Navigating momentum crashes in a trend-following strategy

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Trend-following strategies are a well-established source of portfolio diversification, and have historically served to buffer losses in times of equity market stress. But sharp market rebounds after prolonged weakness (aka 'momentum crashes') can stand in the way of their success. We analyze ways of mitigating the impact of such setbacks to reduce maximum drawdowns and smooth returns.

Trend-following is very straightforward: Go long the winners and sell short the losers. Despite this simplicity, however, trend following has successfully delivered attractive results over extended periods. Hurst et al. (2017) provide significant out-of-sample evidence of how a trend-following strategy has worked consistently over the last roughly 140 years in different economic environments and across multiple asset classes, such as equities, bonds, commodities, and currencies.

Available since December 31, 1999, the SG Trend Index (Bloomberg ticker NEIXCTAT) tracks the net daily return of ten trend-following commodity trading advisors (CTAs), showing live performance of managed futures strategies over the past 24 years. During that period, the SG Trend Index achieved higher returns with lower volatility than the MSCI World Index – and thus a higher Sharpe ratio (table 1).

Since inception, the SG Trend Index has a modest negative correlation to the MSCI World Index (-0.09) and a significantly smaller maximum drawdown (figure 1). Additionally, with a near-zero correlation to the Bloomberg Barclays Global Aggregate Bond Index (0.02), an allocation to a trend-following managed futures strategy can enhance the risk/return profile of traditional multi-asset portfolios.

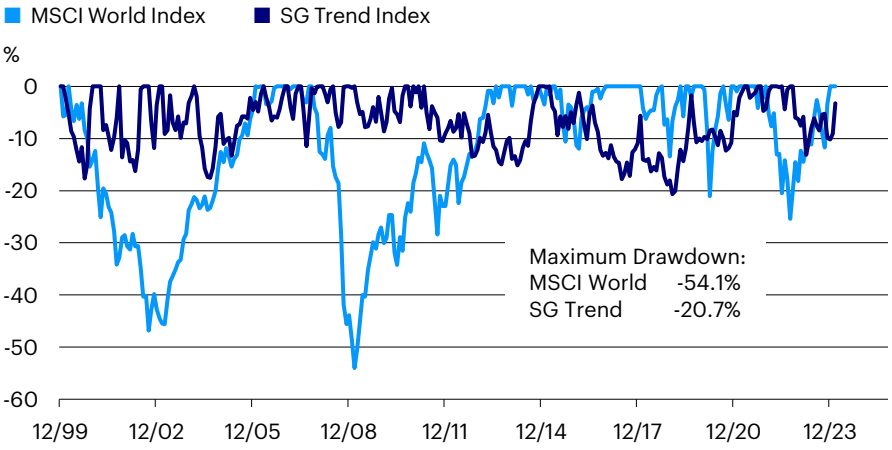
The success of trend-following strategies is often explained using various behavioral biases. According to Kahneman and Tversky (1974, 1979), anchoring leads to the underreaction of prices to the latest information. The disposition effect noted by Frazzini (2006) further slows the development of a trend as investors continue to respond to the news. And, herding behavior, as discussed by De Long et al. (1990), results in more investors jumping in, so that the trend becomes

Table 1
Trend-following in comparison

	MSCI World Index	SG Trend Index
Return p.a. (%)	5.49	5.90
Volatility p.a. (%)	15.70	13.55
Sharpe ratio	0.23	0.30
Cash rate (%)*	1.83	

Source: Bloomberg. Average cash rate: 1.83% (Bloomberg 3-Month US Treasury Bill Index); data from December 31, 1999 to February 29, 2024. **Past performance is not a guarantee of future results. An investment cannot be made in an index.**

Figure 1
Simulated drawdowns in comparison



Source: Bloomberg. Data from December 31, 1999 to February 29, 2024.

self-reinforcing. The profitability of investing based on a behavioral approach is confirmed by Jegadeesh and Titman (1993, 2001). Additionally, non-profit-seeking participants in financial markets, such as central banks and corporations executing hedging strategies can also contribute to persistent price trends.

