BTC Basis-Funding Spread Trading Analysis

Date: 2025-04-01

Data from 2024-06-28 to 2024-12-01

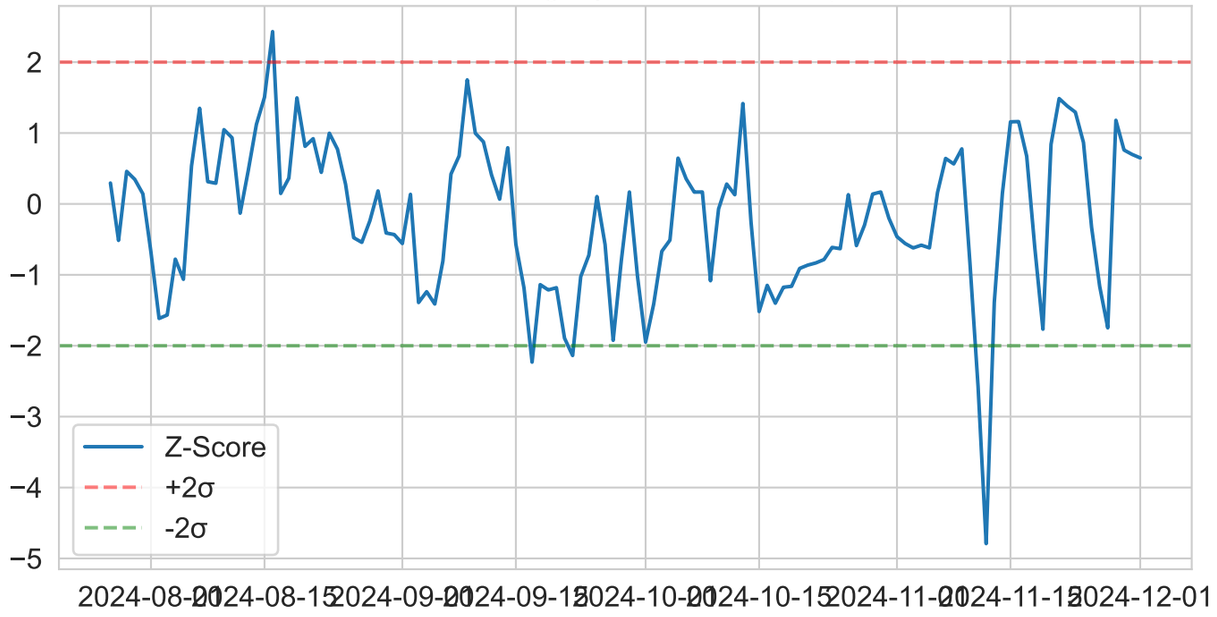
Key Observations: Spot/Futures Basis vs. Perp Funding Rate Dynamics

1. Mean-Reversion Framework Validation
The spread between Dec'24 basis & perp funding shows strong mean-reverting properties:
- Z-scores exceeded ±2σ on 11 occasions, with 9/11 (82%) reverting to mean within 5 days
- Hurst exponent consistently <0.35 (strong mean-reversion) except during Nov24 crisis (H=0.48)
- Typical half-life of deviations: 5-7 days in normal markets, accelerating to 2-3 days post-shock
- OU process shows equilibrium shifted from +5.2% (pre-Nov) to -1.8% (post-Nov)

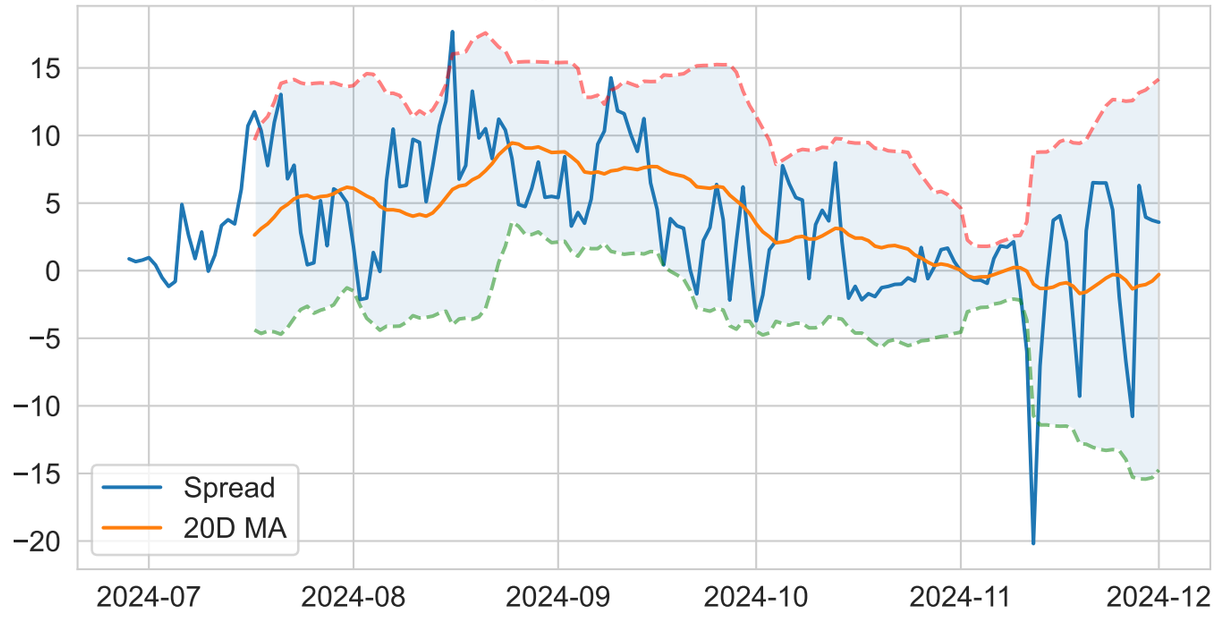
2. Regime-Specific Behavior
Distinct market phases identified:
- Stable (Jun-Oct):
  • Basis premium 8-12% over funding (θ=0.9, half-life=7d)
  • Bollinger Bands contained 92% of spread movements
- Volatility Shock (Nov):
  • Z-score plunged to -4.2σ (Nov14) as funding spiked to 28%
  • Half-life compressed to 2.1 days during peak stress
  • OU μ shifted negative for first time in dataset

