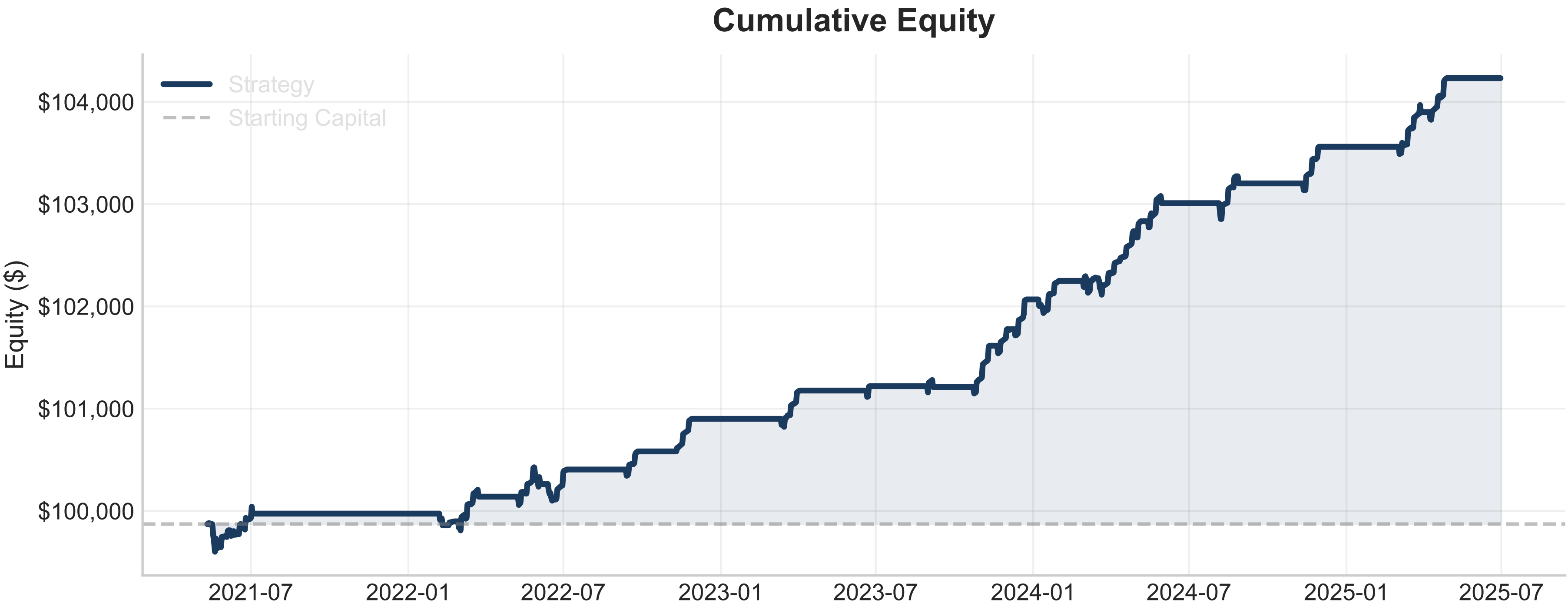
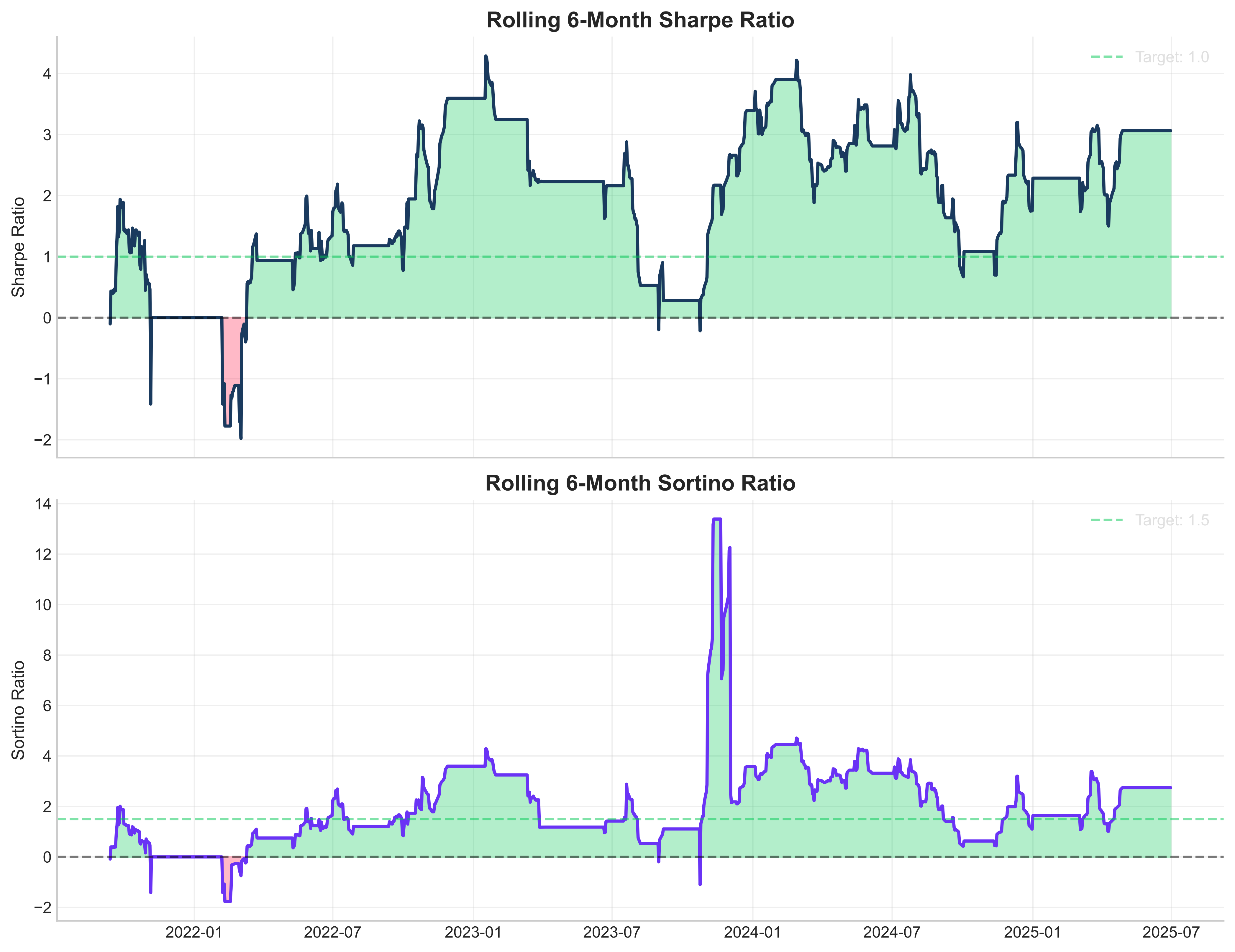
BTCUSD

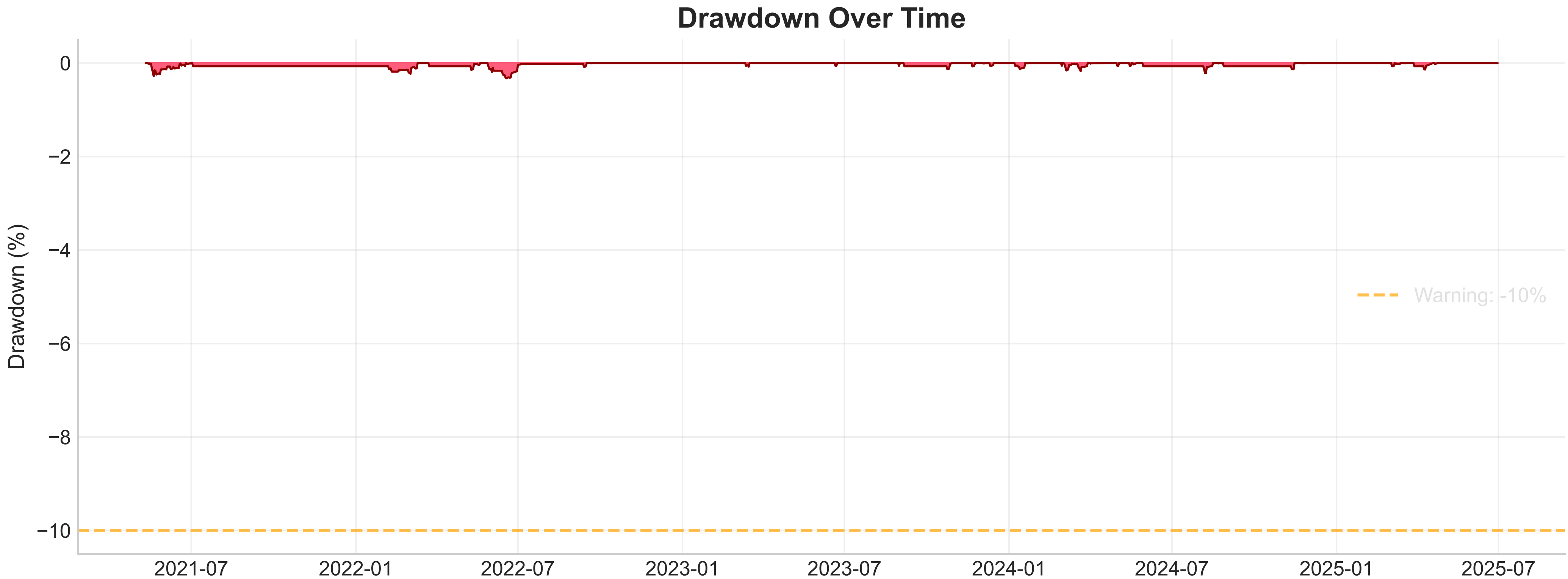
Scientific Options Framework v4.9 — Performance Report