Building a trend-following managed futures strategy

Despite the general success of trend-following strategies, occasional 'momentum crashes' – sharp market rebounds after a prolonged period of weakness – can stymie their success. To analyze this phenomenon and highlight possible ways of mitigating the consequences of a momentum crash, we have constructed a baseline simulation. Based on a simulation period from December 31, 1999 to February 29, 2024, our approach comprises four steps:

1. Defining the asset universe

When selecting assets for a trend-following managed futures strategy, three sometimes competing factors need to be considered: liquidity, trading costs, and diversification. While, in theory, maximum diversification is ideal, the high turnover of a strategy traded weekly requires thoughtful consideration of liquidity and trading costs. We evaluated a wide range of assets and included only those with a minimal difference between gross and net performance over the simulation period. As an example, based on the full bid/ask spread from daily transaction data, 10-year US Treasury futures and S&P 500 futures exhibited differences of only 18 and 34 bp, respectively, between gross and net returns. In contrast, live cattle futures and lean hog futures experienced 412 and 656 bp differences and were thus excluded. As a result, we selected fifty-one assets across equities (15), fixed income (14), commodities (15), and FX (7 pairs against the USD); table 2 shows our selection.

2. Choosing the lookback window

To determine the direction of the trend, today's asset price is compared with a price in the past. Signals based on different lookback windows react to market changes at different speeds. With a shorter window, the signal can adapt faster but may lead to whipsaws in choppy markets. A longer lookback window can avoid this but will react less quickly to changes in the direction of the trend. A single binary signal also results in positions that are 100% long (or short), which can create more turnover and unnecessary volatility.

A comparison of two assets over this simulated period provides a good illustration. Examining the S&P 500 over 3, 6, and 9-month lookback windows evidences higher Sharpe ratios for longer windows, since the index mostly rose over the simulation period. Copper, on the other

Table 2
Assets in our analysis

Equities (Ticker)	Fixed Income (Ticker)	Commodities (Ticker)	FX (Ticker)
Australia (XP1)	Australia 3yr (YM1)	Aluminum (BCC2LA0P)	AUD (AD1)
Canada (PT1)	Australia 10yr (XM1)	Copper (BCC2LP0P)	CAD (CD1)
Emerging Markets (MES1)	Canada 10yr (CN1)	Corn (BCC2CN0P)	CHF (SF1)
Euroland (VG1)	France 10yr (OAT1)	Gas Oil (BCC2GO0P)	EUR (EC1)
France (CF1)	Germany 2yr (DU1)	Gold (BCC2GC0P)	GBP (BP1)
Germany (GX1)	Germany 5yr (OE1)	Natural Gas (BCC2NG0P)	JPY (JY1)
Hong Kong (HI1)	Germany 10yr (RX1)	Brent Crude (BCC2CO0P)	NZD (NV1)
Italy (ST1)	Germany 30yr (UB1)	WTI Crude (BCC2CL0P)	
Japan (TP1)	Italy 10yr (IK1)	Heating Oil (BCC2HO0P)	
Netherlands (EO1)	UK 10yr (G)	Silver (BCC2SI0P)	
Spain (IB1)	US 2yr (TU1)	Soybeans (BCC2SO0P)	
Sweden (QC1)	US 5yr (FV1)	Soybean Oil (BCC2BO0P)	
UK (Z)	US 10yr (TY1)	Soy Meal (BCC2SM0P)	
US Large Cap (ES1)	US 30yr (US1)	Unleaded Gas (BCC2XB0P)	
US Small Cap (RTY1)		Wheat (BCC2WH0P)	

Source: Bloomberg.

> Volatility scaling is essential.

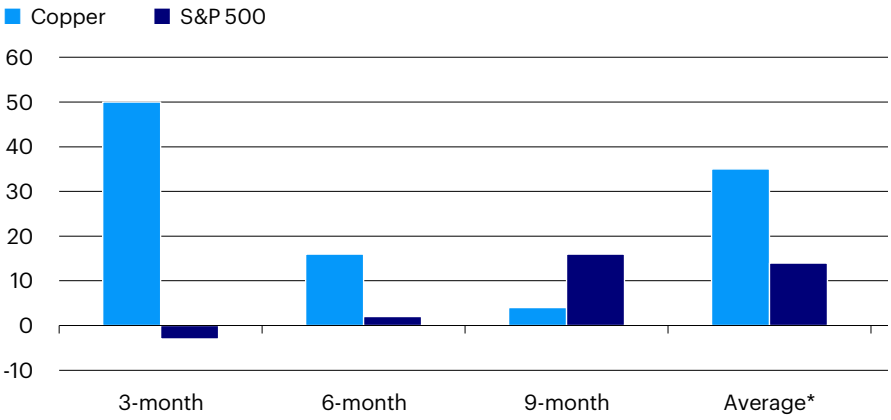
hand, proved more volatile, resulting in better performance with a shorter lookback window (figure 2).

