

Ai-Powered Investment Replication

The Strategy Spotlight

Turning Trend Following into an Actual Risk-Off Strategy: A Novel Approach to Enhancing Portfolio Resilience

This study aims to design and evaluate a novel CTA (Commodity Trading Advisor) strategy with a distinct risk-off profile. Traditional trend-following CTAs are often valued for their diversification benefits and their potential to enhance risk-adjusted returns. However, their reliability as effective hedging mechanisms during abrupt and severe market downturns is inconsistent. This inconsistency is evidenced by the 0% correlation between the S&P 500 and the CTA Trend indices.

Moreover, when investors most require positive returns from trend-following strategies—specifically during periods of negative monthly returns in the S&P 500—the CTA Trend strategies achieved positive returns in only 50% of these instances. In cases where the S&P 500 monthly returns fell below -5%, the CTA Trend strategies delivered an average return of just 0.5%, with positive returns occurring in only 44% of such occurrences.

These limitations highlight the need for a trend-following strategy with stronger diversifying properties—one that provides consistent and compelling positive returns when equities experience significant downturns. This research focuses on creating a "Risk-Off Strategy" designed to consistently generate positive returns during equity market stress events. By addressing these challenges, this study seeks to establish a more effective and reliable approach to mitigating portfolio risk while maintaining long-term growth potential.





Designing Effective Trend Factors for a Risk-Off Strategy

The first objective in developing the CTA Risk-Off strategy is to design the trend factors that form its foundation. These trend factors drive the identification and exploitation of directional market movements, which are essential for achieving a risk-off profile. Drawing inspiration from theoretical constructs such as lookback options—specifically the lookback straddle that combines a lookback call and put—the approach aims to replicate an ex-post maximum payout characteristic of effective trend-following strategies.

This design results in a highly convex payoff profile, capturing positively skewed profits during extreme market movements, whether positive or negative. To enhance responsiveness, the strategy transitions from purely linear trend allocations to a convex framework, allowing for greater emphasis on strong trends while minimizing exposure to weaker ones. This adaptive methodology ensures the strategy not only capitalizes on significant market trends but also enhances risk management during periods of market turbulence, aligning with its overarching risk-off objective.

