



For Alpha

Ai-Powered Investment Replication

The Strategy Spotlight CTA Trend Replication: Is Medium-Term Trend Following the Weakest Link?

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Abstract

We test the claim that medium-term trend following powers CTAs performance. We replicate the reference benchmark of CTAs with a lookback-straddle model across five horizons (20, 60, 125, 250, 500 days), an all-horizon blend, and leave-one-out ablations (horizon-removal tests). Over 2005–2025, the 60–125d band is the **weakest link**: removing it—especially 125d—raises Sharpe Ratio and return-to-max-drawdown while preserving, and at times, improving correlation to the CTA Benchmark. In 2015–2025, the 500d sleeve has the highest standalone Sharpe and the shallowest drawdowns; 250d tracks best; 20d adds diversification. Excluding 500d is costly for both efficiency and correlation. **Implication:** a multi-horizon blend with a light medium-term weight is the robust default allocation; only the No-125 and No-60 strategies outperform the full blend.

Introduction

Replication of CTA (Commodity Trading Advisor) trend-following strategies is a common approach to obtaining liquid, transparent exposure to this alternative investment strategy. Our benchmark is the SG CTA Trend Index (ticker NEIXCTAT). We map benchmark daily returns to lookback-straddle trend factors across liquid futures markets (equity indices, rates, FX, and commodities). To diagnose horizon risk and marginal contribution to overall replication, we evaluate five single-horizon windows (20, 60, 125, 250, 500 trading days), an All Horizons blend, and ablations that remove one horizon at a time. Multi-horizon replication emerges as the robust baseline: across tests, only the No-125 and the No-60 configurations exceed the full blend. Methodologically, we implement a rolling sparse graphical model that dynamically allocates across the selected horizons, translating conditional dependence into weights (see *Methodology*).



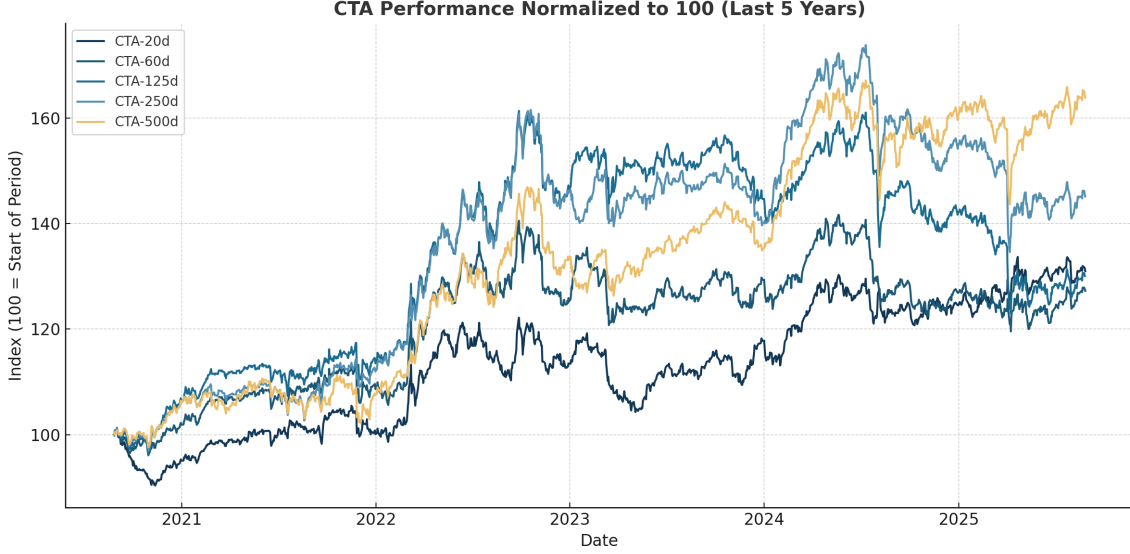


Figure 1: Strategy replication based on single-horizon CTA sleeves (20d, 60d, 125d, 250d, and 500d), 2020–2025.

Read-through. Figure 1 highlights the differentiated recent performance of horizon sleeves. Since 2023, the **60-day** and **125-day** sleeves have lagged materially behind, confirming their role as a performance drag in medium-term trend replication. **20-day sleeve** has provided consistent diversification, dampening drawdowns during reversals and preserving convexity in fast-moving markets. The **250d** and **500d sleeves** remain resilient, with the 500d and 20d strategies leading the post-2023 performance.

