CFM
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November 2018

MAKING FAT RIGHT TAILS FATTER WITH TREND FOLLOWING...

Most of the time

Executive summary

Our prior work has demonstrated the mechanically convex behaviour of trend following that many in the investment industry have enthusiastically embraced as a possible protector of asset portfolios. In this short paper we develop and explain the consequences of these ideas in terms of how this convexity leads to a positively skewed returning strategy, which in turn then becomes a performance chaser's nightmare – selling after prolonged periods of inevitable disappointing performance before missing the next, unpredictable acceleration in positive performance. We contrast this with the P&Ls of most other strategies and assets that are predominantly negatively skewed. This opposing return pattern lures investors into a false sense of security and is equally dangerous to performance chasers. We argue that trend following should form a core and stably allocated component alongside traditional assets in a diversified portfolio. Performance chasers: beware!

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Introduction

Many probing questions have historically been asked about trend following and its longevity as a strategy. Many more probing questions were asked after most Commodity Trading Advisors (CTAs) – firms that predominantly exploit trend following strategies[1] – failed to 'protect' against the abrupt, and severe market sell-off in February earlier this year.[2] The efficacy of trend following as an anti-correlated strategy to equities, and, as it is often marketed, a *protective*[3] addition to a portfolio are some of the key qualities often espoused by trend managers. Trend followers on aggregate did, however, not live up to this misplaced expectation in February, when markets sold off and implied volatility went through the roof. The two most widely quoted CTA performance benchmarks, the Société Générale CTA (NEIXCTA) and BarclayHedge CTA (BARCCTA) indices fell by 6.3% and 3.7% respectively during February.[4] The S&P 500 meanwhile lost a 'mere' 3.9%.

Trend following strategies, in times of severe, instantaneous market jumps or corrections, have a 50% chance of being on the right or wrong side of a large market move. No trend following program could for instance have protected against the 8.7% tumble in the S&P 500 registered over the six trading days that started on Friday, February 2. Even the fastest trend signals would have been unable to react quickly enough to have profited from the downside move. Trend following, as such, is much more adept at providing uncorrelated protection in a long and drawn out bear market (also providing protection from a long and drawn out bull market!).

Speculation as to the apparent failure of trend following strategies is rife. Some observers ask whether trend following is 'dead',[5] while others claim that a new regime of higher volatility and a directionless environment will spell doom for trend followers. Some worry that trend followers have become too correlated with equities (offsetting its anti-correlated properties), while others have asserted that trend was killed by the large quantitative easing (QE) experiment of central banks, and that a rising interest rate environment will prove problematic.[6] It is worth noting that trend followers inherently do not hold, nor position a strategy on any discernible macroeconomic information.

It was, despite the mounting chorus of negative rhetoric, not so long ago that trend followers were considered the darlings of the alternative industry when CTAs outperformed during the 2008 financial crisis, surfing the downward trend in stocks, and the rally in bonds. The crisis revealed that money managers on the whole were exposed to an uncorrelated set of risk premia in normal times, only to become correlated in the heat of the crisis. Trend following proved itself to be an outlier in offering good returns (and liquidity) in a period of market stress.

One may nevertheless forgive the not-so-dyed-in-the-wool trend advocates of questioning the efficacy of trend following as a complimentary, alpha generating addition to a portfolio. Investors, one may rightly argue, are reasonable in rethinking their commitment to trend following, and/or hesitant to invest in a strategy that seemingly fails to protect against a sell-off, and moreover, has registered lacklustre performance since 2015. Yet, trend following strategies have remained popular with consistent inflows of nearly 15% average per annum since 2000. This growth may of course lead investors to question whether the space has become 'crowded'.

We acknowledge many investors' anxieties with the recent performance of trend following, along with the concerns about its protective properties, a crowded space, and correlation magnification. We nevertheless consistently champion the idea that trend following is a long term, diversifying strategy that is highly statistically significant, not overly sensitive to trading costs and takes advantage of one of the classic behavioural biases – that of the human propensity to follow trends. We furthermore believe it is in the best interest of any investor to remain invested, and not attempt to try and time entry and/or exit decisions. Investors and asset managers alike grapple with timing decisions, looking for spurious signals that may indicate an opportune time to either invest, or redeem from a strategy. Basing a decision on noisy price signals to enter or exit a position is fraught with difficulty, as we will explain below.

