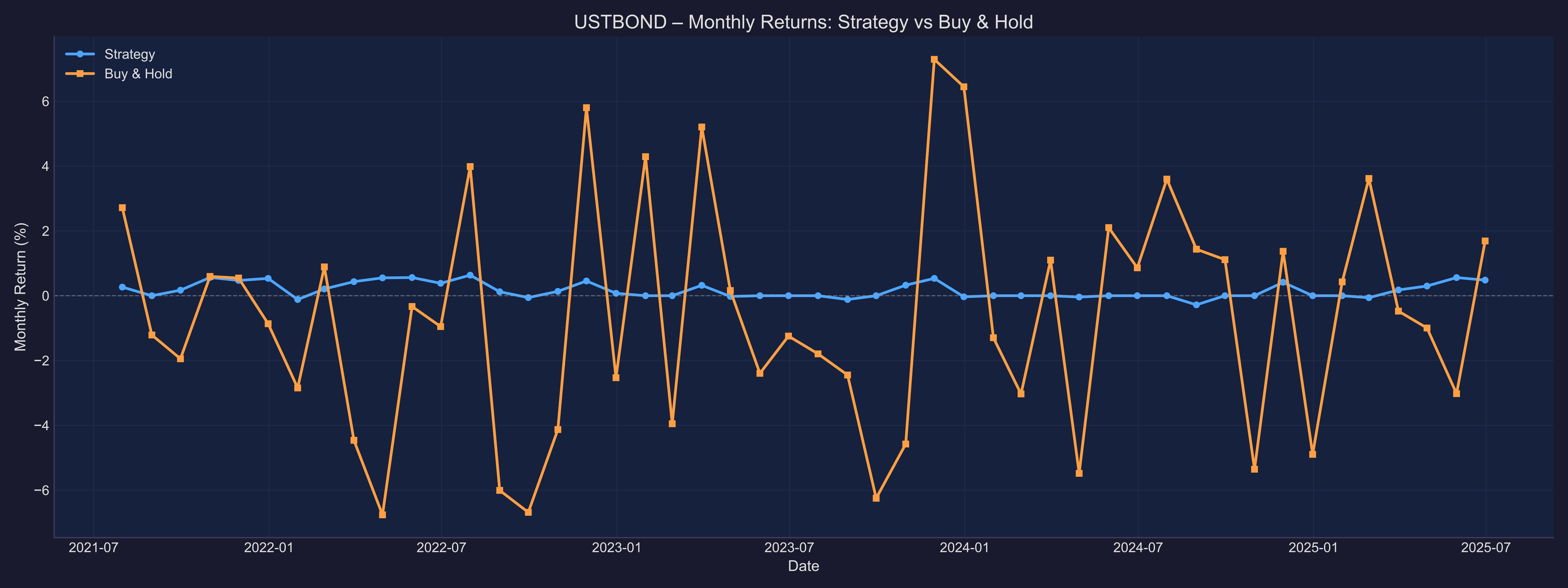
ML Performance (OOS):
- Global AUC: 0.5031

GRADE: EXCELLENT (Significant)