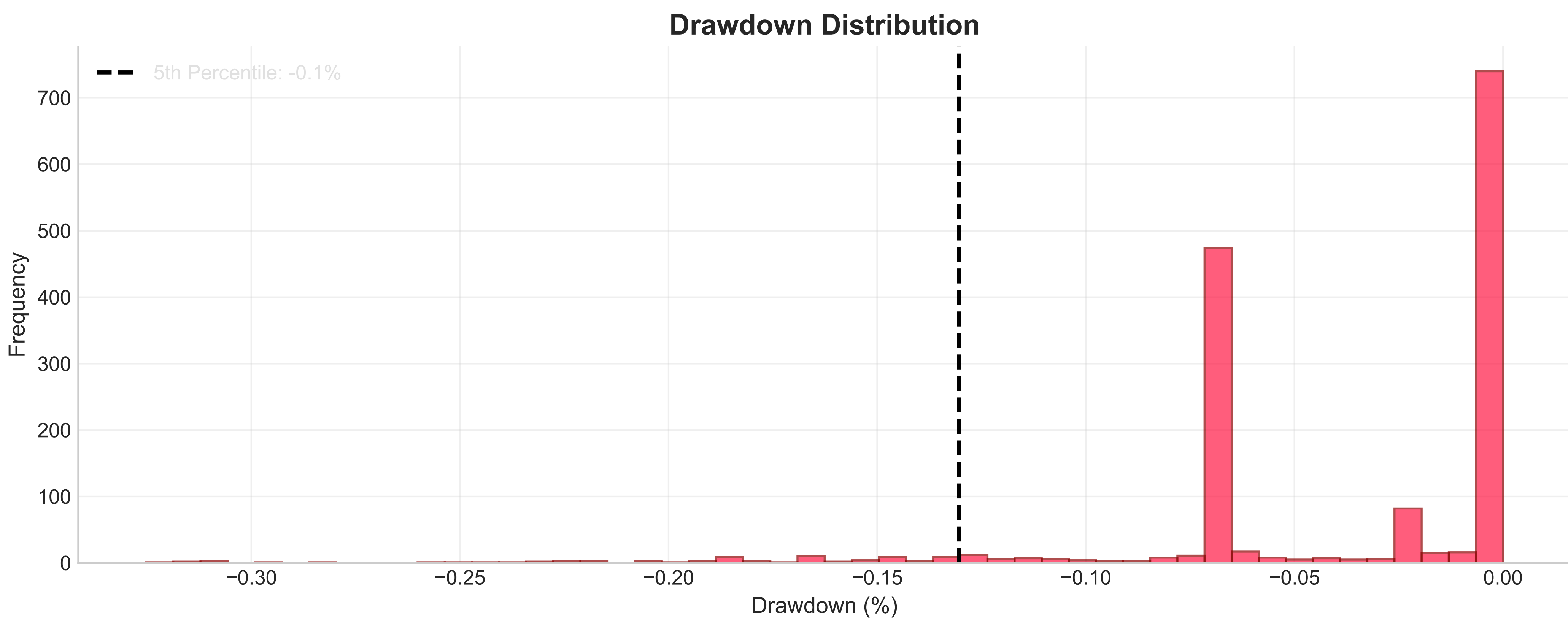
Sharpe Ratio	1.824 □	Sortino Ratio	1.428
Total Return	+4.37%	CAGR	+0.71%
Max Drawdown	-0.33%	Win Rate	76.3%
ML OOS AUC	0.5215	Sharpe p-value	0.0000



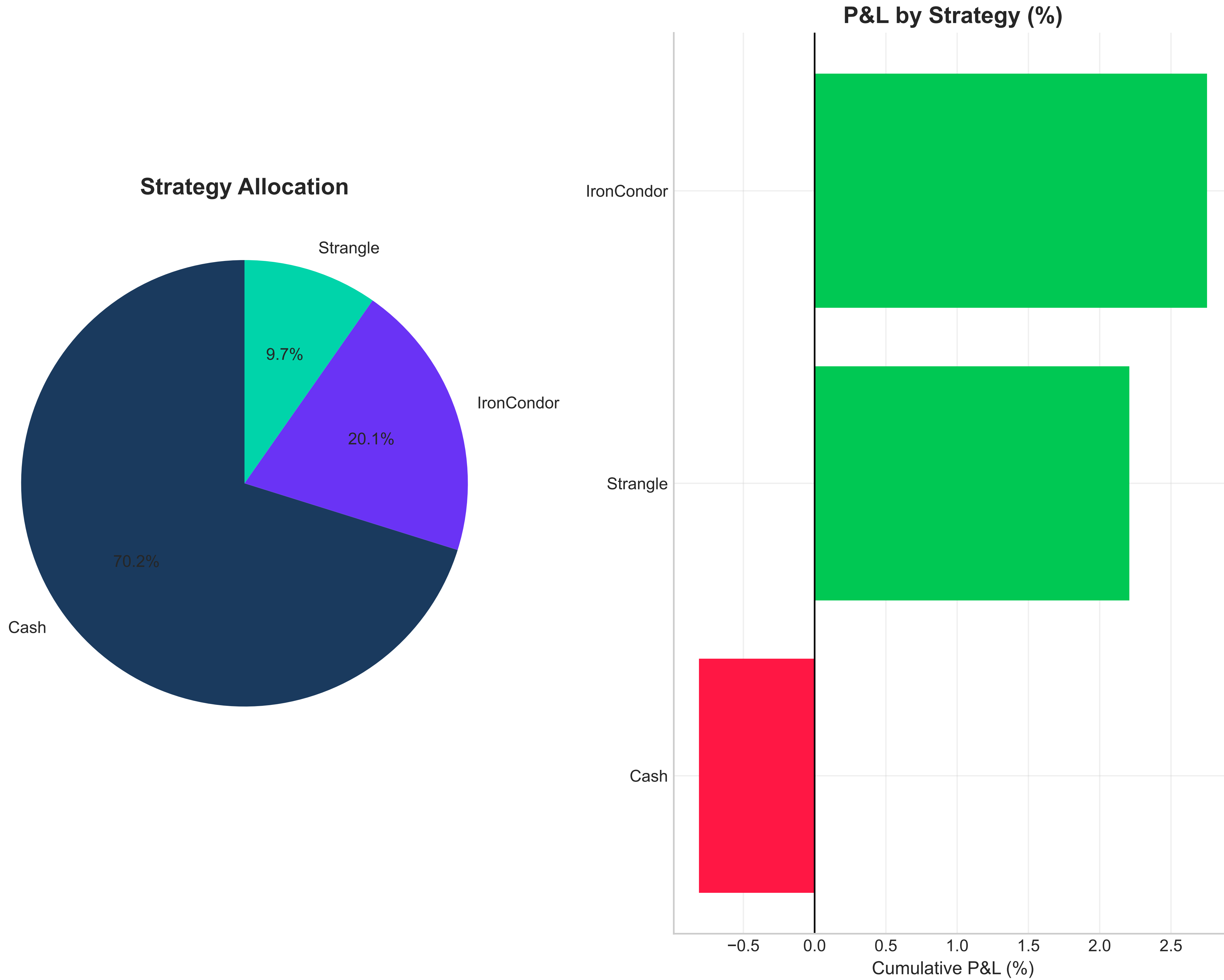
Rolling 6-Month Sharpe Ratio
Target: 1.0
Sharpe Ratio
Rolling 6-Month Sortino Ratio
Target: 1.5
Sortino Ratio
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07