[1] Please see our paper entitled "Explaining hedge fund index returns" available on our website: https://www.cfm.fr/insights/explaining-hedge-fund-index-returns/

[2] For those who need reminding, the S&P 500 lost 2.1% on Friday February 2, (and 4.1% on the following Monday) with the index erasing most of its year to date gains by the following weekend. The debate as to the genesis of the selloff is varied, with most pundits placing the blame on the better-than-expected wage growth in the January Employment Report (non-farm payrolls) that was released on Friday, February 2. This unexpected wage growth prompted many investors to reconsider the trajectory of Federal Reserve rate hikes, placing bets that the Fed will become much more hawkish.

[3] The term 'Crisis Risk Offset®' or simply CRO is attributed to Pension Consulting Alliance (PCA) – a US-based consultancy that promote a class of strategies that are designed to "have a high probability of appreciating significantly during material market drawdowns while also generating a positive return over the long term". PCA count "Systematic Trend Following" as amongst one of these strategies.

[4] These two indices attempt to capture the aggregate performance of many managed futures. The SG CTA Index is a daily index, launched in 2000, containing the largest 20 CTA managers as measured by AUM with methodology that can be found here: https://cib.societegenerale.com/en/our-offering/global-markets/prime-services/prime-services-indices/
The BarclayHedge CTA Index, with data stretching back to 1980, only publishes monthly returns but contains a much larger sample of managed future managers: there are currently 541 programs included in the index. Methodology can be found here: https://www.barclayhedge.com/barclay-cta-indices/barclay-cta-index/

[5] See for instance: https://www.cmegroup.com/education/alternative-investment-resource-center/research/is-trend-following-dead.html

[6] See our paper entitled "CTAs in a Regime of Rising Rates", in which we empirically show that the performance of trend following is impervious to raising (or falling rates). The paper is available for download on our website: https://www.cfm.fr/insights/ctas-in-a-regime-of-rising-rates/

Convexity and skewness: a recap

Trend following has been shown to exhibit unique convexity features that are mechanically stable over timescales comparable to that used for the trend. Key to understanding why investors should proceed with caution when (or if) deciding to change their allocation to trend following is to understand the origin of the convexity and the 'positive skewness' that it produces. We have written extensively on the concept of convexity,[7] and while this paper is not intended to rehash nor expand on what has been well-covered before by ourselves and others, it is worth recapping what these stylised facts are, and tease out why these features are central to the danger of any attempt to time trend following.

Convexity is simply the feature where the P&L does not exhibit a linear relationship with the performance of the underlying instrument. In other words, if the price of an underlying changes, it does not hold that the output (the resulting P&L) will change by the same magnitude. In Figure 1 we demonstrate this mechanical feature of trend following by applying the strategy to the returns of a (necessarily unpredictable) random walk.[8] One sees clearly that the performance of the trend is positive for the infrequent, big moves up or down of the random walk. The overall total P&L is zero (again the random walk is unpredictable) but one observes convexity on the timescale of the trend.

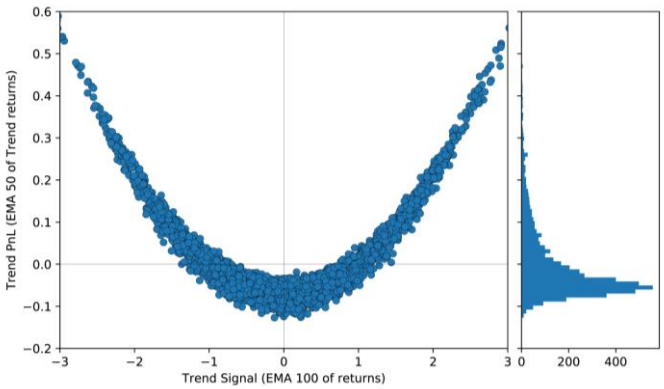


Figure 1: The convexity of trend following on a random walk. The y-axis is a 50 day Exponentially weighted Moving Average (EMA) of the P&L arising from applying a 100 day EMA to the timeseries while the x-axis corresponds to a 100 day EMA of the timeseries. On the right hand side one sees the cross sectional profile of the averaged trend following returns that exhibits a clear positive skew albeit with a zero mean. Stated differently, the P&L of trend following on a random walk is positively skewed on a timescale comparable to that of the trend but the overall long term P&L is necessarily zero (the random walk being unpredictable!)