Due to the drawbacks of a single lookback window, we chose to average the signals from twelve windows varying from 1 to 12 months in length. This has a number of benefits: First, we get a more continuous signal, adding an element of risk management by reducing exposure when the individual signals are mixed while retaining maximum exposure when they align. Averaging the signals from 1 to 12 months also alleviates data mining biases that may arise from picking the best signal for each asset in the backtest. Importantly, averaging the signals retains the strategy's low correlation to the underlying asset (S&P 500 = 0.14, Copper = 0.07), confirming the diversification benefits of a trend-following managed futures strategy.

3. Volatility scaling

Volatility scaling is essential and happens in two distinct ways: To avoid risk imbalances, we first scale individual assets to 10% volatility using a one-year half-life, and average the signals thereafter. Averaging the positions before risk scaling the individual assets would lead to the riskier assets and asset classes dominating the portfolio. The second round of volatility scaling occurs by targeting 10% risk at the portfolio level. Beyond making the strategy flexible to target different volatility levels, this also improves risk-adjusted returns. Risk targeting results in larger positions in a low-risk environment and smaller positions when the general level of volatility increases. This helps to exploit the power of compounding – earning and losing 50%, for example, is not the same for consecutive geometric returns. Avoiding large losses has a substantial impact on the final portfolio value.

Figure 2
Sharpe ratio for different lookback periods



* Average is the average of 12 lookback windows from 1 to 12 months.
Source: Bloomberg. Data from December 31, 1999 to February 29, 2024.

4. Signal mapping

For trend-following strategies, signals are used to determine two things: (1) position direction (long or short) and (2) position size. We use various binary signals, leading to a blended signal of -1 if all of them indicate a negative trend and a blended signal of +1 if all indicate a positive trend. Thus, our blended trend signal for each asset ranges from -1 to +1, with 13 distinct values.

Figure 3 groups asset volatility and returns by each of the possible trend signals. A blended signal of -1 indicates significant market stress, coinciding with a high volatility of both the signal and the S&P 500. For lower values, the blended signal is less volatile than the S&P 500 (or about as high for a value of +1). This mutes volatility in all but the most extreme observations.

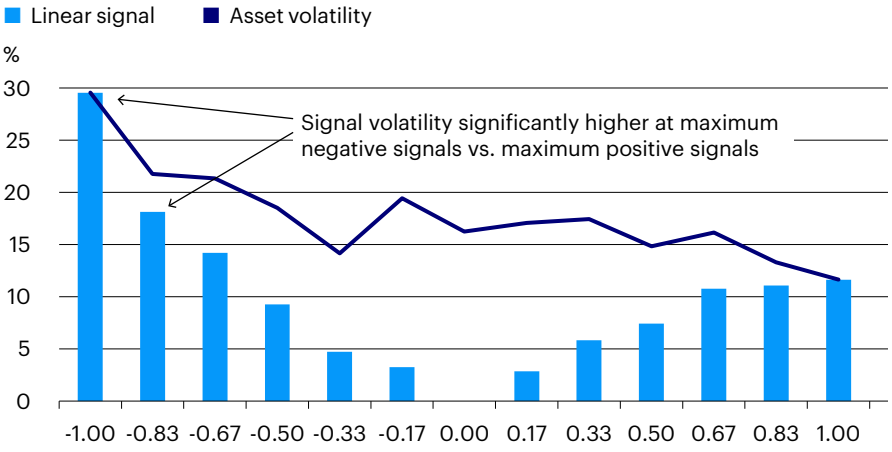
We find similar behavior across all the assets in our universe, reflecting the tail risk observed when an asset suffers a significant drawdown. As this example highlights, asset volatility is 2-3x higher for the lowest signal values than for the highest. This indicates that, even with asset and portfolio risk scaling combined with a blended trend signal, a momentum crash can still be a significant risk at these extreme signal values.

Navigating momentum crashes

Our trend-following managed futures simulation can suffer momentum crashes from abrupt price reversion after periods of market stress. While asset diversification helps to reduce the impact at the portfolio level, positive correlation across assets can aggravate it. This observation – in line with the literature on momentum crashes – leads us to seek improvements when signals are at negative extremes.