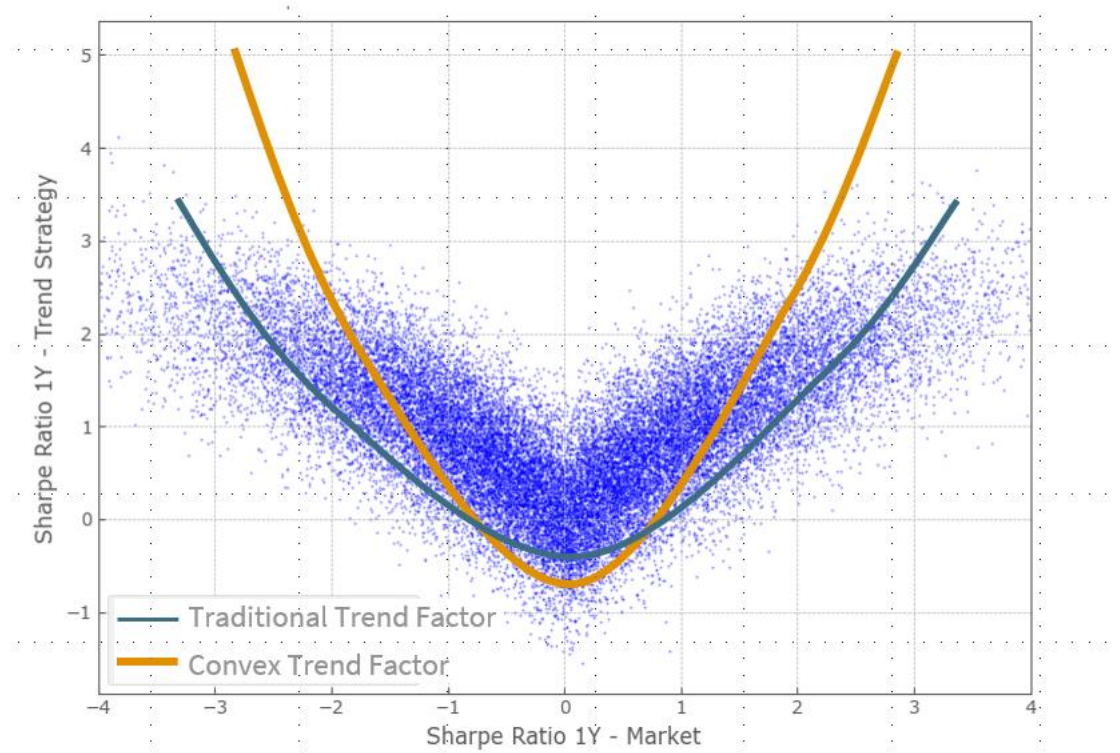


Illustration of Convexified Trend Factors



Replicating the CTA Trends with Advanced Graphical Models

The first step in the development of the proposed strategy is to achieve precise replication of the recognized CTA Trend managers. To accomplish this, the methodology incorporates next-generation Graphical Models, which represent a significant advancement over traditional linear regression and Kalman Filter models. These Graphical Models enhance the allocation of trend factors by capturing complex relationships among "hidden" variables, such as betas, and improving the modeling of interdependencies across markets.

The inclusion of penalized beta estimation adds robustness to the model, reducing the risk of overfitting and ensuring stability across diverse market conditions. Additionally, optimized meta-parameters are employed to maximize the correlation between the replication strategy and the target benchmark, further aligning the strategy's performance with that of the benchmark. This advanced modeling approach ensures a high-fidelity replication of the CTA Trend managers, laying the groundwork for the development of a strategy with superior hedging and diversification capabilities.

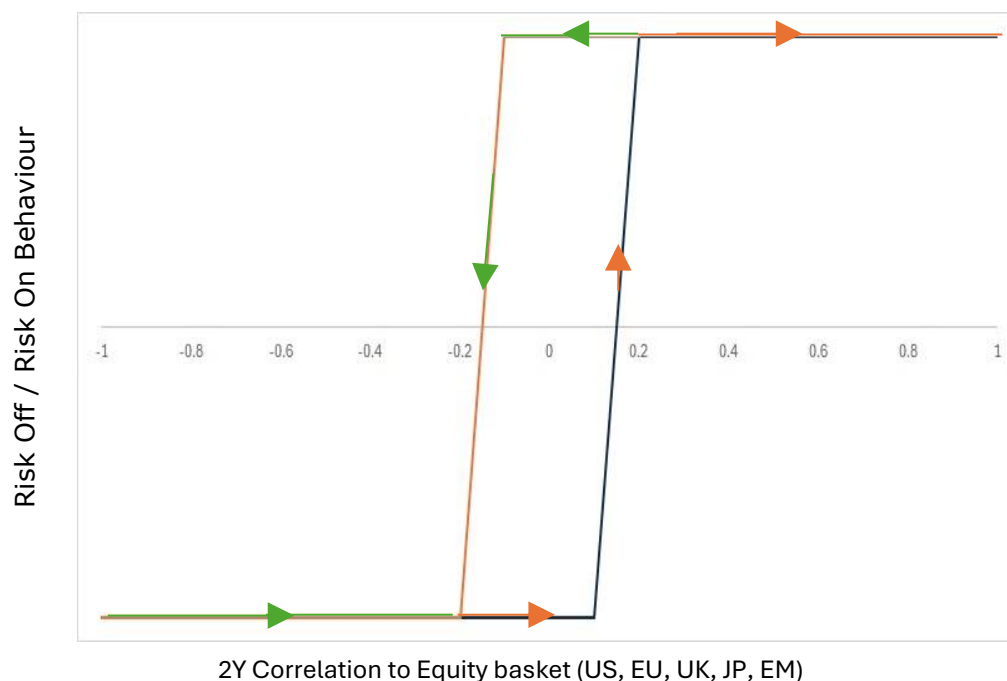
Methodology: Enhancing Hedging through “Risk-Off” Trend Factors Overweighting

The proposed CTA Risk-Off strategy refines traditional CTA signals by focusing on trend factors negatively correlated with global equities through a **Risk-Off Filter**. This filter employs a non-linear **Hysteresis Filtering Algorithm** that uses rolling two-year correlations with global equity indices to classify assets as either "risk-on" or "risk-off." Stability in classification is maintained through a defined correlation threshold. The model prioritizes positive trends in "risk-off" assets and negative trends in "risk-on" assets, enabling the strategy to dynamically hedge equity downturns by selecting the most effective trends for mitigating market stress at any given time.

The portfolio is then constructed as a combination of two distinct components:

- **10% Replication of CTA Managers' benchmark:** This component mirrors the Replication of CTA indices in trend factors determined by beta coefficients derived from the Graphical Model.
- **90% Risk-Off Portfolio:** This portion is tailored to hedge equity exposure, comprising negative trends in "risk-on" assets and positive trends in "risk-off" assets. These trends are filtered from the Replication Portfolio using the Hysteresis Filtering Algorithm.