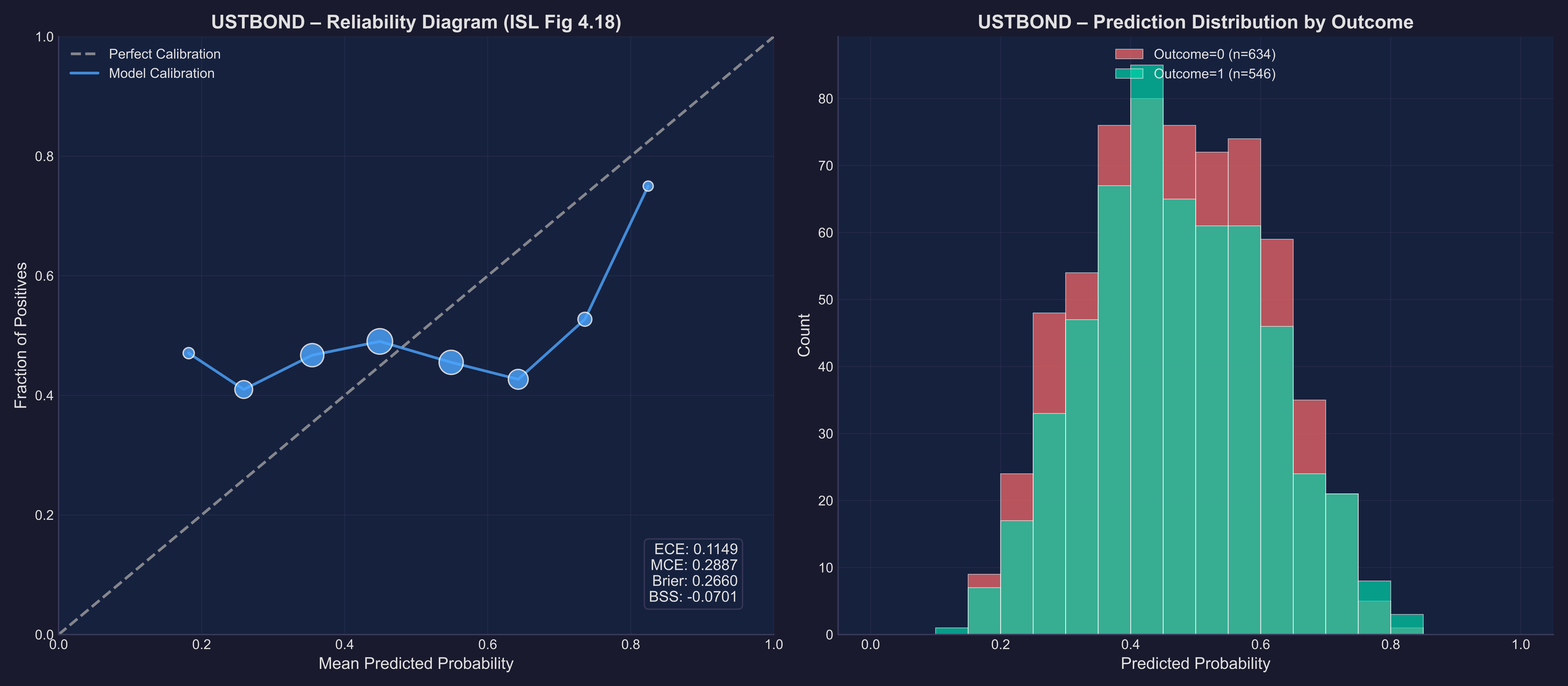


USTBOND – Strategy vs Buy & Hold (Walk-Forward)
Strategy
Buy & Hold
Outperformance
Underperformance
Equity (indexed at 1.0)
Date
1.1
1.0
0.9
0.8
0.7
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07


USTBOND – Price with Trade Entries
Price
Long Entry (36)
Short Entry (37)
160
150
140
130
120
110
Price
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07
Date