This same convex payoff is most commonly associated with buying options. Buying options is a sure-fire way to protect against big moves in a market, but, is by its nature a very costly proposition. If an investor harbours a specific investment mandate or objective, this cost could be a justifiable expense. Nevertheless, we want to stress that trend following should not be compared to buying options (or considered a suitable replacement) as a hedge against large, instantaneous moves in the price of assets. Trend following instead offers protection to long, drawn-out and protracted large moves.

Strategies can also be said to exhibit either positive, or negative *skewness*. Skewness is a measure of symmetry, i.e. how symmetrical the return distribution is. Being long the market is typically a negatively skewed strategy – many small gains are made, but the occasional large loss should be endured (think of February). A positively skewed strategy, on the other hand, is one where many small losses, but a few large gains are registered. Buying options, for example, is a positively skewed strategy: one buys options (paying a premium and taking on small 'losses') in order to be protected from large moves in the underlying instrument (when your option insurance pays out). Selling volatility is then, conversely, a negatively skewed strategy – it is the mirror opposite of buying options! We show the P&L of being systematically short options in Figure 2 where one clearly sees a negatively skewed return stream, albeit one with an overall positive return and Sharpe ratio. The relationship between convexity and skewness is again mechanical. A strategy such as trend following that exhibits large positive returns infrequently and small negative (or at least close to zero) returns frequently translates into a positively skewed return distribution. Convexity and skewness are therefore one and the same thing.

[7] See our paper "The Convexity of Trend Following: Protecting your assets but perhaps not as much as you would like!" available on the CFM website: https://www.cfm.fr/insights/the-convexity-of-trend-following/. Or, for a more technical and in-depth explanation, we invite you to read our academic paper, "Tail protection for long investors: Trend convexity at work" available on arXiv: https://arxiv.org/pdf/1607.02410.pdf

[8] One can build a fake timeseries of price returns by generating random numbers taken from a bell shaped distribution and summing them up. The timeseries of S&P 500 returns, for example, can be thought of as one "Random Walk". Using random numbers has the advantage of being able to generate as much data as we need!

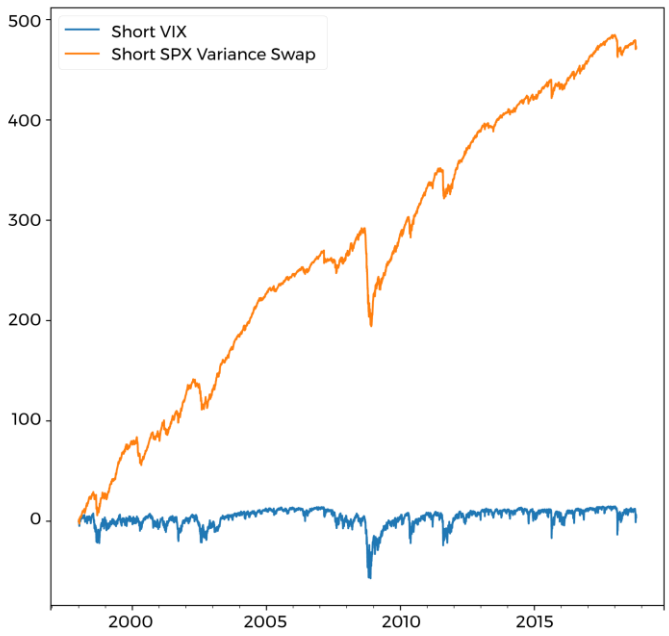


Figure 2: The inverted or 'short' VIX timeseries and the P&L of being short a Variance Swap on the SPX - the archetypal negatively skewed strategy. The protection P&L, buying the Variance Swap, is the mirror opposite of this and is therefore a costly, albeit positively skewed, strategy.