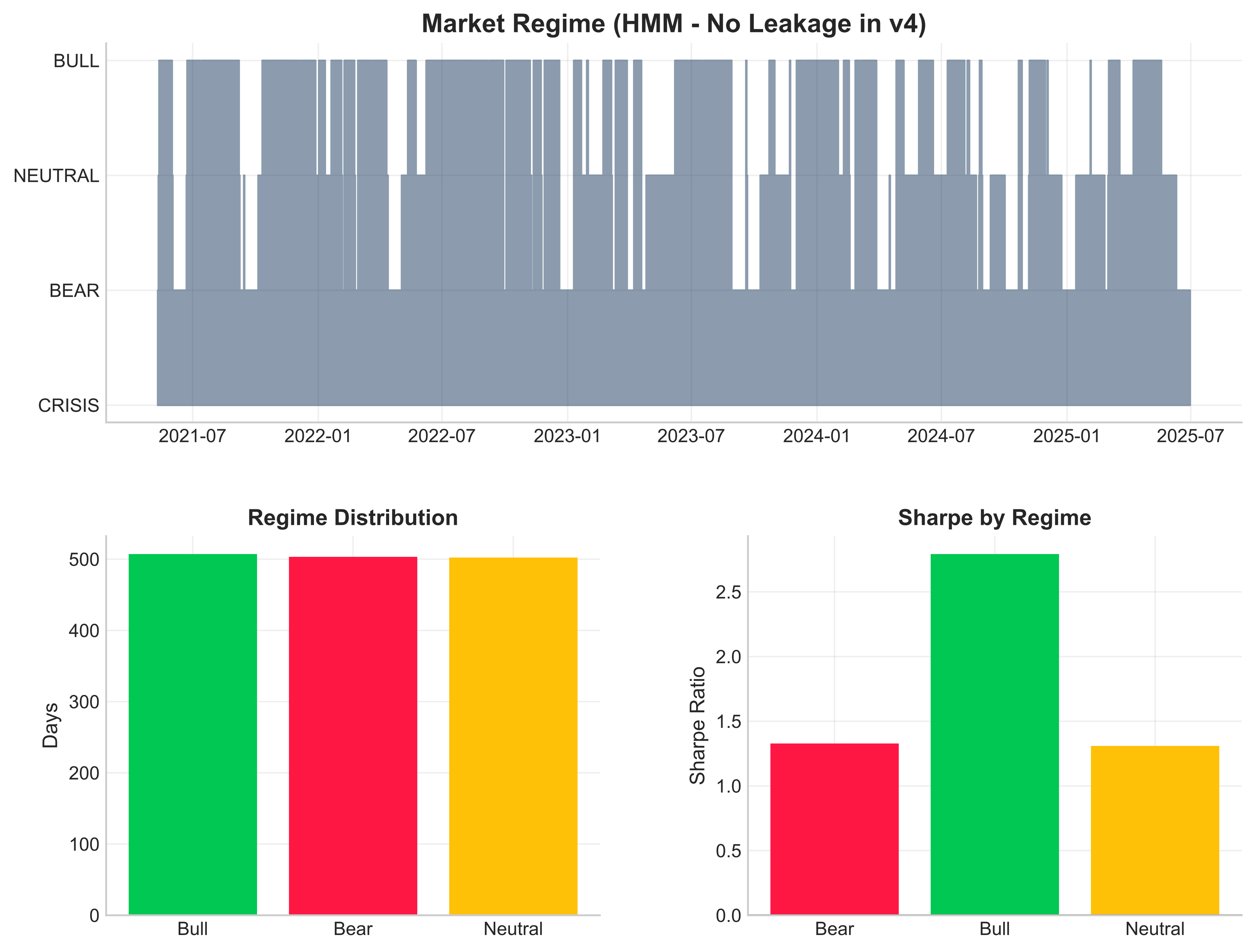


Drawdown Over Time
Drawdown (%)
0
−2
−4
−6
−8
−10
Warning: -10%
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07

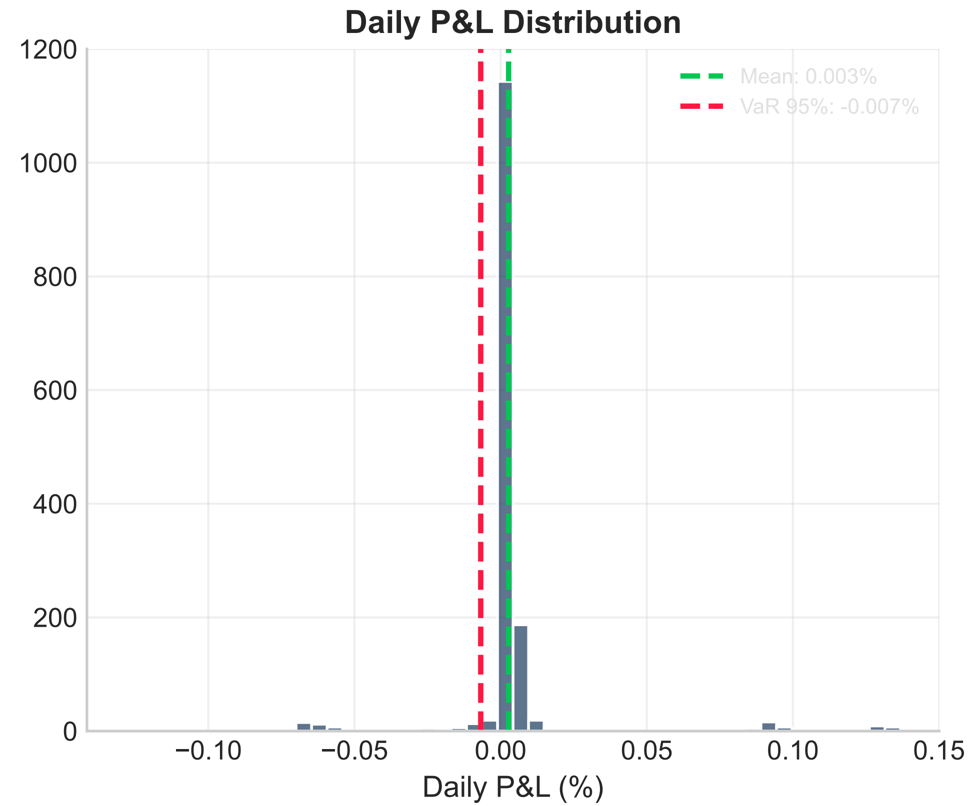


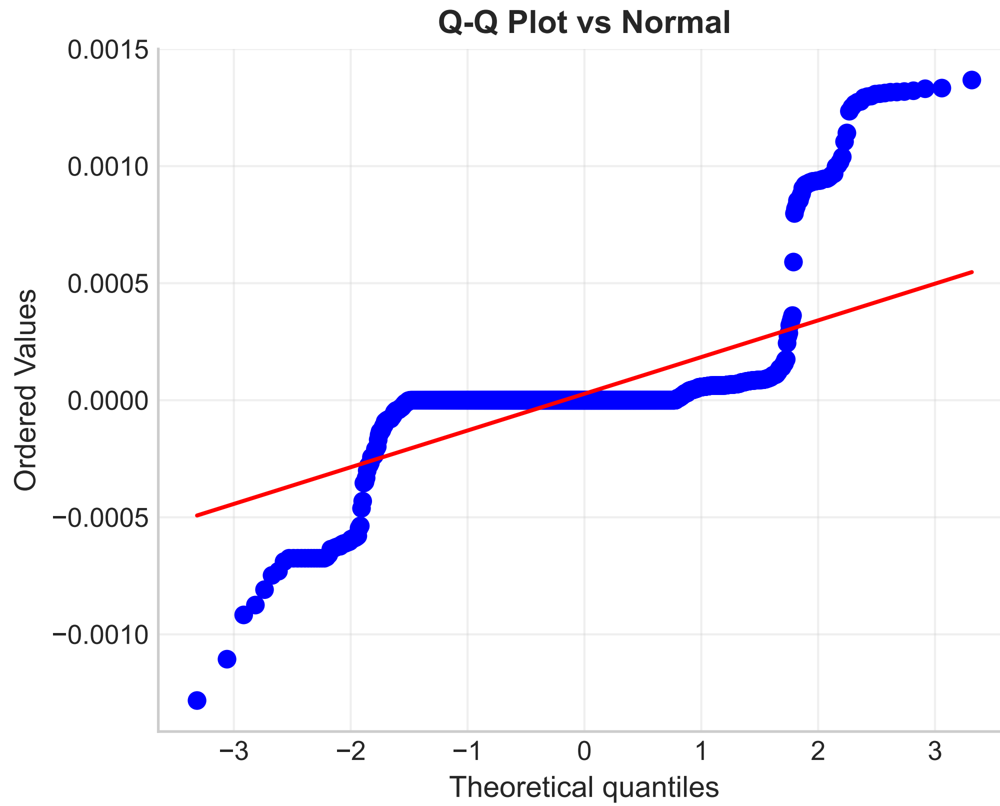
Drawdown Distribution
5th Percentile: -0.1%
Frequency
700
600
500
400
300
200
100
0
−0.30
−0.25
−0.20
−0.15
−0.10
−0.05
0.00
Drawdown (%)