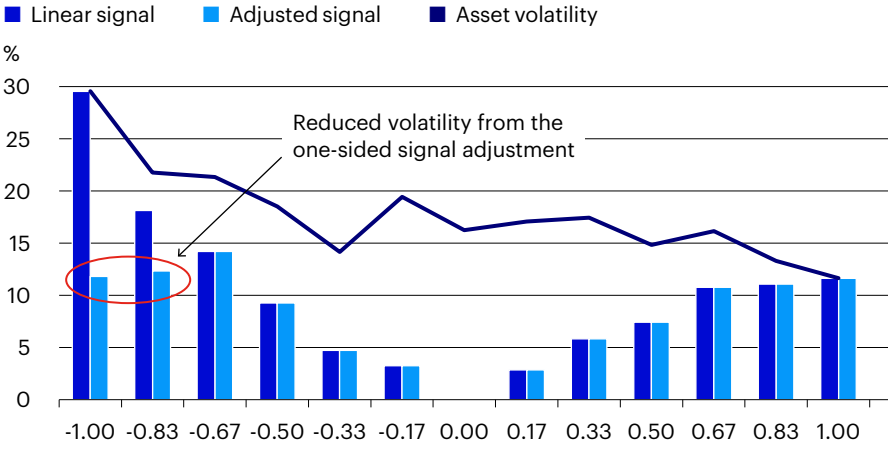
Given the heightened asset volatility when signals are the most negative, a one-sided adjustment can be applied to improve the asset and portfolio volatility scaling from our third step (figure 4). We prefer a one-sided adjustment since there are multiple small positive returns when all the signals are positive and market volatility is low, but a few big negative returns when they are negative. This is evident from the much smaller dispersion of returns when

Figure 3
Simulated volatility in comparison: Trend signal and S&P 500



Source: Bloomberg. Data from December 31, 1999 to February 29, 2024.

Figure 4
Simulated volatility in comparison: Trend signal, adjusted trend signal and S&P 500



Source: Bloomberg. Data from December 31, 1999 to February 29, 2024.

the signal is +1 relative to when it is -1, in addition to the imbalance in the number of observations.

After analizing many approaches, we settled on a simple linear adjustment. Overall, our signal adjustment looks like a checkmark with the most negative signals reduced towards zero (figure 5). Being mindful that portfolio risk targeting can increase extreme negative signal exposures, we apply portfolio risk targeting on the raw signal, then adjust position size based on the adjusted signals.

Evaluation of the approaches

In short, adjusting the signals in an extreme negative trend, high volatility market environment can lead to a meaningful drawdown reduction.

While both signal strategies lead to results considerably above those of the SG Trend Index, adjusting brings further improvements (table 3): The total return of the adjusted signal strategy is only modestly lower, the maximum drawdown is reduced from about 21% to about 13%, i.e., 40% less. Risk-adjusted returns and volatility also improve meaningfully.

In periods of momentum crashes, therefore, a blended signal combined with downside signal adjustment can serve to mitigate the negative impact of the market rebound. A one-sided signal adjustment may generate lower volatility and higher Sharpe ratios. Compared to the linear signal, the one-sided adjusted signal generates a more consistent return profile over time.

'Crisis alpha'

One-sided signal adjustment often results in better upside capture. But, since investors typically use trend-following managed futures strategies to mitigate losses in times of market stress, we also need to ask whether the adjustment causes downside mitigation properties to deteriorate.

Indeed, signal adjustment would have led to lower returns in 2008 and 2022 – but it still enabled sizeable positive returns. We do not believe the 'crisis alpha' property was materially changed. On the other hand, the linear trend-following strategy struggled in subsequent periods (2009-2012 and 2023-2024), whereas using the adjusted signal led to consistent outperformance. The adjustment works as a trade-off between a smoother ride overall and higher positive returns when markets persistently decline. Additionally, the adjustment ameliorates negative strategy returns (2009, 2012, 2016, and 2023).

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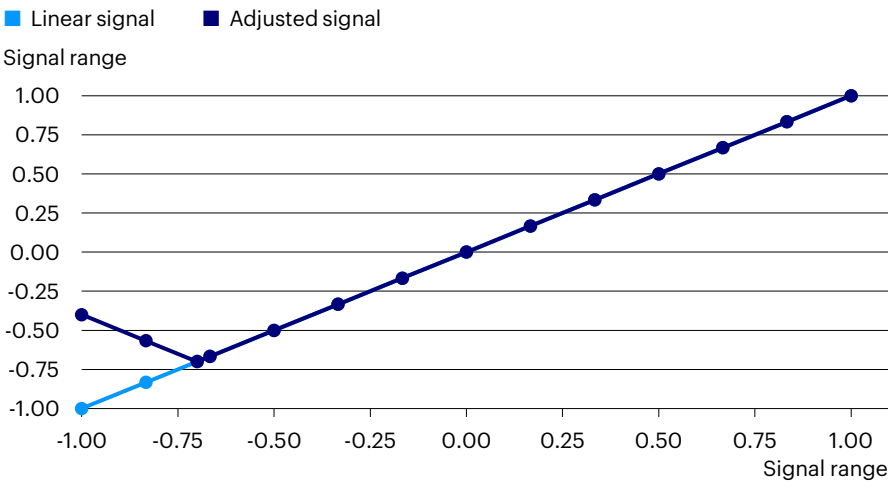
> Adjusting the signals in an extreme negative trend high volatility market environment can lead to a meaningful drawdown reduction.