We have shown how trend following exhibits *positive skewness*, due to its mechanical convexity, and how the return profile is therefore uniquely different from most underlying asset classes. This return distribution is exactly what has made, and, in our opinion, will continue to make trend following an attractive addition to any portfolio, i.e. its ability to protect against long and protracted drawdowns in traditional asset classes. CTAs, put another way, attempt to *preserve* the upside potential of traditional beta, while *limiting* the downside risk.

The positive skewness and protective features of trend following thus make it behaviourally appealing. Most market participants, as behavioural economists have shown, succumb to the same behavioural idiosyncrasies, namely a much stronger aversion to losses than the relative enjoyment of gains.[9] These behavioural traits are persistent over time, with Paul Samuelson once having quipped that "a person's capacity for risk could no more be changed than his nose".[10] This is one of the reasons that selling insurance is such a lucrative business: people are willing to sacrifice a lot in order to avoid huge losses! Trend following has the best of both worlds – a positive Sharpe ratio and a positive skewness – meaning instead of paying a premium for protection, investors receive a premium *and* get protection, albeit only statistically.

However, the positive skewness of the trend following P&L also brings its own behavioural challenges and investors often find it tough to stay the course. Investors too sensitive to loss aversion impulses, and, confronted with a positively skewed strategy such as trend following – where small losses occur frequently and can persist – are overwhelmed by these impulses and often shy from this, and other similar strategies. Investors and managers are moreover stymied by entrenched incentive structures that are too commonly focused on short-term performance, where Year-To-Date performance can determine bonuses and careers.

The positive skewness of trend following – which timescale is your favourite?

The return skewness of trend following can be illustrated with the return distribution of the monthly returns of the BarclayHedge CTA index in Figure 3.[11] The returns in the histogram are clearly positively skewed, i.e. concentrated on the right-hand side (positive) side of the return distribution.

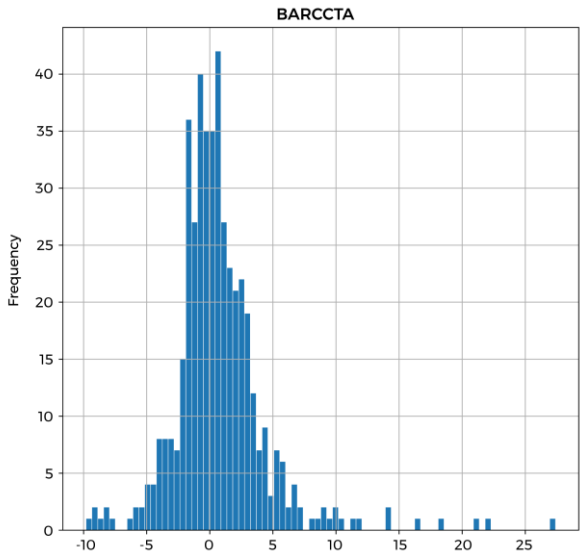


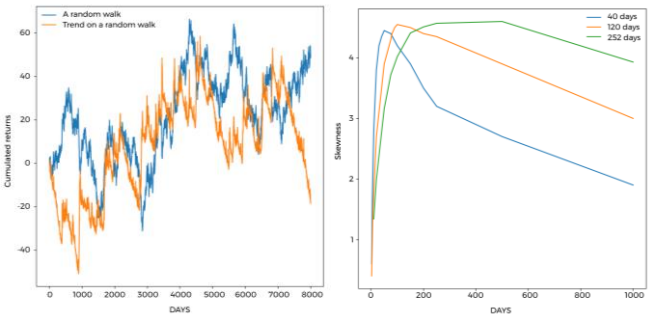
Figure 3: The monthly return distribution of the Barclay Hedge CTA Index since 1980. The returns are visually seen to be positively skewed, with a 'fat' right tail, i.e. infrequent large positive returns (on the right-hand side of the return distribution).

[9] Curious readers may find the seminal works of Daniel Kahneman, Amos Tversky, and Richard Thaler particularly revealing. See for example "Prospect Theory: An Analysis of Decision under Risk" by Kahneman and Tversky, as well as "The Effect of Myopia and Loss Aversion on Risk Taking: An Experimental Test" by Thaler et al.