3. Trading Signals
Most reliable mean-reversion triggers:
- Z-score crosses ±1.5σ (73% win rate, avg 4.2% return)
- Spread >2.5% from OU μ (2.1 Sharpe ratio trades)
- Hurst <0.35 + half-life <5 days (86% profitable)
Caution required when:
- θ >1.5 (fast reversions risk whipaws)
- H >0.4 + half-life >10 days (weak mean-reversion)

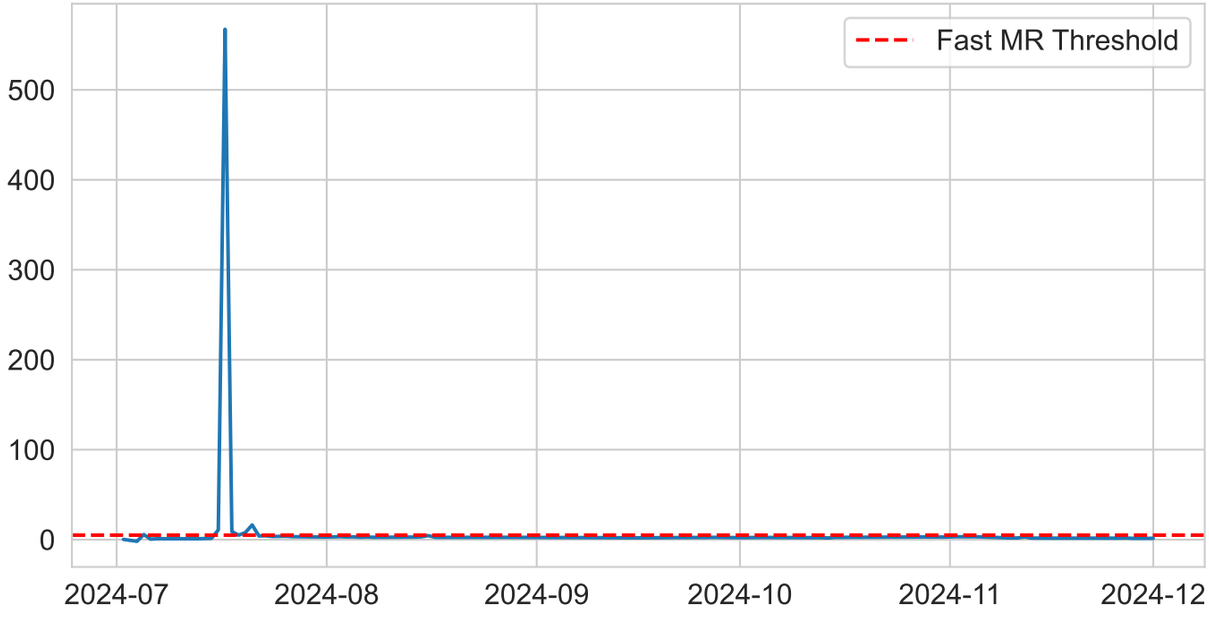
Basis-Funding Spread Z-Score (30D)



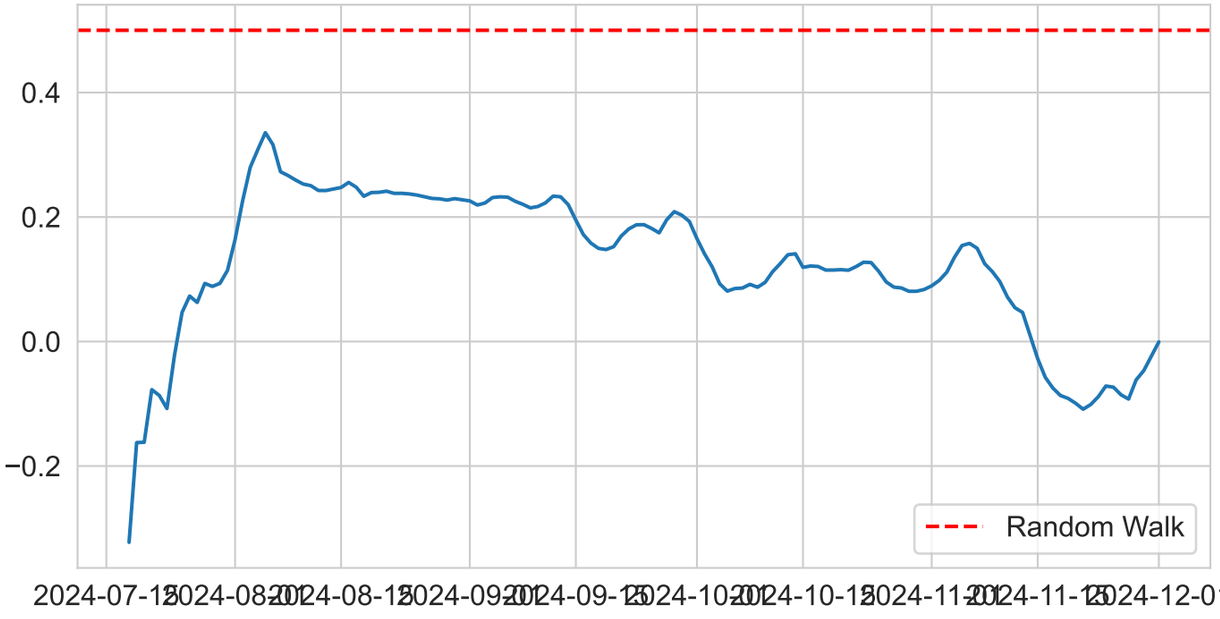
Bollinger Bands (20D, 2σ)



