KeyQuant

Research Insights

# Unfortunately, my CTA was diversified!

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PAST RESULTS ARE NOT NECESSARILY INDICATIVE OF FUTURE RESULTS

## Abstract

*The CTA space is now more diverse than ever. When considering an investment in CTAs for risk mitigation purposes, how to pick the right one? In this note we will take a closer look at multistrategy CTAs and analyze how they fare in comparison to their pure trend counterparts. We find pure trend CTAs offer a better protection against deep losses of traditional portfolios than multistrategy CTAs. The quest for improving their standalone profile might have come with adding convergent strategies, though complementary to trend, but in some way similar to the investors' existing underlying portfolios.*


# Introduction

You probably remember the 2008 global financial crisis. Markets were upside down, trust in the system evaporated overnight. Stocks were losing more value every day. It was frustrating to see all of these long-built gains wiped out… And no hope for a quick recovery on the horizon. The situation went from bad to worse, when the panic and the desperate need for liquidity triggered waves of redemptions and deleveraging, crystallizing losses at the worst moment. Hedge fund investments were not spared by this global crisis either. Their supposed decorrelation with financial markets vanished as they were experiencing losses as well. Ironically, the only strategies that did not suspend redemptions thanks to their liquidity (like CTAs) also were the ones delivering strong positive performance.

The post-crisis years were years of success for CTAs in terms of asset raising. They had proven their value-add: they had delivered strong positive performance in market chaos, true diversification and liquidity. CTAs were the hedge fund strategy to have in your portfolio.

Time went by. Equity markets had the greatest rally ever. Central banks made a vow of never letting another 2008 happen again. Since then, at the slightest sign of a crisis, central banks have taken actions to fight market falls, providing investors with an artificial hedge. With the spectrum of a crisis fading in the distant past, the lumpy yet positive returns of CTAs over the last decade, many investors challenged their very use in their portfolio. In this context, some CTA managers diversified away from their core trend system, thus morphing from pure trend to "multistrategy" CTAs, in order to smooth their return profile.

But, what will happen when the next crisis hits the markets? Will these multistrategy CTAs prove themselves as useful as their trend counterparts in protecting your portfolio against large drawdowns? In this situation, will it matter that they had a better standalone Sharpe ratio when everything else was performing well?

In this paper, we take a closer look at multistrategy CTAs and pure trend CTAs and take an empirical approach in order to answer these questions.

# Drawdown compensation and correlation

*A stitch in time saves nine…*

Fortunately, markets are currently not in crisis mode. So now is a good time to ask yourselves: should we hold CTAs and why?

Very often the argument in favour of a CTA allocation is "diversification". But, what is this so called "diversification"? What is it supposed to achieve?

The idea is to mix various asset types and investment styles to limit exposure to any single asset or risk. The rationale is that, on average, a diversified portfolio will yield higher long-term returns and bear lower risk. In the classic portfolio theory, a diversified portfolio is built using "uncorrelated" assets/strategies and the risk is expressed in terms of volatility.

But volatility is not necessarily the most dangerous risk.

What most investors actually want to avoid is a loss, and more so, a permanent loss. Therefore, drawdowns are the real issue at stake and more specifically long and deep drawdowns. Short-lived drawdowns are, by definition, short-lived. They do not prompt structural changes in your portfolio, nor do they impede your ability to fulfil your long-term obligations. If your portfolio loses 7% in one month and that 7% loss is recouped after two months, this will not trigger waves of redemptions from your clients, raise questions about your ability as portfolio manager or set off massive deleveraging. On the other end, if these losses persist, your stakeholders may lose faith or may need to take back some of their cash and thus the snowball effect kicks in. Redemption and deleveraging crystallize losses, which are then even harder to recoup.

The long drawdowns are definitely one of the risks that you want to mitigate…But are the correlation and Sharpe ratio model the right tools to achieve that?

We created two portfolios with two underlying assets for the sake of simplicity to illustrate our point. Portfolio P+A is constructed with two assets that have a correlation of zero and portfolio P+B is constructed with two assets that have a correlation of one, all else being equal.

We can see on Figure 1 that the portfolio with the zero-correlated assets experiences a deeper drawdown than the portfolio with the two correlated assets. It is simply because correlation does not measure the long-term similarity between the assets' paths but rather the compensation of the daily returns (relative to their respective mean). Two assets can be uncorrelated and experience drawdowns at the same time.