[10] "When does the case for long-term investment make sense?" From The Economist: https://www.economist.com/finance-and-economics/2018/10/13/when-does-the-case-for-long-term-investment-make-sense

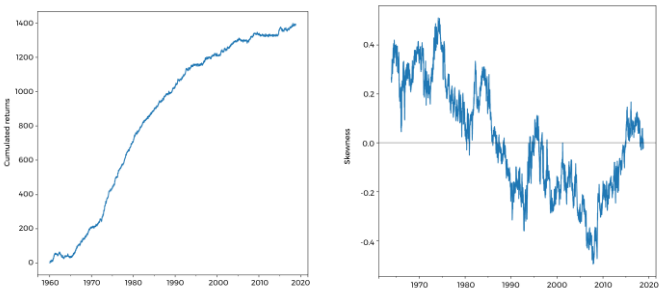
[11] Our paper on explaining Hedge Fund indices (see footnote 1 for more details and a link to the paper) shows that CTAs can be accurately modelled with trend following and this same positively skewed distribution can be generated using a generic trend following approach.

This *monthly* return distribution is satisfactorily positively skewed. Looking at a more granular level, on a *daily* timescale for example, reveals return distributions that are more *symmetric*. This is a natural consequence of the source of the convexity of trend following being on (or close to) the timescale of the trend. A trend follower cannot offer protection against a big instantaneous move in an underlying as the strategy has, as we mentioned earlier, a 50/50 chance of being on the right or wrong side of the move. If this move leads to a protracted, drawn out move in either direction then the trend follower adapts his position and benefits all the while the move persists. In order to illustrate this we show in Panel 1 the skewness[12] of the returns of trend following on different timescales resulting from applying a standard implementation using exponentially weighted moving averages of price returns on three different timescales (2 months, 6 months, and 1 year), to a timeseries of random numbers. One sees, as expected, that first the skewness on a daily timescale is strictly zero, whereas, as one decreases the return sampling frequency from daily, to weekly, to monthly etc., that the skewness of the trend following returns peaks at timescales close to that of the trend timescale. This is indeed interesting - an investor can maximise the skewness on his preferred timescale by trending on something close to that timescale. From a behavioural perspective maybe the preferred timescale should be that of the frequency of an allocator's own work performance appraisal i.e. 6 months or a year?!



Panel 1: On the left hand side we illustrate a random walk (blue line) and trend following on that same random walk (orange line). The positive skewness of the orange line is quite clear with infrequent large moves up and frequent small moves down. The overall return of the trend following strategy is close to zero as expected. On the right hand side we measure the skewness of the trend following returns using return windows of differing lengths for three different trend timescales. For each trend timescale the skewness of 1 day returns is strictly zero. As we increase the size of the windows – weekly, fortnightly, monthly returns etc. – one observes a positive skewness emerging that peaks at timescales close to the trend timescale itself.

Measures of skewness on daily timescales have been studied as a potential indicator or precursor to a crowded trade[13] – the unwinding of multiple investors generating a downward spiral of performance as selling trades lead to further unwinding and negatively skewed returns. The daily skewness of trend following is indeed changing through time and has passed from being positive to being distinctly negative with recent data – see Panel 2 below that shows this pattern using real daily return data. The daily returns of trend following are however very sensitive to the very short term autocorrelation of price returns. Trend following on artificially, serially autocorrelated returns (today's return then easily being forecast by what happened yesterday) leads to an enhanced daily skewness.[14] We feel it is more likely that the reduction in daily skewness of trend following is actually due to the disappearance of a short term (on the timescale of a few days) autocorrelation, rather than a crowding of the trade presumably due to more competition in the short term space with barriers to entry to these markets having being lowered which could indeed, therefore, be loosely referred to as crowding. The longer term autocorrelation of price returns remains robustly present on the other hand.