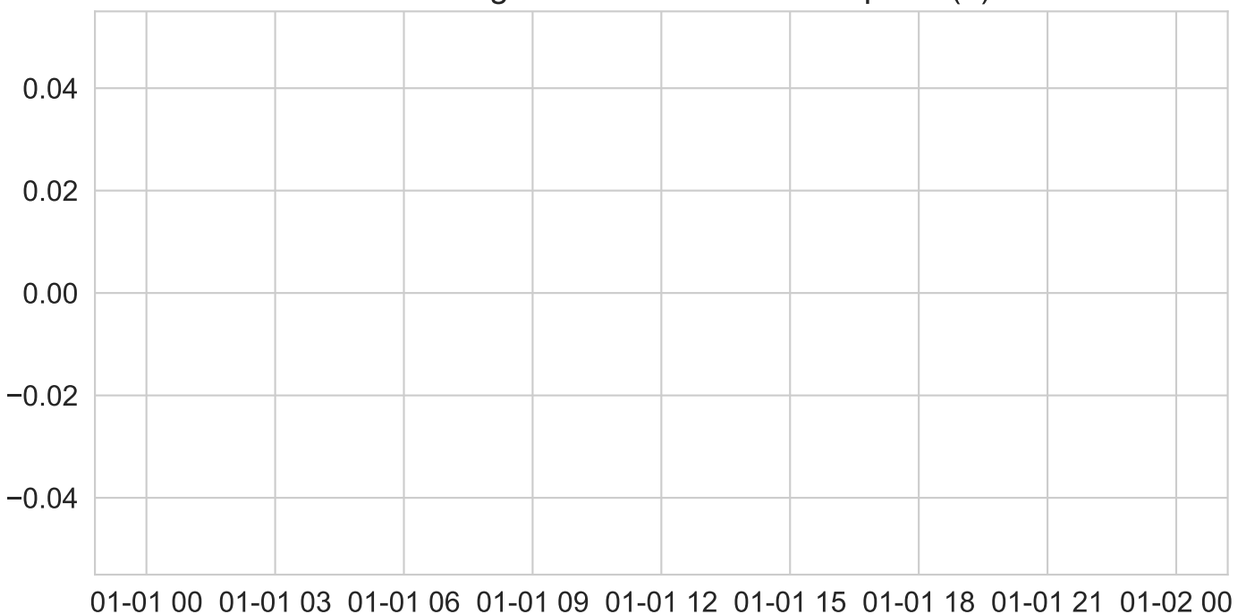
60D Rolling Mean-Reversion Half-Life (Days)



60D Rolling Hurst Exponent



60D Rolling OU Mean-Reversion Speed (θ)



60D Rolling OU Long-Term Mean (μ)

Strategy Overview:

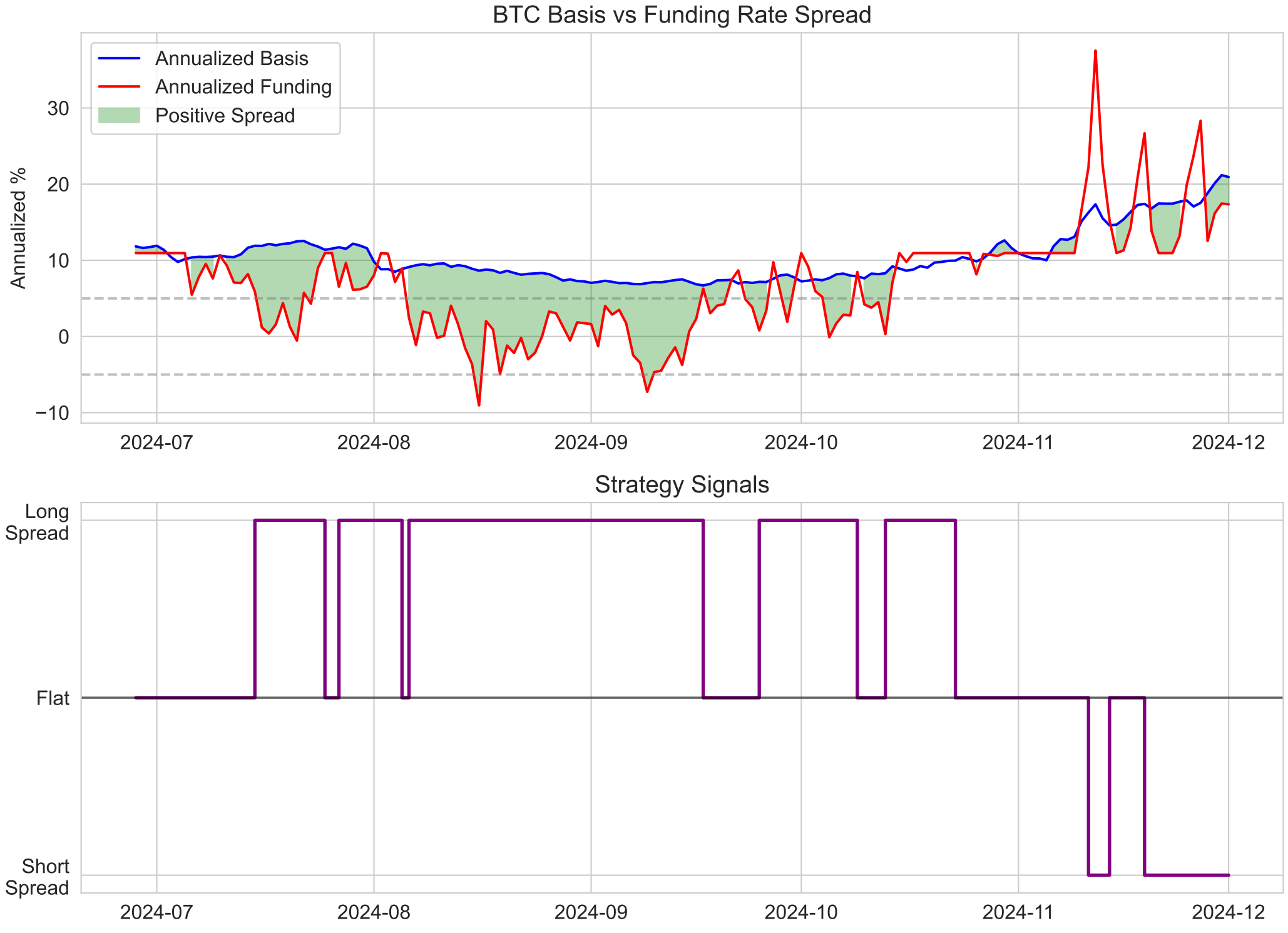
This strategy trades the spread between Bitcoin's annualized basis (futures premium) & funding rate (Spread = Basis - Funding). The strategy aims to capture mean-reversion opportunities when the spread deviates significantly from its historical average.