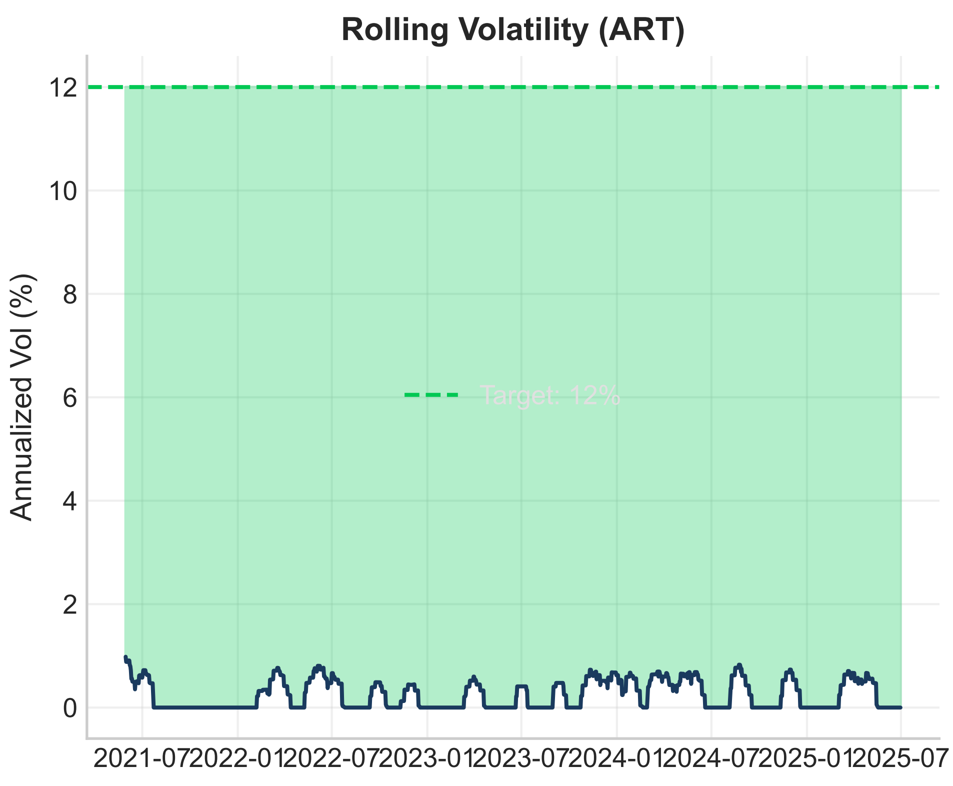

Strategy Allocation
Strangle
IronCondor
Cash
9.7%
20.1%
70.2%
P&L by Strategy (%)
IronCondor
Strangle
Cash
−0.5
0.0
0.5
1.0
1.5
2.0
2.5
Cumulative P&L (%)



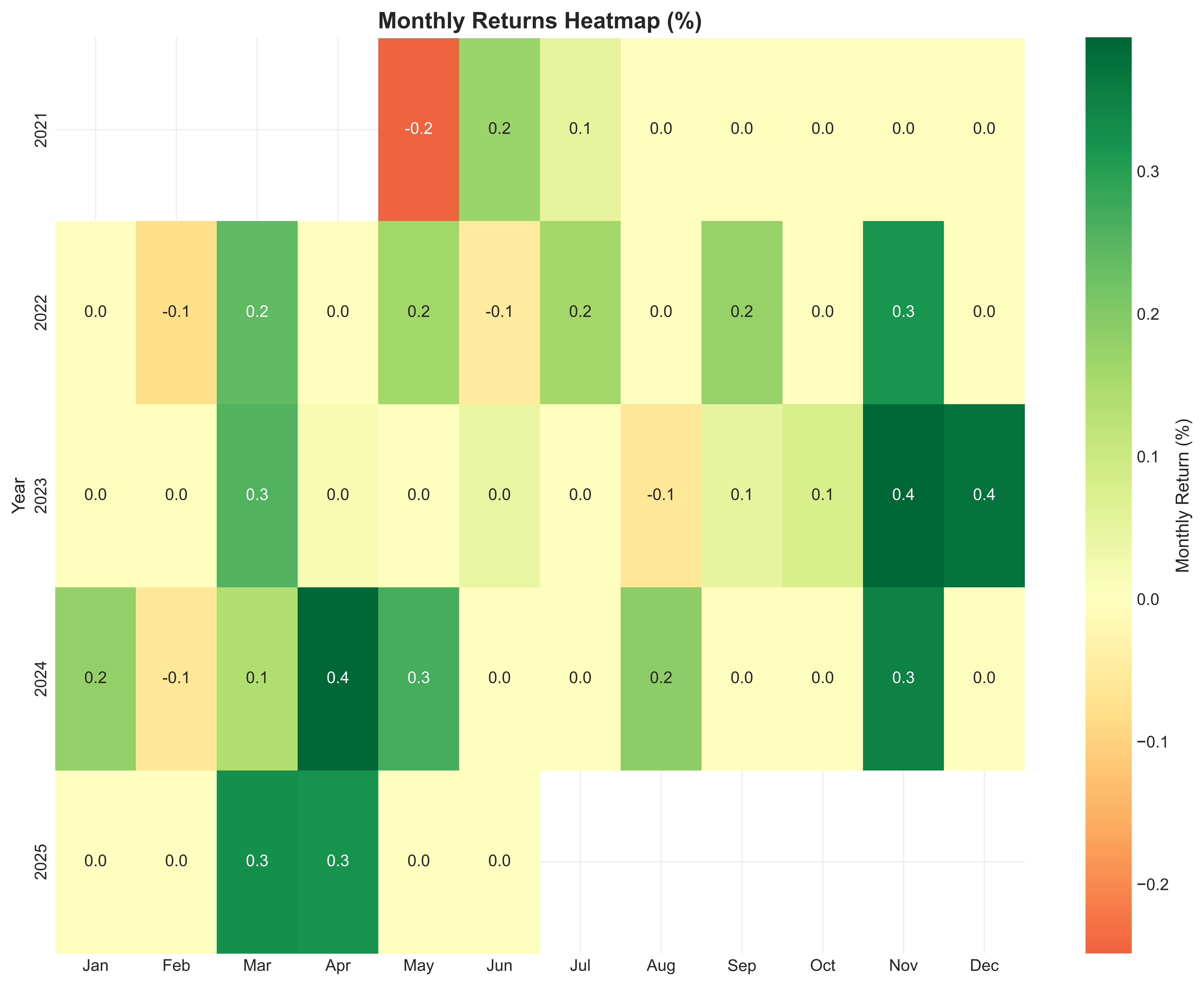
Market Regime (HMM - No Leakage in v4)
BULL
NEUTRAL
BEAR
CRISIS
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07
Regime Distribution
Days
0
100
200
300
400
500
Bull
Bear
Neutral
Sharpe by Regime
Sharpe Ratio
0.0
0.5
1.0
1.5
2.0
2.5
Bear
Bull
Neutral







Metric	Value
VaR 95%	-0.007%
ES 95%	-0.046%
Skewness	2.344
Kurtosis	14.976
Omega Ratio	2.157
Profit Factor	2.157


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

Top 10 Winners & Losers

Rank	Strategy	P&L (%)
1	IronCondor	+0.5212%
2	IronCondor	+0.2144%
3	IronCondor	+0.1761%
4	Strangle	+0.1729%
5	Strangle	+0.1546%
6	Strangle	+0.1484%
7	Strangle	+0.1462%
8	Strangle	+0.1453%
9	Strangle	+0.1445%
10	Strangle	+0.1430%
B1	IronCondor	-0.0607%
B2	IronCondor	-0.0624%
B3	Strangle	-0.0636%
B4	Strangle	-0.0670%
B5	Strangle	-0.0689%
B6	IronCondor	-0.0753%
B7	IronCondor	-0.0809%
B8	Strangle	-0.1163%
B9	IronCondor	-0.1241%
B10	IronCondor	-0.1620%