Methodology: Graphical Model for Dynamic Horizon Allocation

We build on Ai For Alpha’s *Bayesian graphical state-space allocator* from the Strategy Spotlight on CTA replication (June 2025) also presented in details in [OBSG22] and [BOG24]. We extend it to five explicit lookback–straddle sleeves (20, 60, 125, 250, 500 trading days). At each date t , the benchmark return r_t is expressed as a convex combination of the investment universe factor returns $r_{t,i}$, corresponding to n assets factors as follows

$$r_t = \sum_{1 \leq i \leq n} w_{t,i} r_{t,i} + \varepsilon_t,$$

with *time-varying* weights $(w_{t,i})_{1 \leq i \leq n}$ that follow a Gaussian random walk,

$$w_{t,h} = w_{t-1,h} + \eta_{t,h}, \quad \eta_{t,h} \sim \mathcal{N}(0, \tau_h^2).$$

In the case of a trend following strategies, the factors are trend factors computed over different periods whose set is denoted by $\mathcal{H} = \{20, 60, 125, 250, 500\}$. This yields a two-layer Bayesian network: latent weight states generate observed returns. Estimation is performed sequentially with a forward filter that uses only information available up to time t , ensuring that signals are strictly out-of-sample. The allocator is the same graphical engine introduced in the *Strategy Spotlight* [Ai 25]—where hidden weights tilt among short-term trend, long-term trend, and raw market returns—but here it is applied across five horizon sleeves for each market.

1. Benefit of Multi-Horizons for CTA Replication (2015–2025)

Over the full decade, the **long-term 500-day** strategy leads on Sharpe and Return/Max Drawdown efficiency. In contrast, the **125-day** medium-term strategy lag on both metrics. The

short-term **20-day** strategy lags in correlation to the benchmark but provides the strongest diversification benefit among the horizons. This is similar to the conclusion of the spotlight [BOE⁺25]. Crucially, the *All Horizons* blend delivers the *strongest alignment with the CTA benchmark*, posting the highest correlation to NEIXCTAT (0.84 in Table 1); among single-horizon sleeves, the **250-day** remains the closest correlation proxy (0.81).

Table 1: Correlation matrix of horizons and benchmarks (2015–2025).

	20d	60d	125d	250d	500d	All Horizons	NEIXCTAT
20d	100%	83%	83%	59%	44%	66%	62%
60d	83%	100%	81%	60%	44%	81%	69%
125d	59%	81%	100%	84%	67%	94%	78%
250d	44%	60%	84%	100%	90%	90%	81%
500d	35%	44%	67%	90%	100%	78%	75%
All Horizons	66%	81%	94%	90%	78%	100%	84%
NEIXCTAT	62%	69%	78%	81%	75%	84%	100%

Table 2: Performance summary by horizon (2015-08-31 to 2025-08-29).

	20d	60d	125d	250d	500d	All Horizons	NEIXCTAT
Annual Return	4.2%	4.4%	4.5%	6.7%	7.2%	6.1%	2.7%
Vol	10.0%	10.5%	10.9%	10.8%	10.5%	10.6%	11.1%
Sharpe Ratio	0.20	0.21	0.21	0.42	0.47	0.36	0.05
Max DD	17.3%	15.6%	23.8%	22.6%	14.5%	21.6%	22.4%
Return/MaxDD	0.24	0.28	0.19	0.30	0.49	0.28	0.12

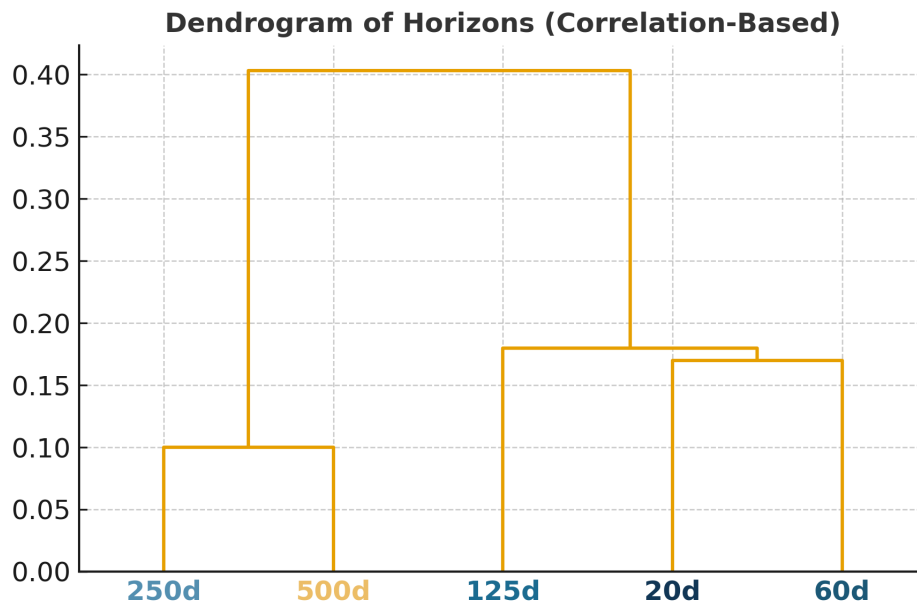


Figure 2: Dendrogram of horizon strategies (2015–2025).