To ensure robust risk management, the combined portfolio is volatility-targeted at 10%. This design not only preserves the general trend-following characteristics of a CTA strategy but also prioritizes assets that provide strong hedging against equity market declines, maximizing diversification and risk mitigation.



Hysteresis Filtering Algorithm

Performance Analysis

The novel Risk-Off Strategy was analyzed on a monthly basis, compared to a set of seven anonymized major trend-following funds, covering the period from January 2010 to October 2024.

1. Average Risk-Adjusted Returns

Over the evaluation period, the proposed CTA Risk-Off strategy achieves a Sharpe Ratio of 0.53, marginally higher than that of leading CTAs. This highlights the strategy's ability to deliver strong risk-adjusted returns while maintaining consistency and stability. Furthermore, its annualized volatility is effectively managed at 10%, demonstrating a balanced approach to risk and return.

2. Robust Performance During Equity Market Downturns

A defining feature of the proposed CTA Risk-Off strategy is its consistent outperformance during equity market declines:

- **Returns during negative equity market months:** The strategy achieves an average return of 1.8% during months when the S&P 500 experiences negative performance. This performance surpasses that of all other CTAs analyzed, and the strategy achieves positive returns in 65% of such months, underscoring its reliability in mitigating equity market risks.
- **Returns during severe equity downturns:** When the S&P 500 falls below -5% in a given month, the strategy achieves an average positive return of 3.6%, significantly outperforming



other CTAs by at least a factor of two. Notably, it delivers positive returns in 88% of these instances. This reinforces its effectiveness as a crisis alpha strategy.

3. Overall Negative Correlation with the S&P 500

The proposed CTA Risk-Off strategy exhibits a correlation of -36% with the S&P 500, indicating a robust inverse relationship with equities. This pronounced negative correlation enhances the strategy's value as a diversification tool, as it consistently performs well during periods of equity market weakness.

Comparative Advantage Over Traditional CTAs

Traditional CTA strategies are known for their diversification benefits, but the proposed CTA Risk-Off strategy builds on these by demonstrating superior performance during market downturns and a stronger negative correlation with equities.

- Traditional CTAs typically exhibit a correlation with the S&P 500 in the range of -5% to -21%, whereas the CTA Risk-Off strategy shows a significantly more negative correlation of -36%.
- While the average Sharpe Ratio of traditional CTAs is approximately 0.28, the CTA Risk-Off strategy achieves a Sharpe Ratio of 0.53, indicating strong risk-adjusted performance without compromising diversification or stability.

Despite its distinct hedging capabilities, the CTA Risk-Off strategy retains core characteristics of a trend-following CTA, as evidenced by its 62% correlation with the SG CTA Index. These attributes underline its dual role as a robust risk-off tool and a reliable trend-following strategy, making it an effective component within an asset allocation for enhancing portfolio resilience.

	Risk Off	CTA 1	CTA 2	CTA 3	CTA 4	CTA 5	CTA 6	CTA 7	SG CTA Trend Index
Sharpe Ratio	0.53	0.27	0.20	0.34	0.22	0.33	0.25	0.34	0.27
Average Monthly Return	0.6%	0.4%	0.3%	0.5%	0.4%	0.4%	0.3%	0.5%	0.4%
Return if Monthly Returns of S&P >=0	0.0%	0.5%	0.0%	0.5%	0.5%	0.6%	0.2%	0.9%	0.5%
Return if Monthly Returns of S&P <0	1.8%	0.2%	0.9%	0.4%	0.1%	0.2%	0.5%	-0.4%	0.1%
Return if Monthly Returns of S&P < -5%	3.6%	1.1%	1.9%	0.4%	1.2%	1.3%	1.6%	-1.1%	0.5%
% Of Returns >0 when Monthly Returns of S&P < 0	65%	50%	59%	61%	56%	48%	56%	48%	50%
% Of Returns >0 when Monthly Returns of S&P < -5%	88%	44%	69%	69%	63%	56%	56%	25%	44%
Correlation with S&P 500	-36%	-4%	-21%	-3%	1%	-5%	-16%	10%	-1%

Table 1: statistics of CTA Funds, SG CTA Trend and Risk Off Strategy (From January 2010 to October 2024).