v4.9 Fixes & Improvements Dashboard

Improvement	Metric	Status
1. Robust ML (Lasso Logistic)	OOS AUC: 0.5215	□
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: 1.7523	□
7. Strategy Leverage Diff	Per-strategy scaling	□
8. OOS AUC Reporting	Test AUC, not train	□

```
BTCUSD - FINAL SUMMARY (v4.9)

Core Metrics:
- Sharpe Ratio:   1.8238
- Sortino Ratio:  1.4280
- Total Return:   +4.37%
- Max Drawdown:   -0.33%

Statistical Significance:
- t-stat:         21.5703
- p-value:        0.000000
- 95% CI:         [1.0943, 2.5226]
- Significant:    Yes

ML Performance (OOS):
- Global AUC:     0.5215

GRADE: EXCELLENT (Significant)
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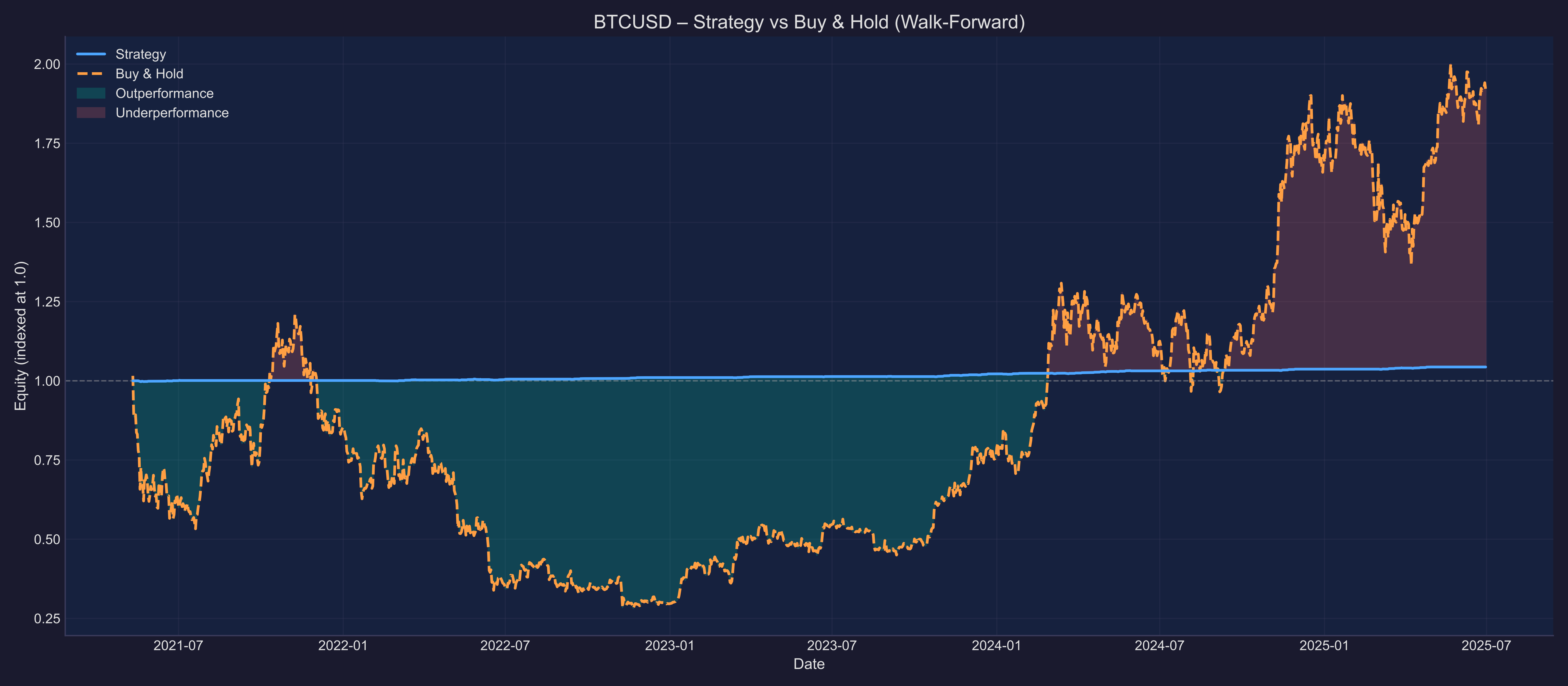
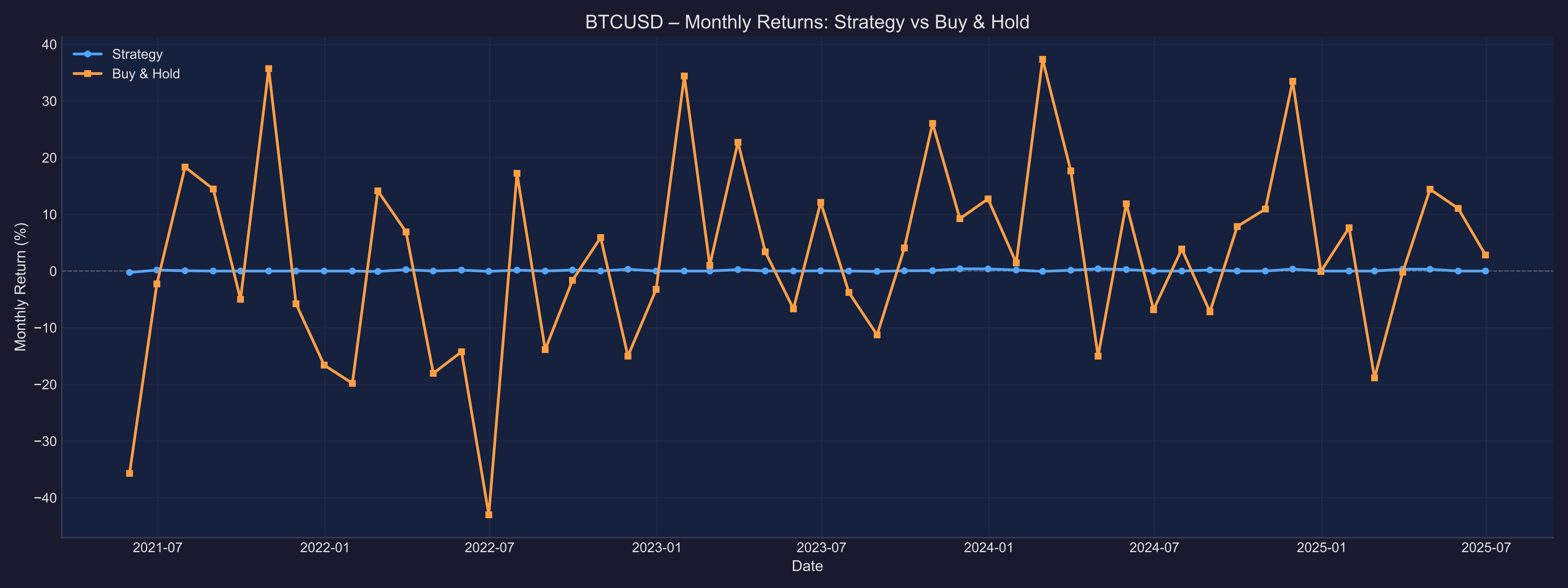
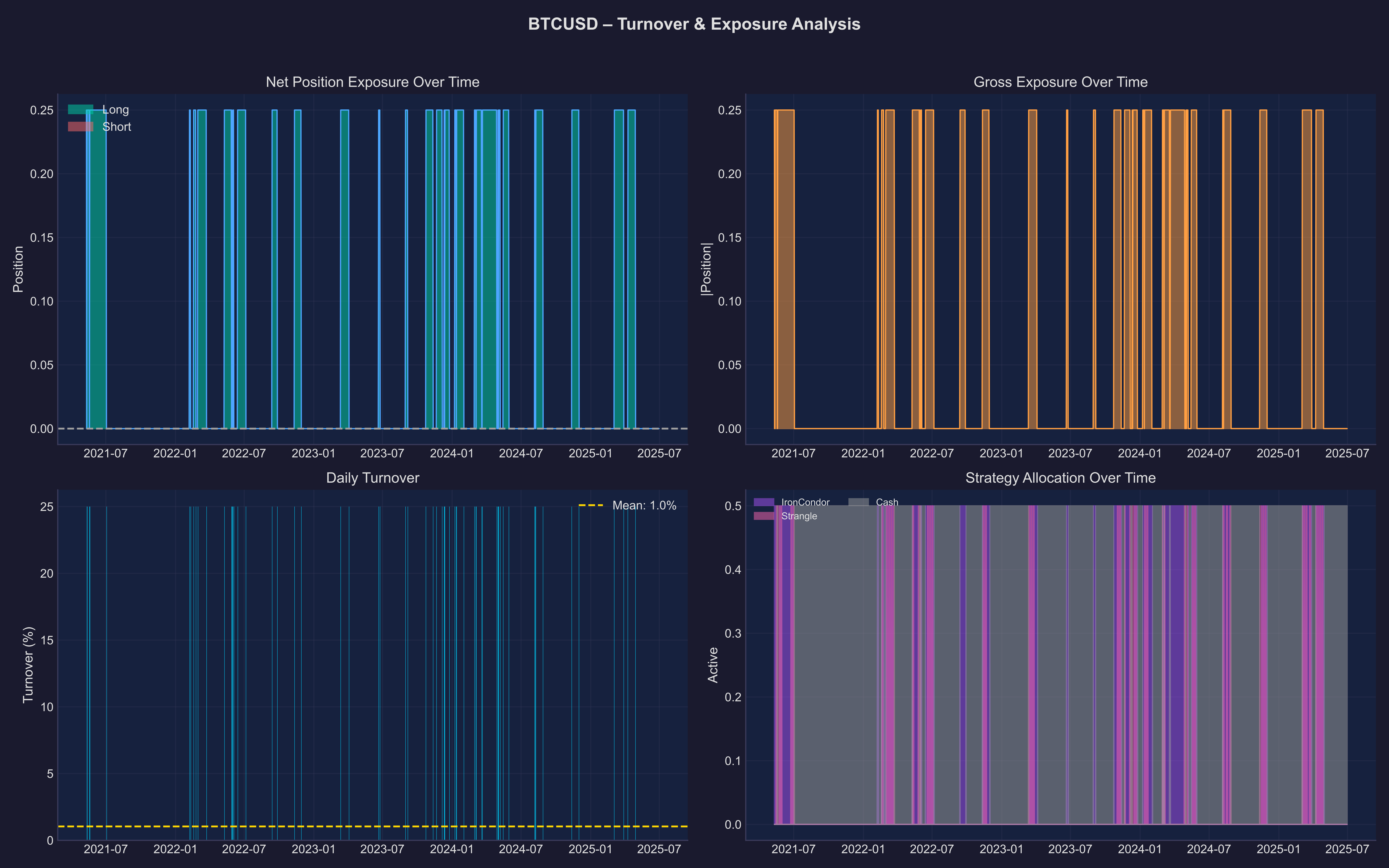
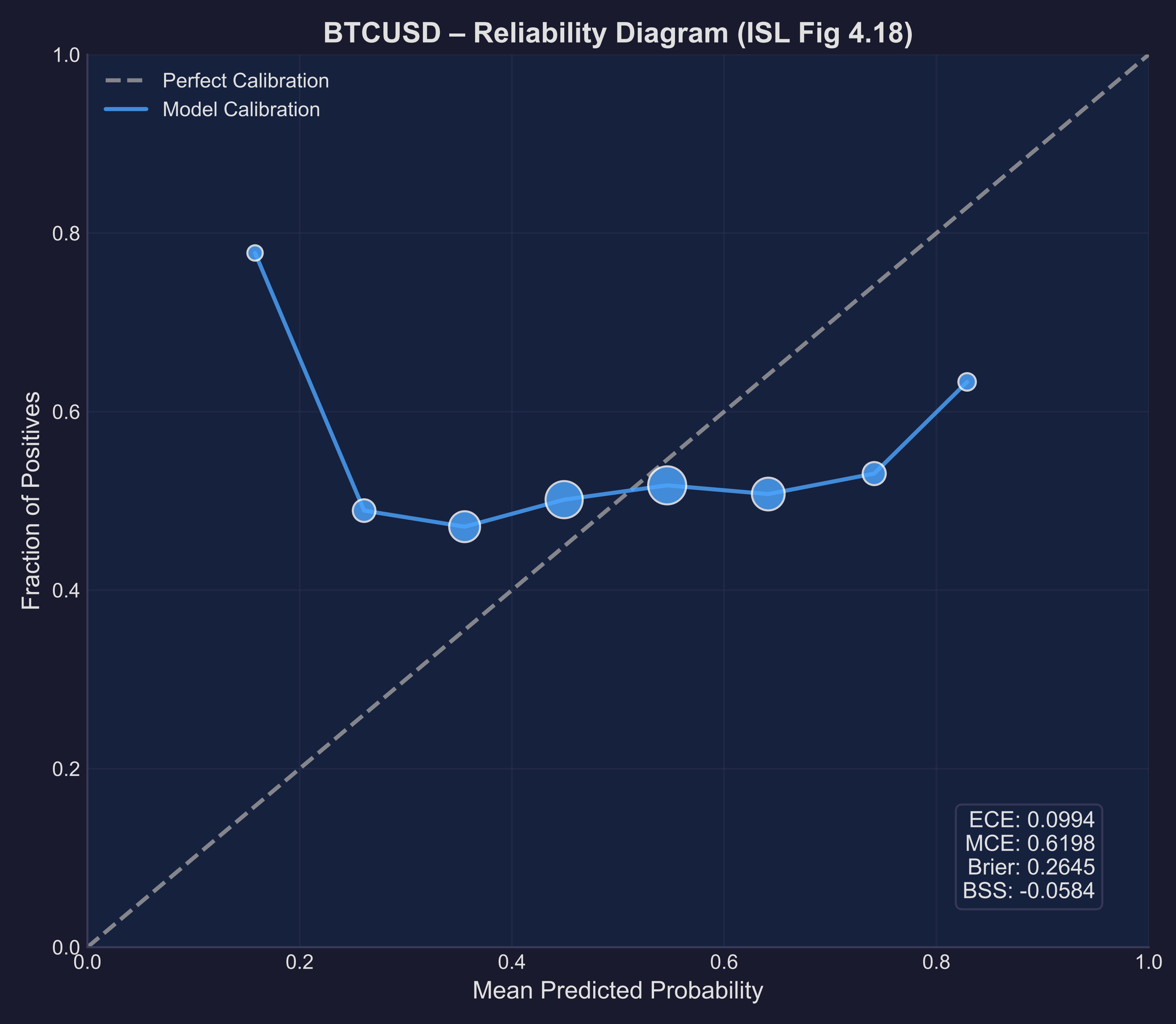