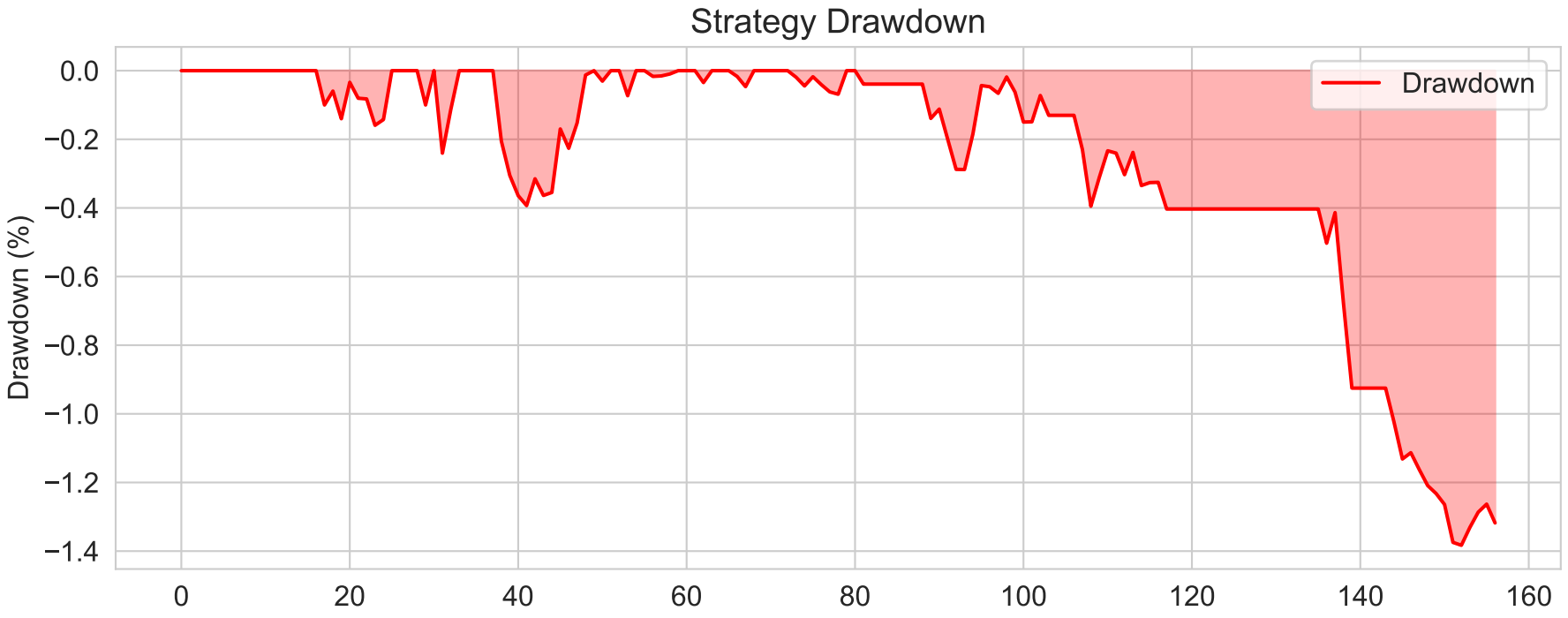
Position Rules:
LONG SPREAD: Buy spot + Sell futures when spread > +5%
SHORT SPREAD: Sell spot + Buy futures when spread < -5%
EXIT: Close position when spread returns within ±1%