Correlation is tricky and also unstable. Strategies can look uncorrelated at a certain point in time but then re-correlate at other times (often for the worse). This is partly why some hedge fund strategies have disappointed investors.

We can conclude that if one of your goals is to protect your portfolio against permanent losses, looking at correlation for diversification will not necessarily provide the full picture. In that context, it is important to evaluate the actual drawdown mitigation properties of the strategies under review.

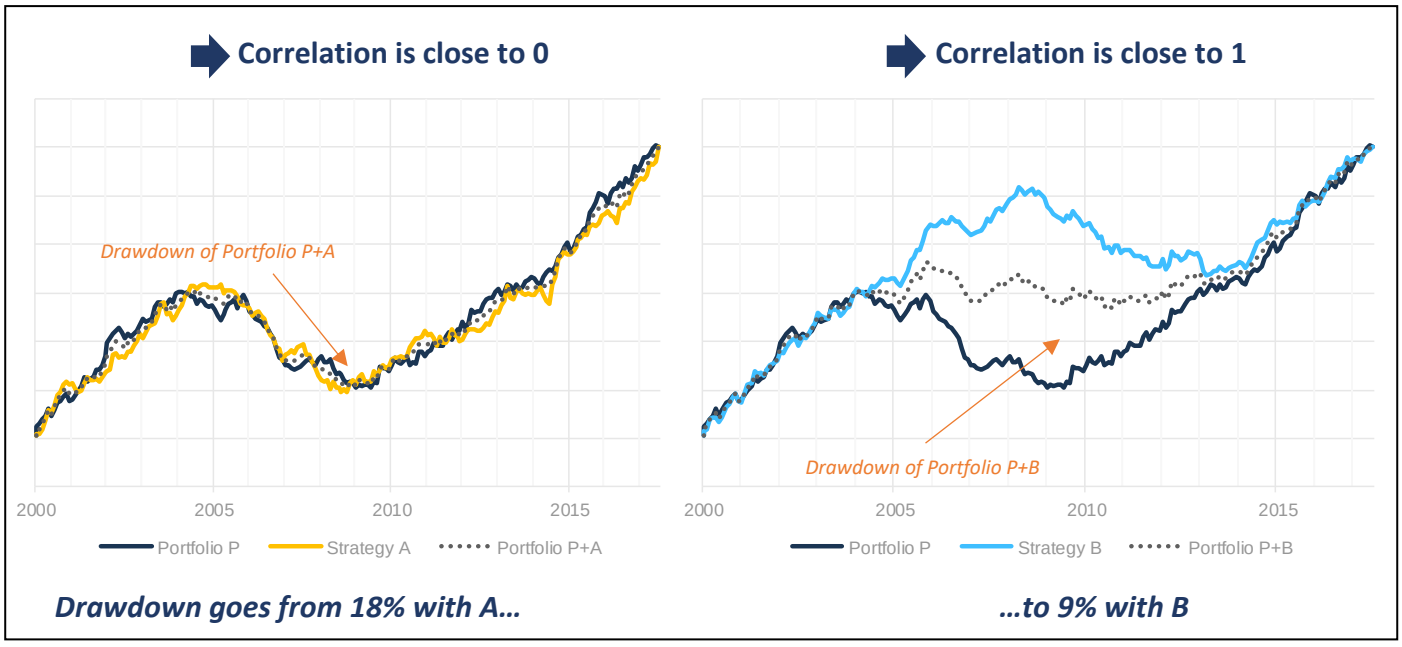


Figure 1: Left panel shows the NAVs of a portfolio P (blue), a strategy A (yellow) and the resulting equal-weighted portfolio P+A (dotted grey). Right panel shows the NAVs of the same portfolio P, a strategy B (light blue) and the resulting equal-weighted portfolio P+B (dotted grey). (Source: KeyQuant)

As introduced earlier in this paper, a plethora of CTA styles have emerged in response to the quest for higher standalone Sharpe ratio. The question is: which type of CTA is most likely to protect your portfolio? Is a multistrategy CTA going to provide sufficient upside when a crisis or a persistent downturn hits the markets?

# Drawdown compensation: Pure Trend vs. Multistrategy

Let's start with a very simple exercise: assess the impact of both pure trend and multistrategy CTAs on the drawdowns of a standard portfolio (of either a traditional 60/40 or a global hedge fund).