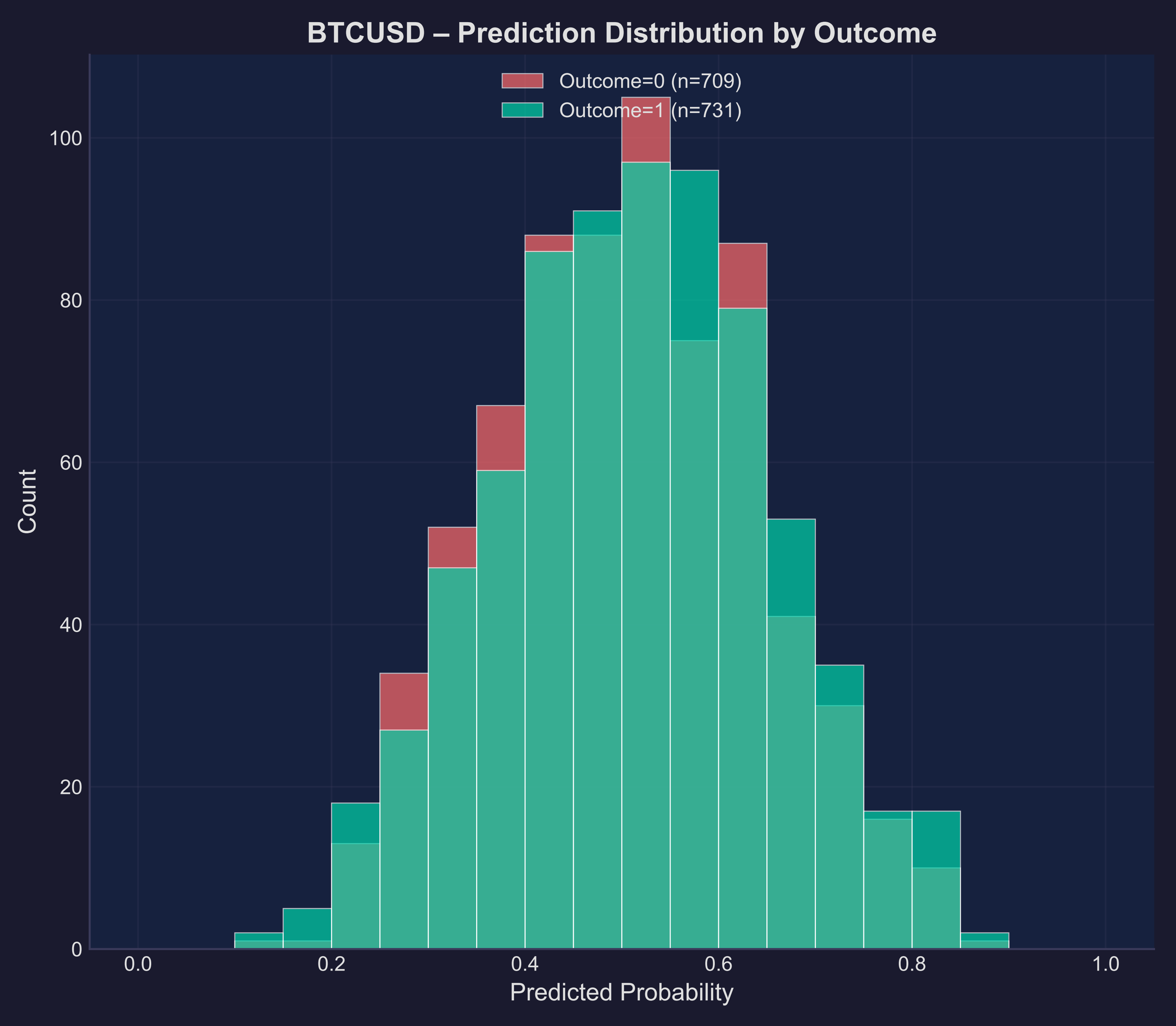

BTCUSD – Strategy vs Buy & Hold (Walk-Forward)
Strategy
Buy & Hold
Outperformance
Underperformance
Equity (indexed at 1.0)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07
Date


BTCUSD – Price with Trade Entries
Price
Long Entry (31)
Short Entry (32)
100000
80000
60000
40000
20000
Price
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07
Date

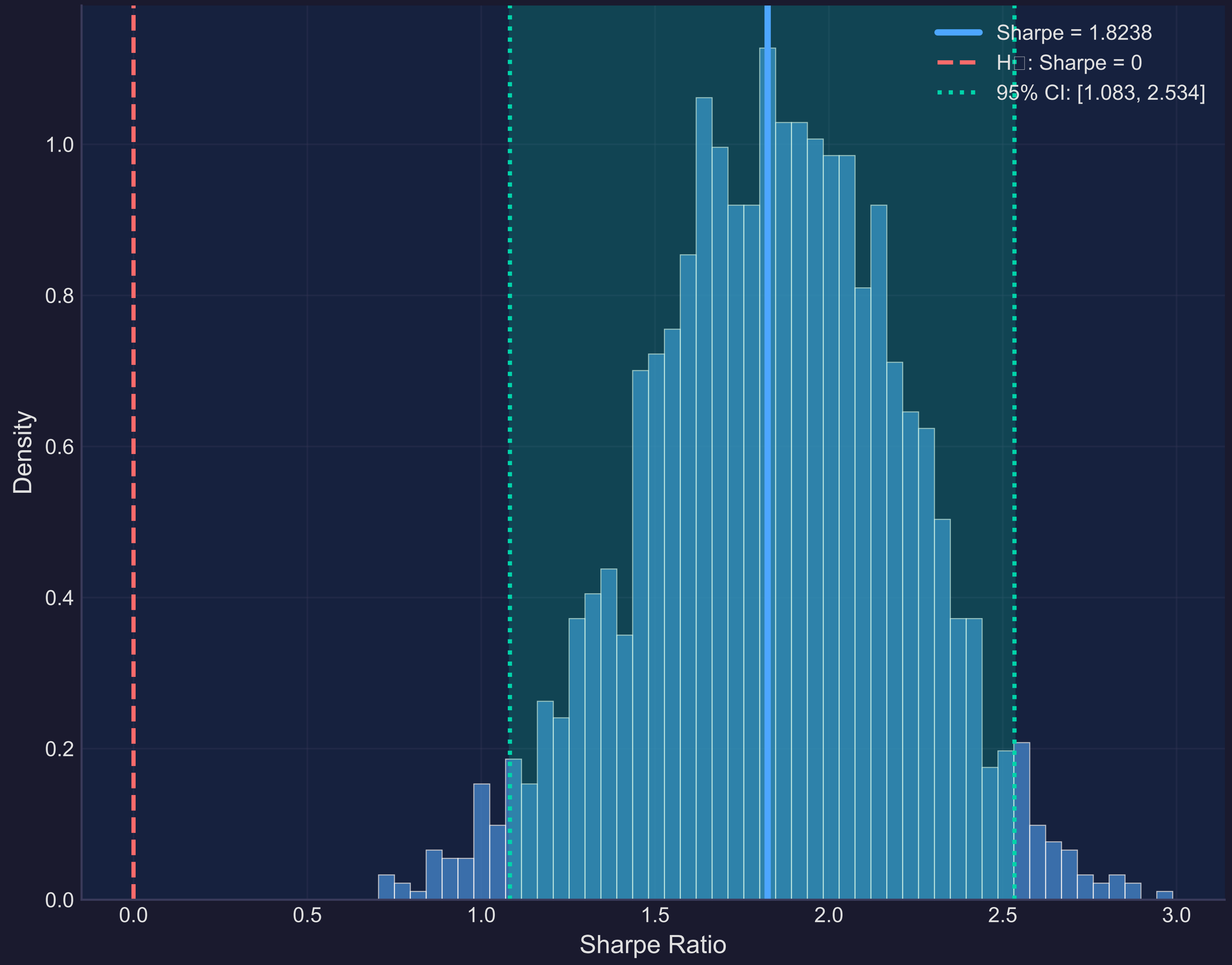

BTCUSD – Monthly Returns: Strategy vs Buy & Hold
Strategy
Buy & Hold
Monthly Return (%)
Date
40
30
20
10
0
−10
−20
−30
−40
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07


BTCUSD – Turnover & Exposure Analysis
Net Position Exposure Over Time
Long
Short
Position
Gross Exposure Over Time
|Position|
Daily Turnover
Mean: 1.0%
Turnover (%)
Strategy Allocation Over Time
IronCondor
Cash
Strangle
Active
2021-07
2022-01