	CTA 1	CTA 2	CTA 3	CTA 4	CTA 5	CTA 6	CTA 7	SG CTA Index	Risk Off Strategy	S&P 500
CTA 1	100%									
CTA 2	78%	100%								
CTA 3	77%	77%	100%							
CTA 4	79%	72%	76%	100%						
CTA 5	88%	79%	77%	77%	100%					
CTA 6	83%	72%	68%	70%	88%	100%				
CTA 7	74%	73%	78%	75%	79%	72%	100%			
SG CTA Index	91%	86%	89%	86%	93%	85%	88%	100%		
Risk Off Strategy	61%	58%	59%	59%	65%	58%	47%	62%	100%	
S&P 500	-4%	-21%	-3%	1%	-5%	-16%	10%	-1%	-36%	100%

Table of Monthly Returns Correlations (From January 2010 to October 2024).

3: Superior Complementarity Profile in Equity Portfolio Allocation Compared to Traditional Trend Following Approaches"

Finally, to highlight the diversification benefits of the novel strategy, we compare two portfolios: one composed of the Risk-Off Strategy and the S&P 500, and another composed of the Benchmark SG CTA Trend and the S&P 500. A 50/50 weighting was selected for both portfolios to eliminate bias and provide a clear comparison of the complementary properties of the CTA strategies within an equity-focused portfolio.

Since the SG CTA Trend has a longer track record, we conducted the analysis starting from December 2004, when data for both the Risk-Off Strategy and the SG CTA Trend became available.

To avoid any bias arising from potential advantages linked to the backtesting of the strategy, we adjusted the returns of the Risk-Off Strategy downward to match the exact same Sharpe Ratio as the Benchmark SG CTA Trend over the entire period ("Adj Risk-Off" Strategy). This adjustment ensures that the analysis focuses solely on the diversification benefits of the Risk-Off Strategy when combined with an equity portfolio, without being influenced by potential biases in long term backtesting.

This approach provides a fair basis for comparison, allowing us to evaluate how effectively the Risk-Off Strategy complements equities relative to the Benchmark SG CTA Trend ("CTA Trend" in the table below). By isolating the diversification properties, we aim to demonstrate the added value of the Risk-Off Strategy in improving portfolio resilience during periods of market stress.



	CTA Trend	Risk Off	Adj Risk Off	S&P 500	50/50 S&P / CTA Trend	50/50 S&P / Risk Off	50/50 S&P / Adj Risk Off
Annual Return	4.4%	7.5%	4.3%	10.3%	8.0%	9.6%	8.0%
Annual Volatility	11.5%	9.3%	9.3%	19.2%	11.3%	9.4%	9.4%
Sharpe Ratio	0.24	0.62	0.24	0.45	0.55	0.84	0.67
Max DD	23%	16%	21%	55%	24%	21%	22%
10% Highest DD	15%	11%	16%	22%	9%	5%	5%
Return / Max DD	0.19	0.47	0.20	0.19	0.33	0.46	0.36
Return / 10% Highest DD	0.29	0.71	0.26	0.47	0.92	2.08	1.59

Statistics comparing the S&P 500, the Benchmark SG CTA Trend, the Risk Off Strategy, the Conservative Adj Risk Off Strategy, and portfolio allocation combining 50% CTA Strategies and 50% S&P 500.

Period: December 2004 -December 2024

The results reveal a notable **enhancement in portfolio performance**, with the Sharpe Ratio improving by at least 20%, even when employing the conservatively **adjusted Risk-Off Strategy**. Moreover, the reduction in the 10th percentile of the highest drawdowns—a more reliable risk metric than the maximum drawdown—is even more pronounced, achieving a 45% decrease. As a result, the return relative to the 10th percentile drawdown increases by 50%. This underscores the ability of the Risk-Off Strategy to minimize drawdown durations and accelerate recovery, providing efficient protection and enhancing the overall resilience of the portfolio.

Conclusion

The CTA Risk-Off strategy appears to be a convincing tool for **improving portfolio resilience in the CTA landscape**. By delivering steady performance in times of market stress, maintaining a strong **negative correlation with the S&P 500** and demonstrating a high probability of positive returns in adverse conditions, it is proving to be a reliable diversifier. The strategy's dynamic ability to identify and utilize the most effective hedges in the equity market - whether commodities, currencies, bonds or equities - guarantees comprehensive protection without compromising the return potential of the trend-following strategy. This approach provides investors with a new strategy for effectively mitigating downside risk, sustaining long-term performance, and achieving a stronger, more diversified portfolio that can confidently weather periods of falling stock markets.