What we consider as your standard portfolio is either:

- The traditional portfolio: a constant daily 60/40 allocation in equities/bonds, respectively, and equally-weighted between the US and Europe[1]
- The global hedge fund portfolio is represented by the HFRI Fund of Funds Index, reported on a monthly basis[2]

What we consider as pure trend or multistrategy CTA are:

- The pure trend CTA is proxied by the SG Trend Index, which contains the largest ten trend followers
- The multistrategy CTA is proxied by the SG CTA-ex-Trend Index, which contains the funds that are present in the SG CTA Index and absent from the SG Trend Index[3,4].


Figure 2: Ulcer Performance Index (UPI) of two standard portfolios, traditional 60/40 (left) or global hedge fund (right), diversified with an incremental portion of CTA. Portfolios with the pure trend CTA are in dark blue, whereas portfolios with the multistrategy are in purple. (Source: KeyQuant)

[1] Indices included in the traditional portfolio are: S&P500 TR, EuroStoxx50 TR, Barcap US 10Y and Barcap Euro 10Y (Data source: Bloomberg).

[2] The HFRI Fund Weighted or Asset Weighted Composite indexes are not replicable due to a high number of funds present in it.

[3] Both SG CTA and Trend Indexes can be found on Société Générale's website: https://wholesale.banking.societegenerale.com/en/prime-services-indices/. Methodology and returns are available.

[4] Again, we thank Société Générale for kindly providing this index and are especially grateful to Tom Wrobel and Liu Lianyan for their help.

The impact on drawdowns will be analysed by looking at the evolution of the return-to-drawdown ratio (Ulcer Performance Index, UPI) over varying levels of portfolio allocation.[5] The higher the ratio, the more diversifying the added strategy is.

Starting from the standard portfolio, we simulate the incremental addition of either CTA (see figure 2 above). We voluntarily limit the investment in a CTA to 25% of the global portfolio. Indeed, we assume higher allocations are not realistic, since it would result in the diversifier becoming the core investment.

Results are indisputable. The pure trend CTA is a far better diversifier than the multistrategy CTA, for both modelled portfolios. The return-to-drawdown ratio (UPI) increases twofold for an equity/bond portfolio versus only 57% for a multistrategy CTA. If you were to possess a traditional 60/40 portfolio and diversify it with 25% of a pure trend CTA, you would reduce your average drawdown by a factor 2, considering a fixed return.

You might be wondering: "ok, pure trend CTA have historically showed a much better ability to compensate the dramatics losses of a traditional or hedge fund portfolio, but is this going to hold true in the future? Is the pure trend CTA going to better protect my portfolio from future crises?" You are correct, there is no point in analysing the past if it is of no use for the important part: the future. So, to address this issue, we are going to dive deeper into the results and study performance drivers.

# The trend characteristics and the role of skew and convexity

As a divergent strategy, trendfollowing is inherently positively-skewed *(i.e. more observations of strong positive returns vs strong negative returns).*

Convergent strategies will take profits and double up on losses because convergent risk takers believe their world to be well structured, stable and somewhat dependable (Rzepczinsky, 1999). They believe assets have a "fair value" and that the price will end up converging toward that fair value. In other words, they are convinced that they will win in the long-run and therefore they are willing to keep betting until they do and then take profits. They believe that the risk is known: it is the probability that a negative but predictable event will happen. Convergent strategies have many small gains with occasional big losses, thus their return distribution is, by construction, negatively-skewed.

On the other hand, divergent strategies cut losses and double up on a win as divergent risk takers believe that there is a degree of uncertainty in the risk they are facing and that a price can diverge from its "fair value" in the long run. For them the risk is a situation where the events, their magnitude and probabilities, are unknown. As the risk they face cannot be quantified, they cut the losses and run with the gains. Divergent strategies have typically many small losses with occasional huge gains, which is why their return distribution is, by construction, positively skewed.

Trendfollowing strategies clearly fall within the divergent category: they ride the trends (double up when they win) and cut the losses.

There is a lot to be told on the convergent/divergent subject, but it is not the point of this paper therefore we leave this discussion as it is. We focus on the impact of this view of risk on strategies and their return distribution.

We have established that trendfollowing is a divergent and therefore positively skewed strategy. What does it tell us regarding its natural ability to compensate drawdowns?

In order to assess this, we need to have a look at when the positive skew is expressed relatively to the traditional portfolio performance.

[5] Please see Martin (1987) and our white paper Alternative Portfolio Theory (2017) for further details.