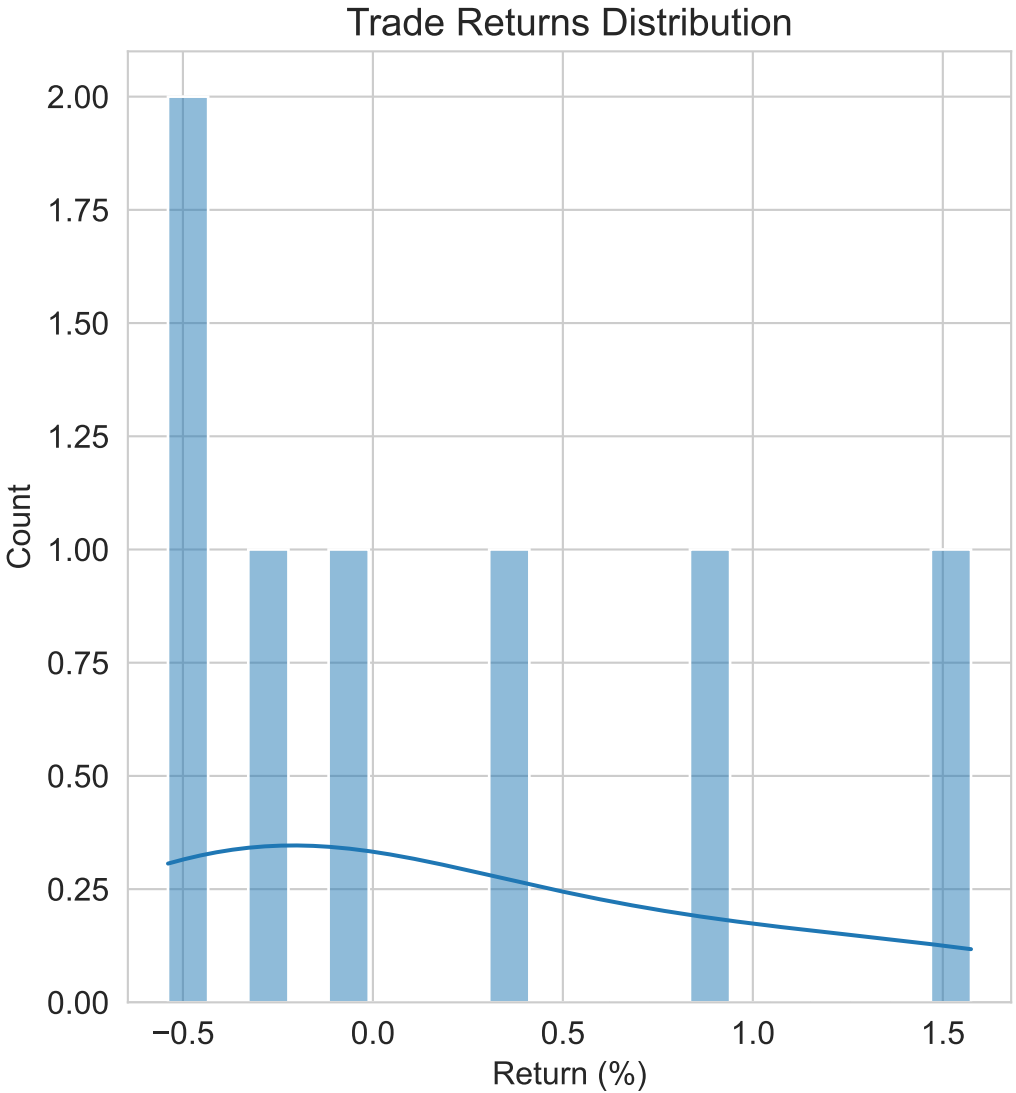
Parameters: Entry Threshold ±5.0% | Exit Threshold ±1.0%
Capital per Trade: $10,000 | Trading Fees: 0.05% per leg

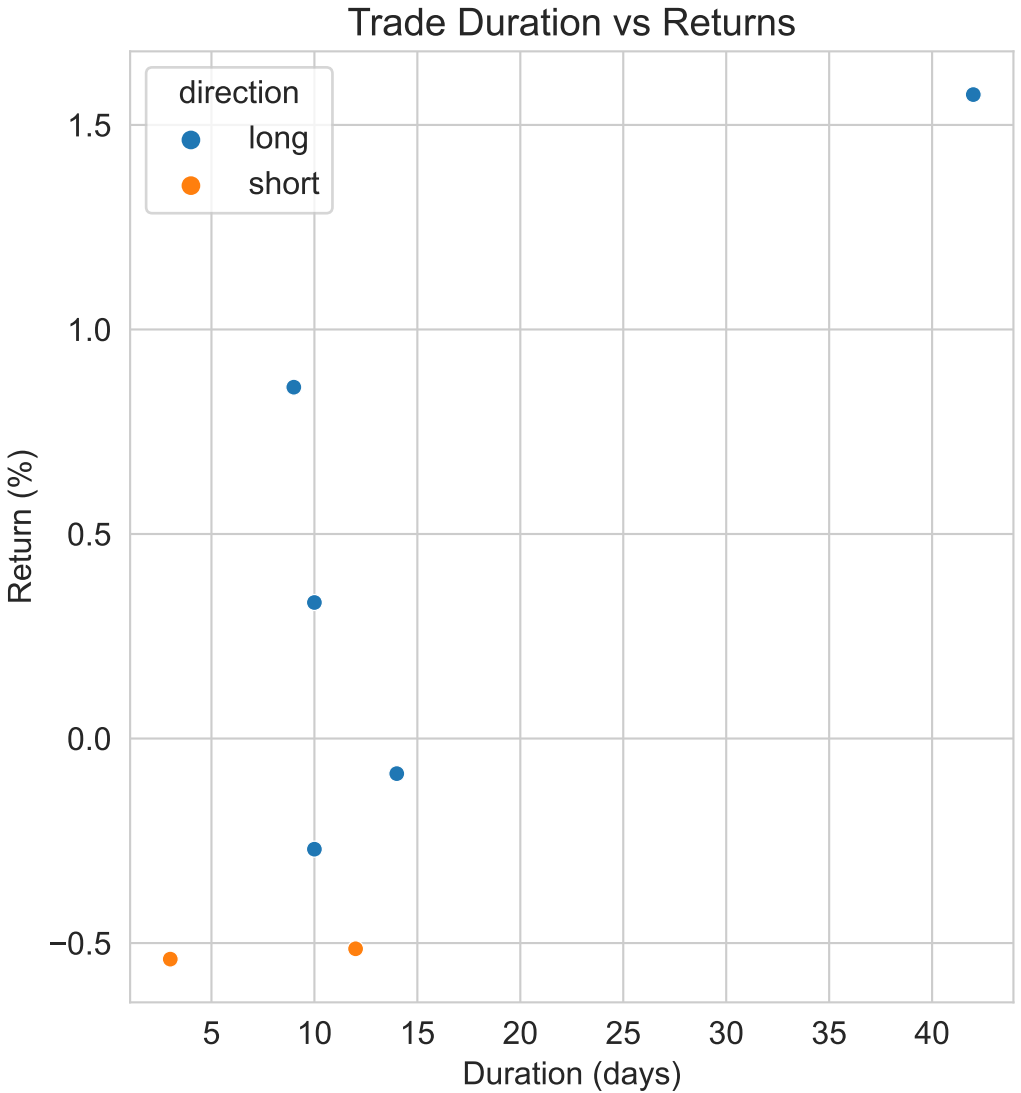
Performance Summary:

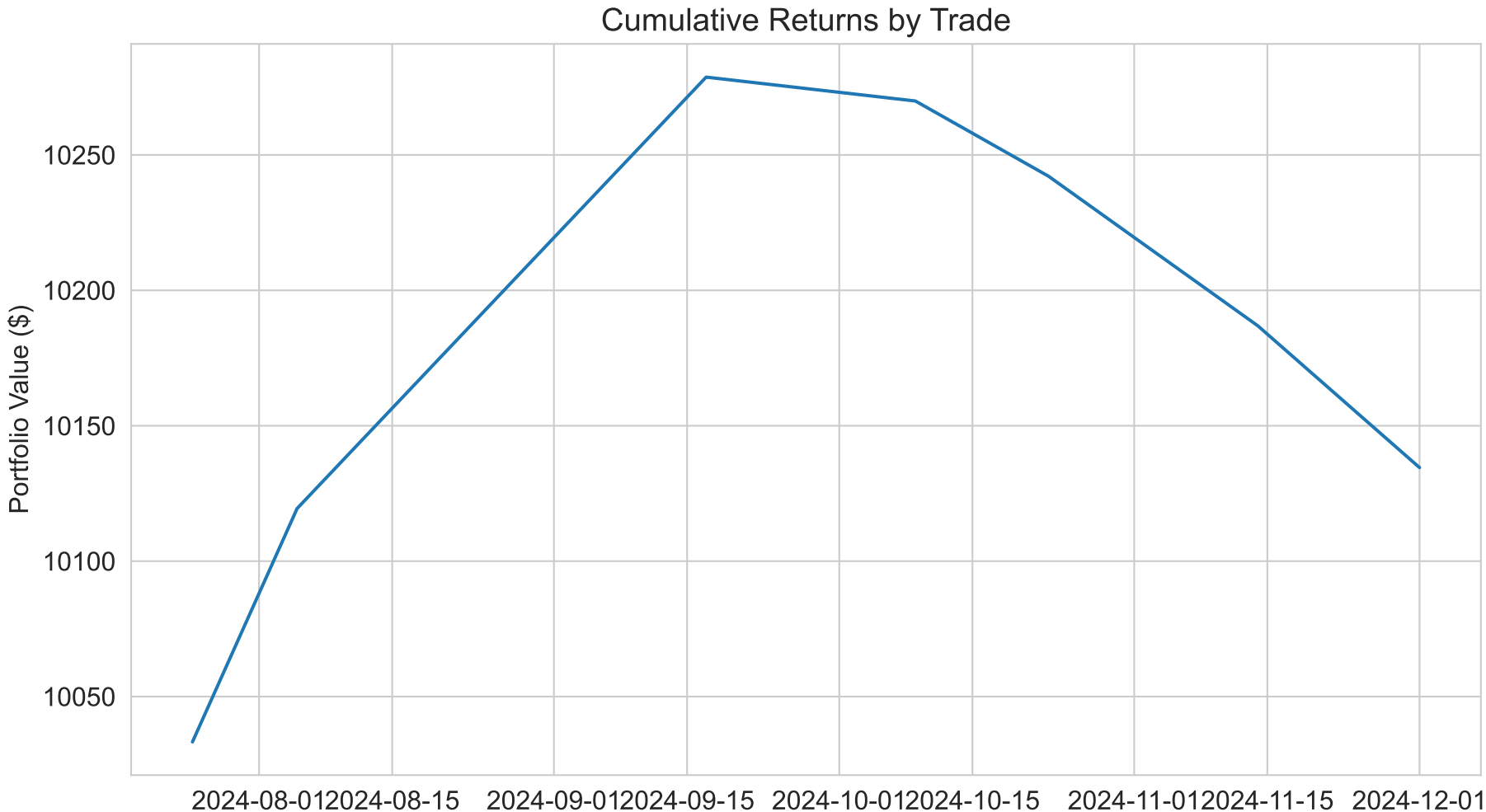
Total Return	1.60%
Annualized Return	3.78%
Sharpe Ratio	1.95
Max Drawdown	-1.42%
Total # Roundtrip Trades	7
Win Rate	42.9%
Profit Factor	1.96
Avg Trade Duration	14.3 days