The 125-day horizon is simultaneously connected to both short- and long-term sleeves but does not add meaningful diversification. Its overlap reduces efficiency and offers little incremental value compared to the extremes.

2. Ablation of Time Horizons: Which Horizons Hurt, Which Add Value?

We re-run the replication after removing one horizon at a time and score three objectives by disjoint five-year windows: Sharpe, Return/MaxDD, and correlation to NEIXCTAT. We first report the overall Z-score ranking across metrics, then drill into period panels.

Table 3: Ranking of horizon removals by overall average Z-score (higher is better)

Strategy	Avg Z-score Sharpe	Avg Z-score Ret/MaxDD	Avg Z-score Corr	Overall Avg Z-score
No 125	+0.84	+0.96	+0.59	+0.80
No 60	+0.40	+0.21	+0.49	+0.37
All Horizons	+0.34	+0.17	+0.40	+0.30
No 250	+0.07	+0.19	-0.16	+0.03
No 20	-0.28	-0.67	-0.19	-0.38
No 500	-1.36	-0.86	-1.13	-1.12

Table 4: Sharpe ratios by period (leave-one-out ablation)

Period	All Horizons	No 20	No 60	No 125	No 250	No 500
2005–2010	0.91	0.84	0.94	0.90	0.89	0.87
2010–2015	1.37	1.32	1.28	1.41	1.37	1.26
2015–2020	0.43	0.47	0.45	0.42	0.40	0.36
2020–2025	0.35	0.33	0.37	0.44	0.37	0.28
2005–2025	0.74	0.72	0.74	0.77	0.73	0.67

Table 5: Return / MaxDD by period (leave-one-out ablation)

Period	All Horizons	No 20	No 60	No 125	No 250	No 500
2005–2010	1.12	1.02	1.15	1.13	1.13	1.14
2010–2015	1.39	1.17	1.23	1.75	1.43	1.21
2015–2020	0.48	0.50	0.48	0.45	0.45	0.40
2020–2025	0.32	0.30	0.33	0.39	0.34	0.28
2005–2025	0.48	0.45	0.48	0.52	0.50	0.44

Table 6: Correlation to NEIXCTAT by period (leave-one-out ablation)

Period	All Horizons	No 20	No 60	No 125	No 250	No 500
2005–2010	0.83	0.82	0.84	0.83	0.83	0.82
2010–2015	0.85	0.84	0.85	0.87	0.84	0.84
2015–2020	0.84	0.84	0.83	0.83	0.84	0.83
2020–2025	0.81	0.81	0.83	0.83	0.78	0.77
2005–2025	0.83	0.82	0.84	0.84	0.82	0.81

Read-through. The medium band (60–125d) is the consistent drag: removing *125d* improves all three metrics across multiple periods, and removing *60d* often helps. Dropping *500d* is costly in both correlation and risk-adjusted returns, while excluding *20d* mainly erodes diversification. These results corroborate the Z-score ranking and support a multi-horizon blend that de-weights the crowded middle.

Downside Crisis-Adjusted Performance. We now assess the downside crisis-adjusted performance of the strategy, i.e. its ability to deliver positive returns during severe equity drawdowns. Formally, we compute a *conditional Sharpe ratio* defined as the average monthly return of the strategy in months when the S&P 500 return is below -3% , divided by the monthly volatility of the strategy over the full sample. This metric captures the extent to which the strategy provides protection (or "crisis alpha") during equity sell-offs. We evaluate whether excluding the mid-term trend band materially alters this property. Table 7 reports the results:

Table 7: Downside Crisis-Adjusted Performance (Leave-One-Out Ablation)

Period	All Horizons	No 20	No 60	No 125	No 250	No 500
2005–2025	0.65	0.61	0.62	0.63	0.62	0.65

The scores are nearly identical across specifications, indicating that removing the mid-term horizon does not impair the strategy’s downside protection.

Conclusion

Across our tests, the **medium-term (60–125 day) band is the weakest link** in CTA replication. Removing either horizon from the blend—especially 125d—raises Sharpe, improves Return/MaxDD, and holds or even increases correlation to NEIXCTAT. In contrast, the **20-day** sleeve contributes diversification (costly to drop), while removing the **500-day** horizon materially hurts both correlation and risk-adjusted returns. For standalone sleeves in 2015–2025, **500-day** delivers the highest Sharpe and the shallowest drawdowns; **250-day** remains the cleanest single-horizon tracker.

Implementation guidance. The most robust build keeps multiple horizons but de-weights the crowded middle: either (i) an *All Horizons* blend with a lighter 60/125d band, or (ii) a *No 125* (or *No 60*) configuration. In practice, **multi-horizon replication is the safe default**; among all variants, only those that strip the 60–125d band outperform the full blend.

References

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