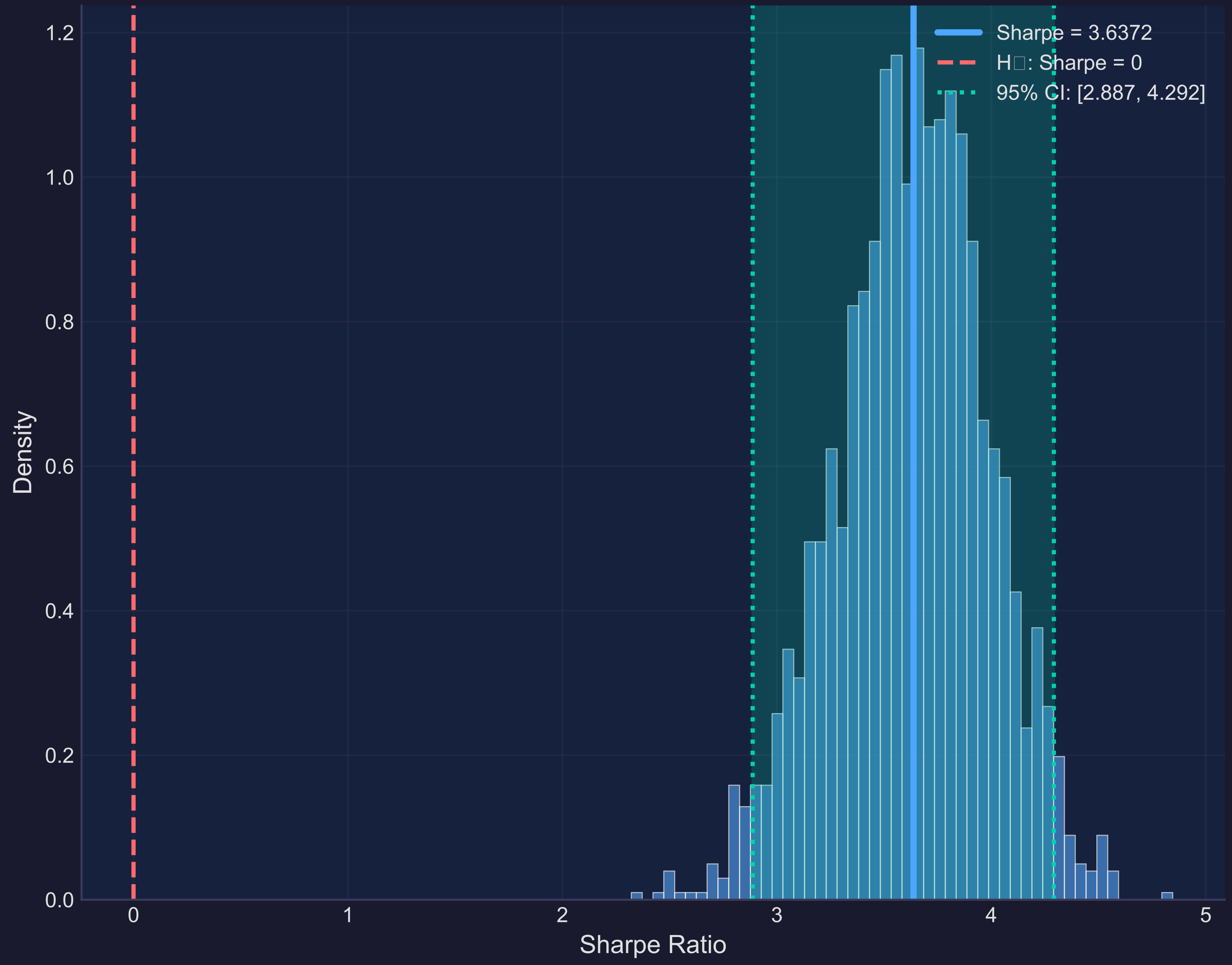

USTBOND – Monthly Returns: Strategy vs Buy & Hold
Strategy
Buy & Hold
Monthly Return (%)
Date
6
4
2
0
−2
−4
−6
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07


USTBOND – Turnover & Exposure Analysis
Net Position Exposure Over Time
Long
Short
Position
Gross Exposure Over Time
|Position|
Daily Turnover
Mean: 1.5%
Turnover (%)
Strategy Allocation Over Time
Strangle
IronCondor
Cash
Active
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07



USTBOND – Reliability Diagram (ISL Fig 4.18)
Perfect Calibration
Model Calibration
ECE: 0.1149
MCE: 0.2887
Brier: 0.2660
BSS: -0.0701
Fraction of Positives
Mean Predicted Probability
0.0
0.2
0.4
0.6
0.8
1.0
USTBOND – Prediction Distribution by Outcome
Outcome=0 (n=634)
Outcome=1 (n=546)
Count
Predicted Probability
0
10
20
30
40
50
60
70
80