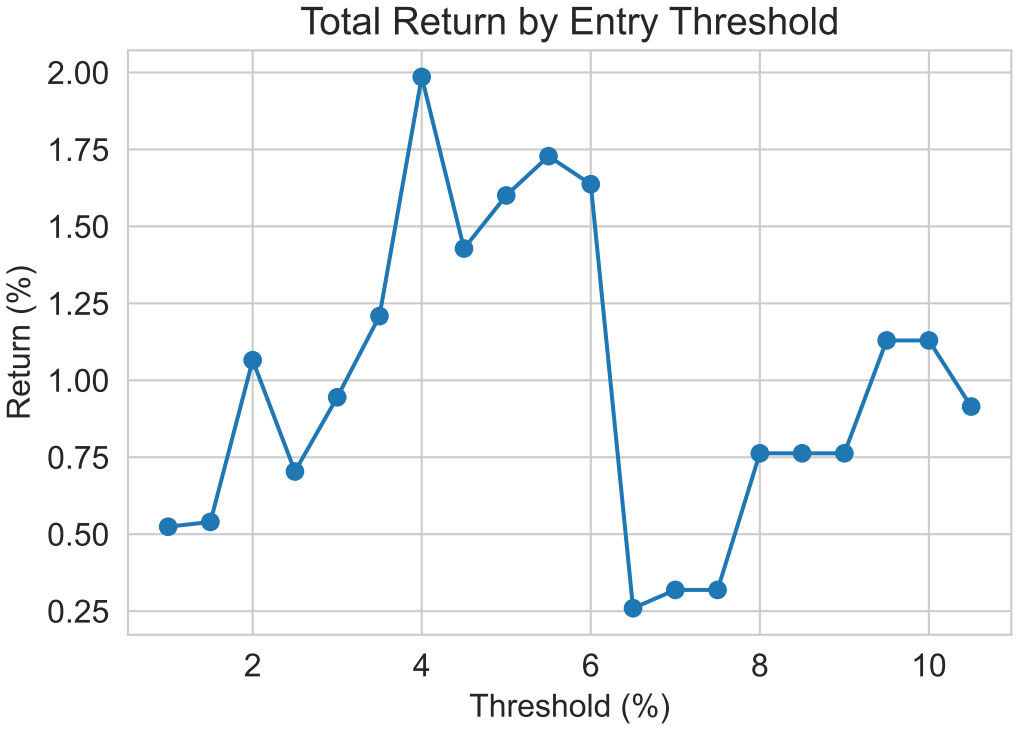

BTC Basis vs Funding Rate Spread
Annualized Basis
Annualized Funding
Positive Spread
Annualized %
30
20
10
0
−10
2024-07
2024-08
2024-09
2024-10
2024-11
2024-12
Strategy Signals
Long Spread
Flat
Short Spread
2024-07
2024-08
2024-09
2024-10
2024-11
2024-12

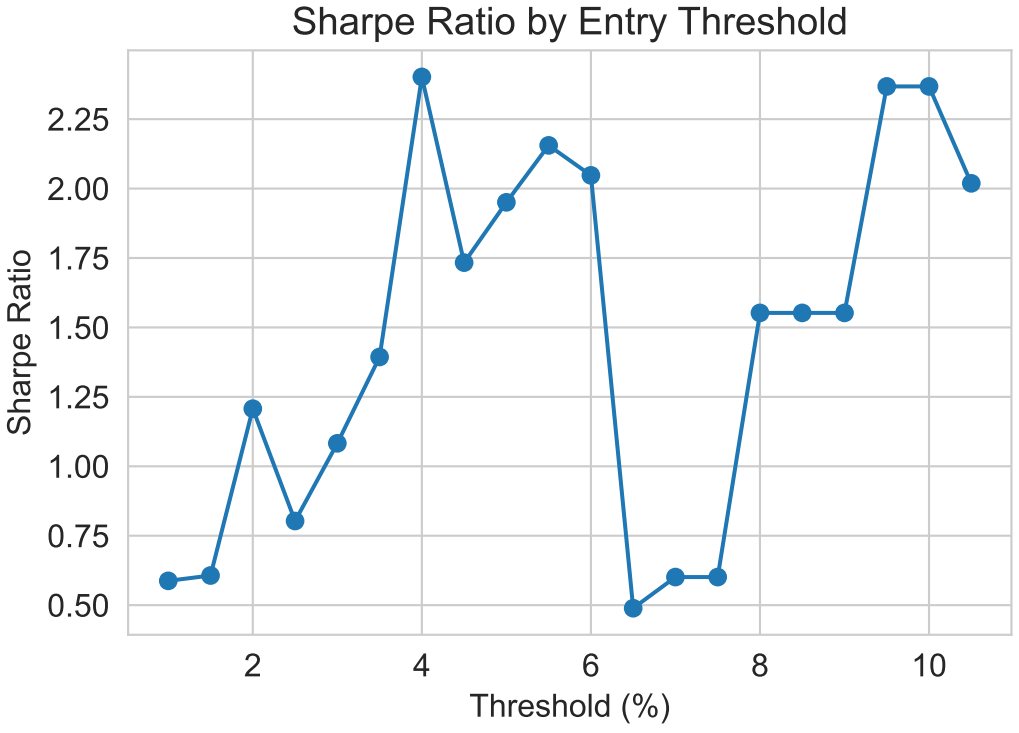

Strategy Drawdown
Drawdown
Drawdown (%)
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
−1.4
0
20
40
60
80
100
120
140
160

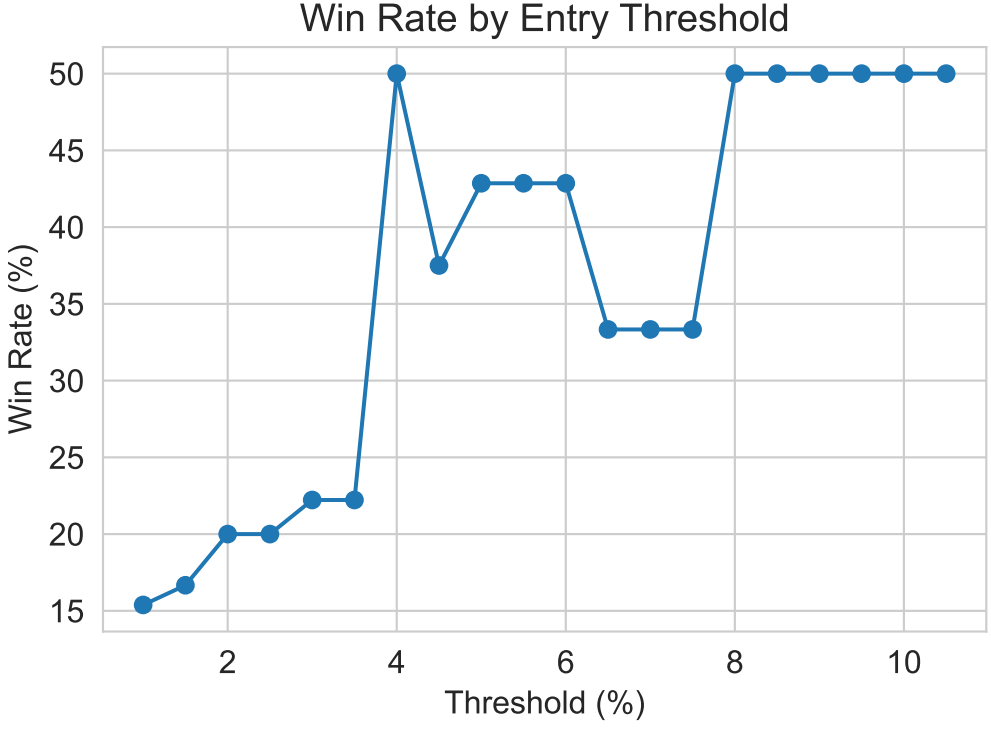

Trade Returns Distribution
Count
Return (%)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
−0.5
0.0
0.5
1.0
1.5