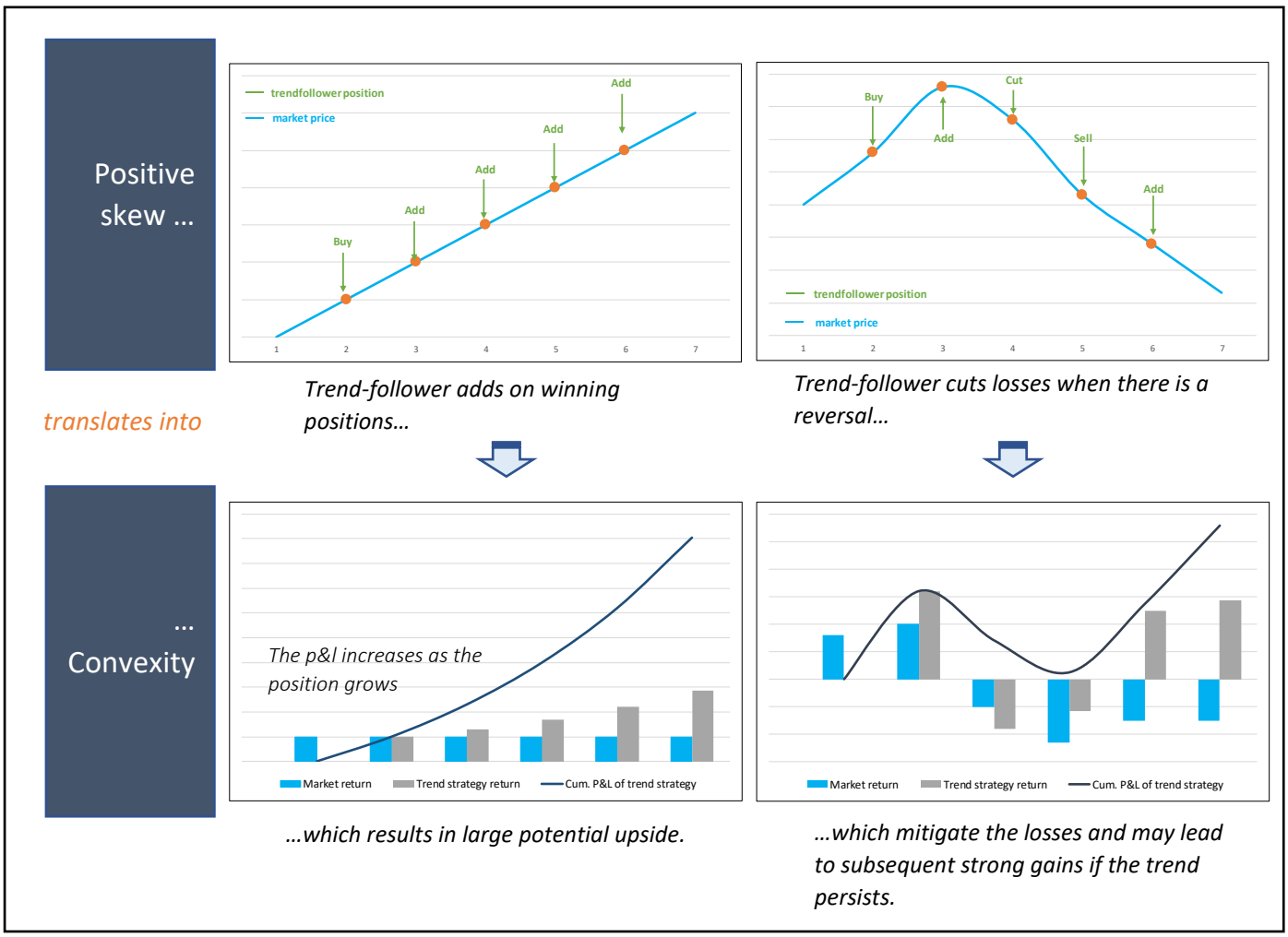


Figure 3: Left panel shows a market with a continuing trend whereas the right panel shows a reversal market. Bottom charts exhibit a simple trend strategy cumulative p&l and underlying market and strategy returns. (Source: KeyQuant)

To do so, we introduce the concept of convexity. In accordance with Sepp (2018), we differentiate skewness from convexity. A strategy is said to be convex when its return profile is non-linear, having both positive returns when the underlying asset exhibits extreme losses and gains, whereas the skewness characterizes the standalone return distribution. In other words, convexity reveals the full potential of skewness, when properly 'located'. An example of a strategy with positively-skewed returns and without convexity is the "Short Bias".