2022-07
2023-01
2023-07
2024-01
2024-07
2025-01
2025-07


BTCUSD – Reliability Diagram (ISL Fig 4.18)
Perfect Calibration
Model Calibration
ECE: 0.0994
MCE: 0.6198
Brier: 0.2645
BSS: -0.0584
Fraction of Positives
Mean Predicted Probability
0.0
0.2
0.4
0.6
0.8
1.0


BTCUSD – Prediction Distribution by Outcome
Outcome=0 (n=709)
Outcome=1 (n=731)
Count
Predicted Probability
0
20
40
60
80
100
0.0
0.2
0.4
0.6
0.8
1.0

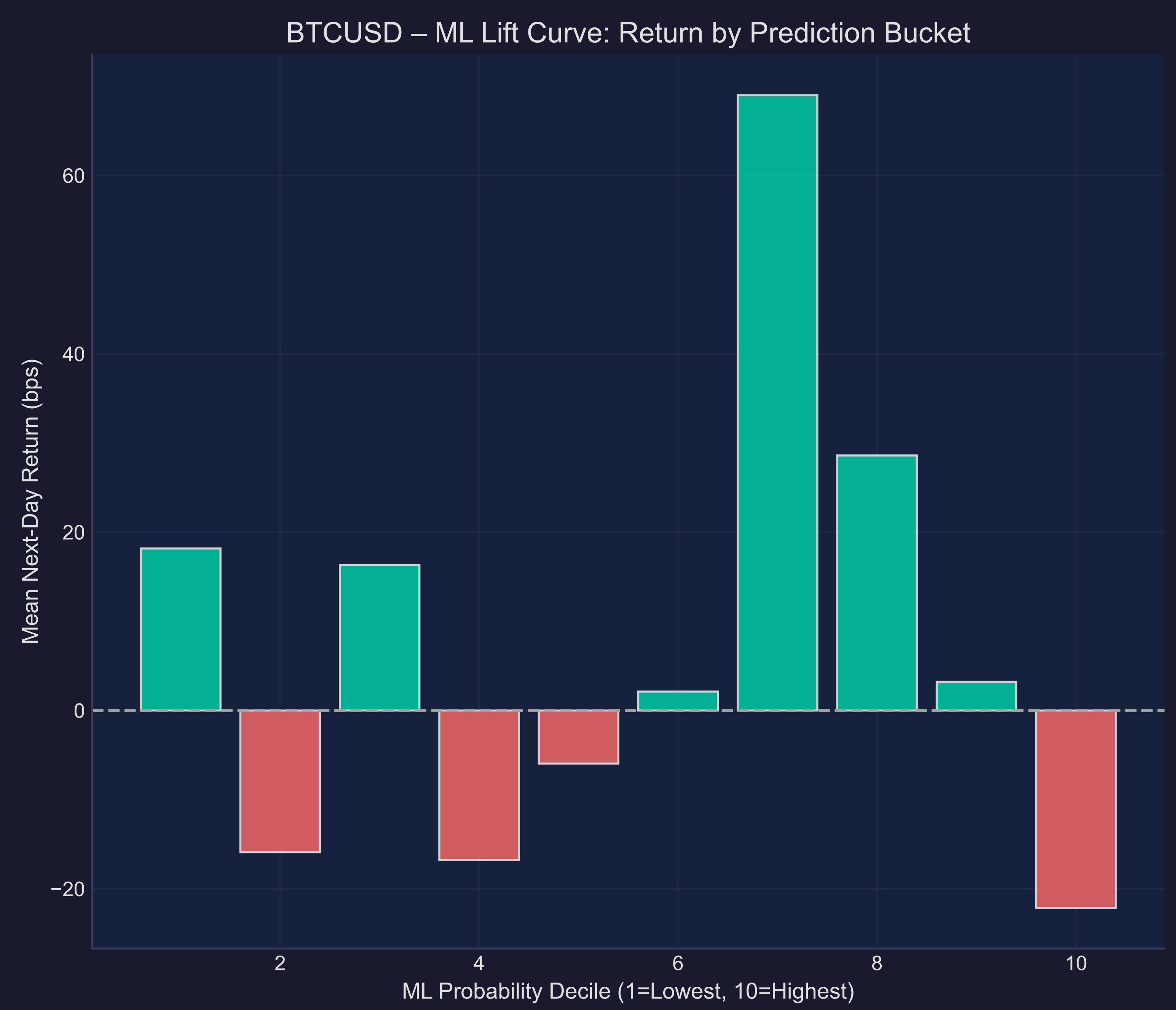
BTCUSD – Bootstrap Distribution of Sharpe Ratio

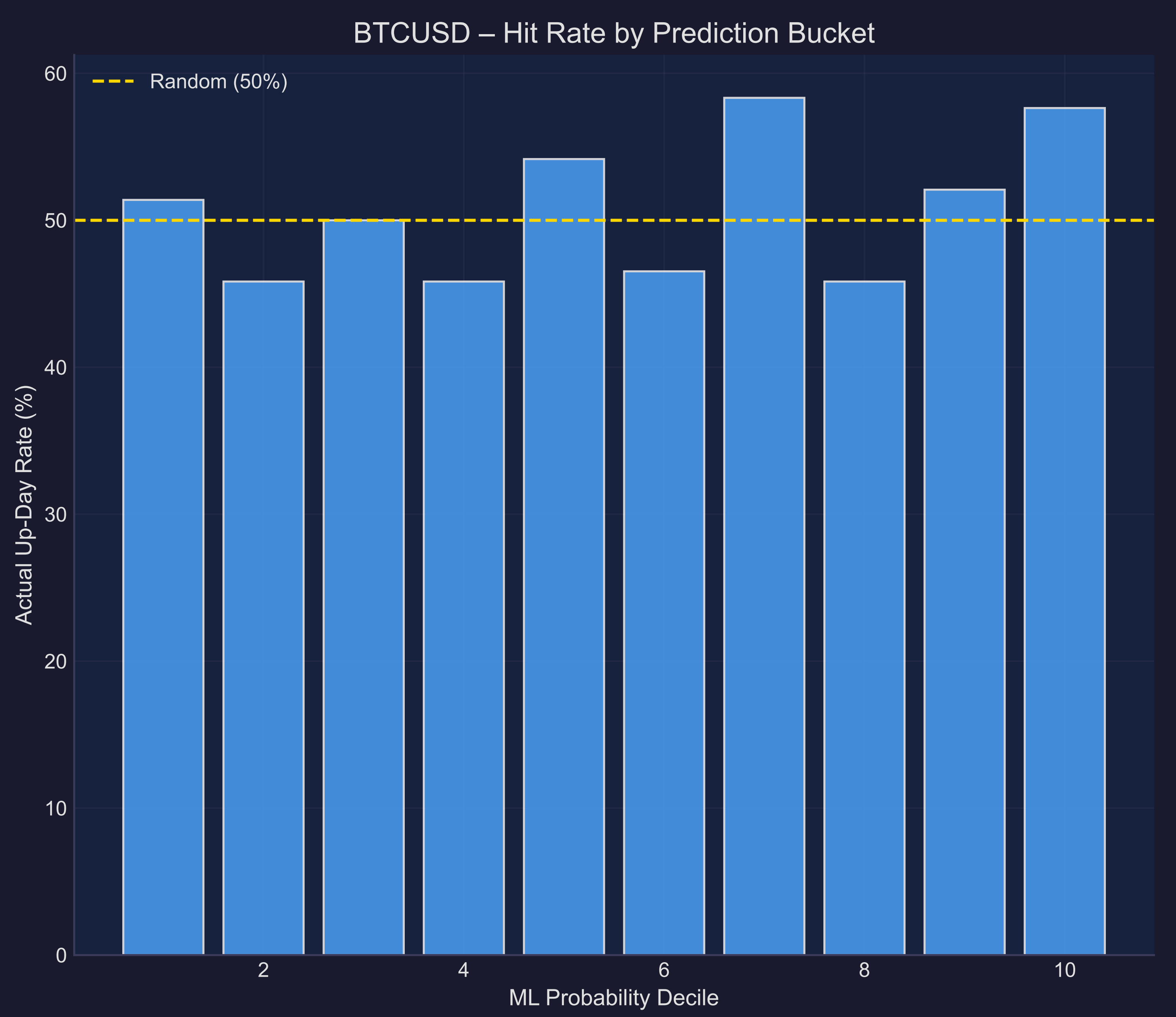


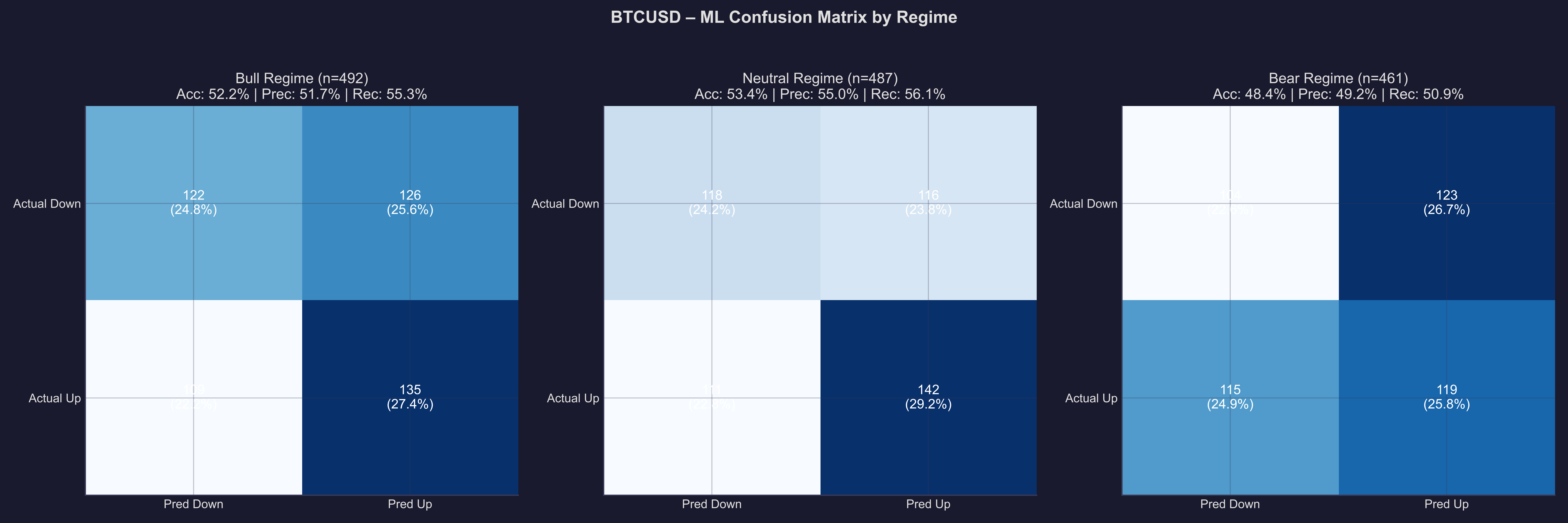
BTCUSD – Sharpe Ratio T-Test Results

SHARPE RATIO STATISTICAL SIGNIFICANCE TEST

Sample Size (n):	1,512 days
Point Estimate:	
Sharpe Ratio:	1.8238
Standard Error:	0.0846
T-Test (H_0: Sharpe = 0):	
t-statistic:	21.5703
p-value:	0.000000
Degrees of freedom:	1511