Panel 2: The performance of a short term (3 day) trend (left plot) applied to a portfolio of approximately 40 futures and the rolling skew of a 100 day trend (a timescale closer to that of the CTA industry) on the same pool of futures that has evolved over time from being positive to negative (right plot). The short term trend performance does not include trading costs and the inclusion of realistic cost estimates results in a loss making strategy. However, one observes on the left that the short term autocorrelation of price returns was strong in the past (albeit not strong enough to beat costs) and weakening as we approach recent data. The daily skew of the 100 day trend was positive and has evolved towards being more negative, an effect that can also be related to the disappearance of a short term trend signal.

[12] Measured as Pearson's second skewness coefficient https://en.wikipedia.org/wiki/Skewness#Pearson%27s_second_skewness_coefficient_(median_skewness)

[13] Please see our paper, entitled "Two centuries of trend following", available on our website: https://www.cfm.fr/insights/two-centuries-of-trend-following/

[14] As discussed in our academic paper entitled "Tail protection for long investors: convexity at work", assuming an autocorrelation structure $C(u) = q^u$ with $0<q<<1$ and u the separation in time of daily returns, one finds that the skewness of daily returns is $6q + O(q^2)$.. If q is positive (short term autocorrelated daily returns) then the skew is positive whereas if q=0, as is the case for a random walk, then the daily skew is zero. Please refer to this paper that can be downloaded from our website: https://www.cfm.fr/insights/tail-protection-for-long-investors-convexity-at-work/

Conclusion

Much has been written about trend following. One of the more successful and popular books in financial literature, a desk-bending behemoth, entitled, simply, *Trend Following* championed many of the benefits, and, equally, highlighted the drawbacks of trend following.[15] We have similarly concluded plenty of research on trend following, and have shown that it has properties, albeit over timescales comparable to that of the trend approach employed, that make it a suitable addition to most traditional portfolios.[16]

Investors and asset managers alike have contemplated the merits of 'timing' managed futures, which is to say to estimate the most opportune entry or exit time. Theoretically, this presents an obvious dilemma, since claiming an ability to time one's entry or exit is predicated on an ability to predict the future performance of the trend following strategy itself. Even if, in a hypothetical setting, one could manage to tactically and successfully engage in timing entry and exit decisions, one should account for additional transaction costs - one could tactically time the market only if the additional alpha harvested from such a strategy exceeds the trading costs.

We instead prefer to take an empirical approach. Trend following produces a long term highly statistically significant P&L; can be slowed such that it is relatively insensitive to costs; has produced good out-of-sample returns; and seems consistent with the preponderance of literature demonstrating that human beings find it difficult to avoid following trends! Even the way that investors and analysts were forecasting the death of trend following prior to the acceleration of performance in 2014 of the CTA industry, only to be followed by those same investors and analysts reinvesting having seen the error of their ways – illustrates the way that people trend follow on the performance of trend following itself. This anecdotal example, but, similar to many similar examples in history, demonstrate the perverse (but persistent) nature of investors' inherent need to follow trends.

We have demonstrated that the mechanically convex nature of trend following also produces mechanically positively skewed returns, albeit with a skewness that is maximised on the timescale of the trend. This feature of the strategy makes for an uncomfortable ride for the investment industry's performance chasers – being attracted to the strategy and investing after the draw ups while being inevitably disappointed and redeeming prior to the next one. It is our belief, based on the extensive research we have done on the strategy, that these accelerations are unpredictable. Therefore, to garner the most benefit from the strategy one needs to allocate to it as a core component of a portfolio.

Interestingly, negatively skewed strategies also pose problems for performance chasers. Investors are lulled into a false sense of security as (often hidden) risk goes unseen for long periods of time, leading to overinvestment and the inevitable tears that follow when strategies sell off – leaving portfolios and investors to attempt to recuperate losses. Ironically, this often involves a subsequent investment in a recently over performing trend follower only to redeem months and years later while impatiently awaiting the next draw up!

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[15] Trend Following: How to Make a Fortune in Bull, Bear, and Black Swan Markets. Michael W. Covel

[16] Here the reader is again encouraged to refer to our "Two centuries of trend following" paper, specifically in section 4.4 for further details.

CFM has pioneered and applied an academic and scientific approach to financial markets, creating award winning strategies and a market leading investment management firm.

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