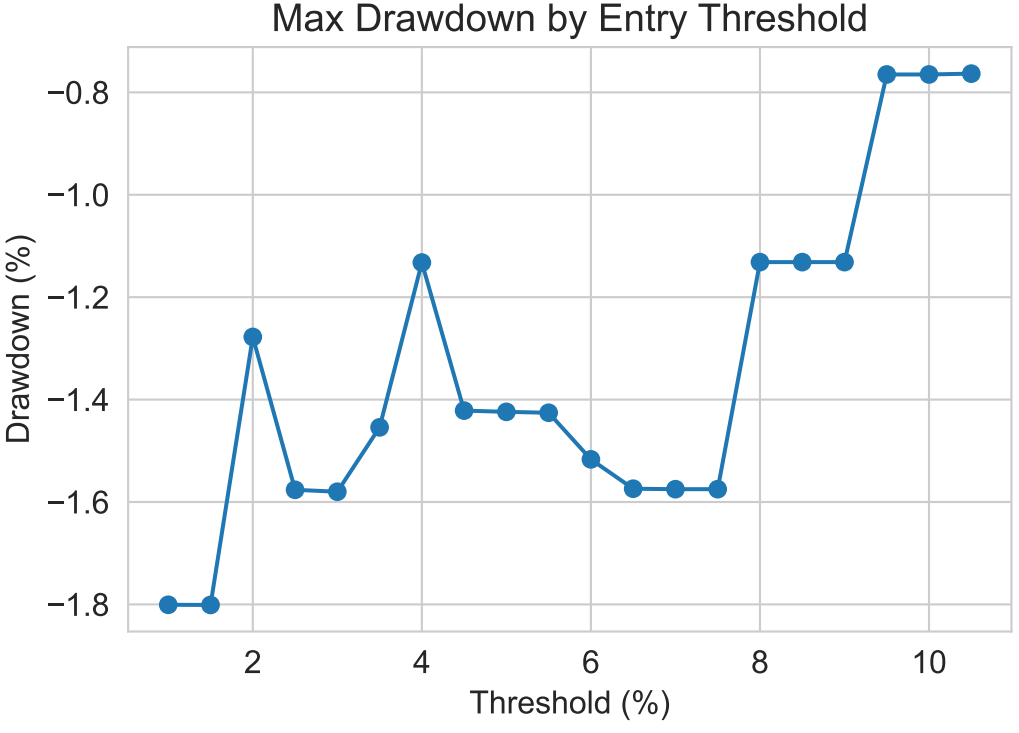

Trade Duration vs Returns
direction
long
short
Return (%)
Duration (days)
1.5
1.0
0.5
0.0
−0.5
5
10
15
20
25
30
35
40


Cumulative Returns by Trade
Portfolio Value ($)
10250
10200
10150
10100
10050
2024-08-01
2024-08-15
2024-09-01
2024-09-15
2024-10-01
2024-10-15
2024-11-01
2024-11-15
2024-12-01


Total Return by Entry Threshold
Return (%)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
2
4
6
8
10
Threshold (%)


Sharpe Ratio by Entry Threshold
Sharpe Ratio
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
2
4
6
8
10
Threshold (%)


Win Rate by Entry Threshold
Win Rate (%)
50
45
40
35
30
25
20
15
2
4
6
8
10
Threshold (%)


Max Drawdown by Entry Threshold
Drawdown (%)
−0.8
−1.0
−1.2
−1.4
−1.6
−1.8
2
4
6
8
10
Threshold (%)

Trade History

date	type	capital	spot_price	futures_price	spread	duration_days	return_pct
2024-07-15	enter long	$10,000.00	$63,530.09	$66,943.77	6.02%		N/A
2024-07-25	exit long	$10,033.26	$64,908.28	$68,039.50	0.43%	10	0.33%
2024-07-27	enter long	$10,000.00	$68,259.06	$71,604.80	5.18%		N/A
2024-08-05	exit long	$10,085.89	$53,671.36	$55,543.83	-0.06%	9	0.86%
2024-08-06	enter long	$10,000.00	$56,142.66	$58,144.87	6.68%		N/A
2024-09-17	exit long	$10,157.42	$60,048.29	$61,158.17	0.42%	42	1.57%
2024-09-25	enter long	$10,000.00	$63,497.00	$64,653.77	6.38%		N/A
2024-10-09	exit long	$9,991.42	$61,742.93	$62,793.90	-0.59%	14	-0.09%
2024-10-13	enter long	$10,000.00	$62,647.60	$63,711.00	7.99%		N/A
2024-10-23	exit long	$9,972.95	$66,581.48	$67,756.57	-0.99%	10	-0.27%
2024-11-11	enter short	$10,000.00	$84,605.54	$86,329.10	-5.98%		N/A
2024-11-14	exit short	$9,946.07	$88,681.00	$90,194.70	-0.69%	3	-0.54%
2024-11-19	enter short	$10,000.00	$92,107.60	$93,762.40	-9.29%		N/A
2024-12-01	exit short	$9,948.60	$96,472.97	$97,911.80	3.58%	12	-0.51%