Significance:	
At α = 0.05:	✓ Yes
At α = 0.01:	✓ Yes
Confidence Intervals:	
Analytical 95% CI:	[1.6581, 1.9895]
Bootstrap 95% CI:	[1.0826, 2.5337]
Bootstrap Statistics:	
Mean:	1.8383
Median:	1.8464
Std Error:	0.3681


BTCUSD – ML Lift Curve: Return by Prediction Bucket
Mean Next-Day Return (bps)
ML Probability Decile (1=Lowest, 10=Highest)
60
40
20
0
−20
2
4
6
8
10


BTCUSD – Hit Rate by Prediction Bucket
Random (50%)
Actual Up-Day Rate (%)
ML Probability Decile
60
50
40
30
20
10
0
2
4
6
8
10


BTCUSD – ML Confusion Matrix by Regime
Bull Regime (n=492)
Acc: 52.2% | Prec: 51.7% | Rec: 55.3%
Neutral Regime (n=487)
Acc: 53.4% | Prec: 55.0% | Rec: 56.1%
Bear Regime (n=461)
Acc: 48.4% | Prec: 49.2% | Rec: 50.9%
Actual Down
Actual Up
Pred Down
Pred Up
122 (24.8%)
126 (25.6%)
135 (27.4%)
118 (24.2%)
116 (23.8%)
142 (29.2%)
123 (26.7%)
115 (24.9%)
119 (25.8%)