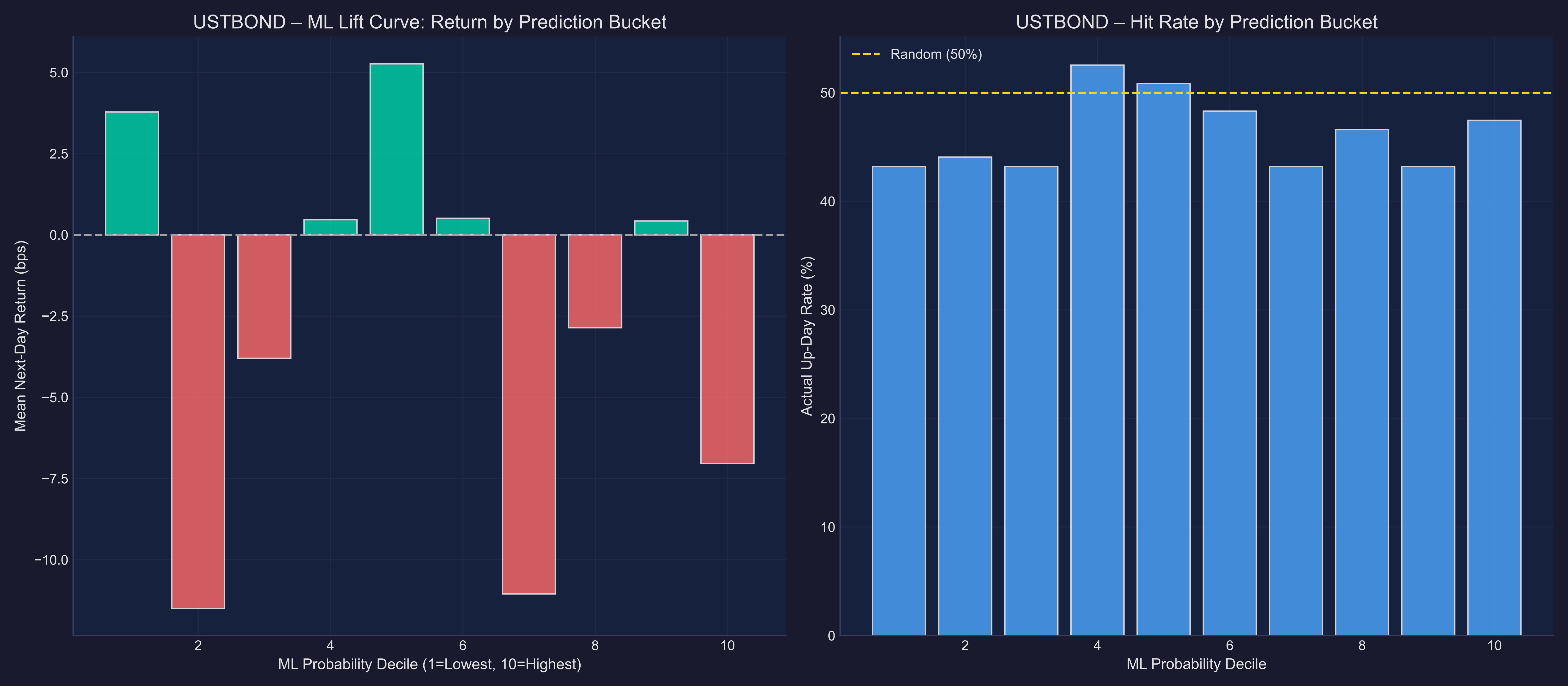
USTBOND – Bootstrap Distribution of Sharpe Ratio



USTBOND – Sharpe Ratio T-Test Results

SHARPE RATIO STATISTICAL SIGNIFICANCE TEST

Sample Size (n):	1,239 days
Point Estimate:	
Sharpe Ratio:	3.6372
Standard Error:	0.1608
T-Test (H_0: Sharpe = 0):	
t-statistic:	22.6191
p-value:	0.000000
Degrees of freedom:	1238
Significance:	
At α = 0.05:	✓ Yes
At α = 0.01:	✓ Yes
Confidence Intervals:	
Analytical 95% CI:	[3.3220, 3.9523]
Bootstrap 95% CI:	[2.8869, 4.2915]
Bootstrap Statistics:	
Mean:	3.6291
Median:	3.6440
Std Error:	0.3552


USTBOND – ML Lift Curve: Return by Prediction Bucket
Mean Next-Day Return (bps)
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
2
4
6
8
10
ML Probability Decile (1=Lowest, 10=Highest)
USTBOND – Hit Rate by Prediction Bucket
Random (50%)
Actual Up-Day Rate (%)
50
40
30
20
10
0
2
4
6
8
10
ML Probability Decile

USTBOND – ML Confusion Matrix by Regime