Figure 5
Linear and adjusted signal



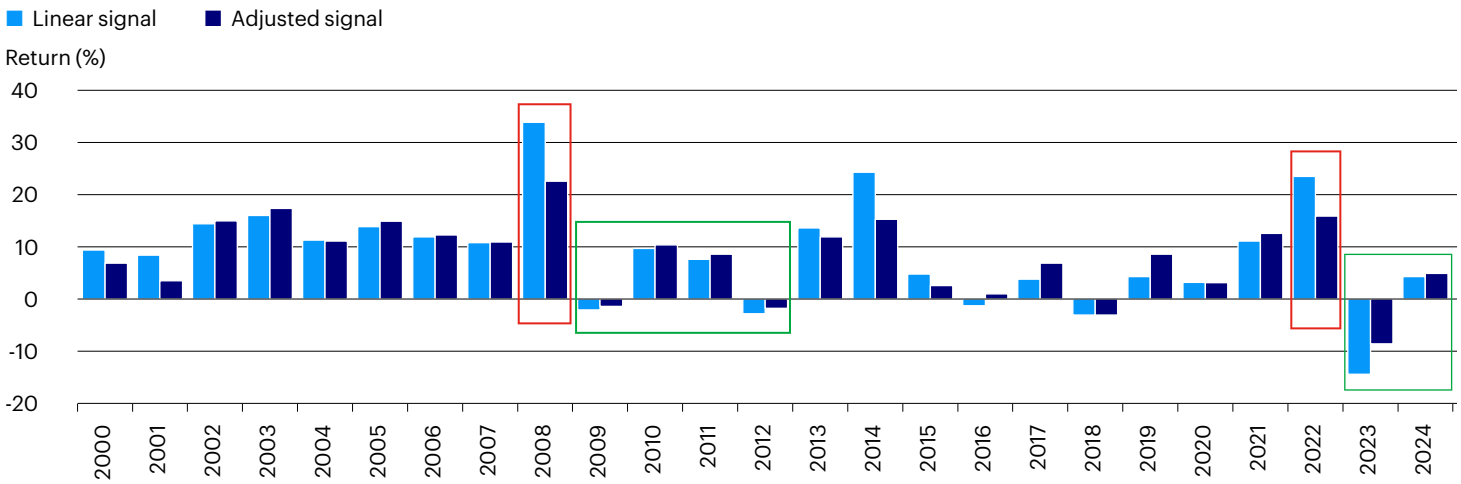
Source: Invesco analysis.

Table 3
Signal adjusting in comparison

	MSCI World	SG Trend Index	Linear signal	Adjusted signal
Return p.a. (%)	5.49	5.90	8.48	8.03
Volatility p.a. (%)	15.70	13.55	10.04	8.52
Sharpe ratio	0.23	0.30	0.66	0.73
Maximum drawdown (%)	-54.1	-20.7	-20.5	-12.8

Source: Bloomberg, Invesco analysis. **Past performance is not a guarantee of future results. An investment cannot be made in an index.**

Figure 6
Simulated annual return comparison



Source: Bloomberg, Invesco analysis. Data from December 31, 1999 to February 29, 2024. **There is no guarantee that the simulated performance will be achieved in the future.**

A trend-following managed futures strategy can provide attractive return potential and diversification.

Conclusion

A trend-following managed futures strategy can provide attractive return potential and diversification. But strategy parameters such as asset selection, binary or more continuous lookback signals, risk scaling, and signal mapping can have a material impact on the results. With the objective of smoother returns over a full market cycle and reduced drawdowns, this approach – with a dynamic adjustment of extreme negative signals – may mitigate losses in times of market stress and provide attractive risk-adjusted returns over time.

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The performance results shown are hypothetical (not real) and were achieved by means of the retroactive application of the statistical model. It may not be possible to replicate the hypothetical results. The simulation is for informational and educational purposes only and is not an offer of any investment product.

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