Several financial industry papers (Man AHL 2012 and CFM 2018) proved mathematically, under certain assumptions on the distribution of the underlying returns, that a simple trend strategy brings positive convexity. [6]

Figure 3 is a chart that theoretically shows why trendfollowing positive skew is correctly located in relation to the underlying asset, with a simple example.

We have established that a trendfollowing strategy would produce a convex return profile on any underlying asset. However, the traditional portfolio is not just any asset, and for that to hold true, the markets traded by the CTAs would need to be similar to the assets traded in the traditional portfolio.

[6] Beware, this is the result of simple mechanisms and assumptions regarding the behavior of underlying assets. Based on the speed of the trend signal and the asset profile, the skewness depends on the frequency of observation and can be negative in certain setups.

We can conclude that the trendfollowing strategies have a convex return profile (defined as the ability to have both positive returns when the underlying assets exhibit extreme losses and gains), and that specific profile explains why they are able to compensate the traditional portfolio drawdowns. Let's see if the empirical evidence confirms our findings.

To do so, we are going to analyse the rolling monthly returns of the portfolio and the diversifiers. We focus on the traditional 60/40 portfolio as the core portfolio to have more data and statistical significance, since daily data is available.

We observe on Figure 4 a blue smile on the pure trend CTA (T-statistic of the convexity beta is 7.60), and not on the multistrategy CTA. This concept, borrowed from the option pricing world, means that frequently, the pure CTA posts large positive gains when the core portfolio is having large losses or gains. This explains why the pure trend CTA better improves the overall drawdown profile of the core portfolio.

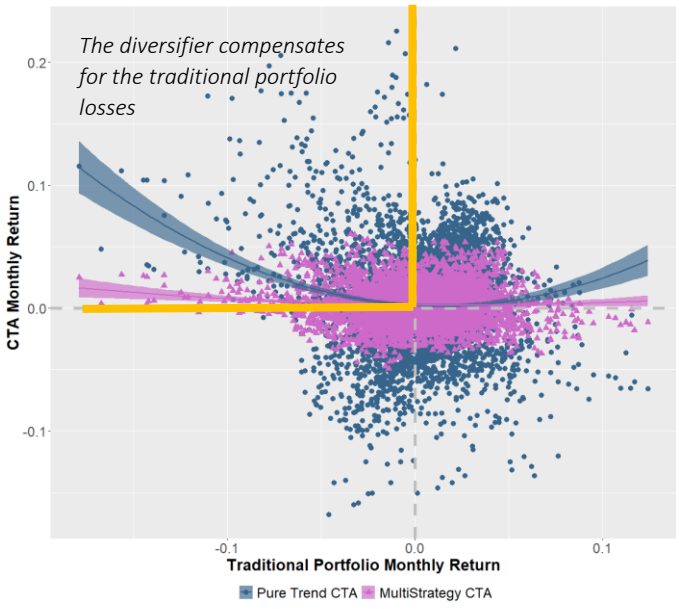


Figure 4: Scatterplot of rolling monthly returns, with the diversifying asset (either pure trend CTA or multistrategy CTA) on the y-axis and the traditional portfolio on the x-axis. (Source: KeyQuant)

The frequency of points, coupled with the inherent convex profile of trendfollowing strategies, allow us to say with confidence that the pure trend CTA is a better diversifier of a traditional portfolio. The "pure trend CTA-smile" indicates that the strategy would deliver a profile similar to a "long straddle" (Fung and Hsieh 2001) for a fraction of the cost available in the option market. This is of course to be mitigated as these two strategies have different drivers and do not react to the same factors. This still indicates that pure trend CTAs can mitigate traditional portfolio drawdowns while delivering a positive expected return over the long run, which differentiates it from a pure insurance strategy - being costly to maintain.

In order to better quantify the observation we made from the convexity smile, we will use the Capture Measure (CM), which calculates the average performance of the two CTAs (pure trend and multistrategy) when the traditional portfolio loses more than s% (with s=0%, s=-5%, and s=-10%).

| | $CM_{MultiStrategy\ CTA}$ | $CM_{Pure\ Trend\ CTA}$ |
|---|---|---|
| 0% | 0.24% | 0.21% |
| −5% | 0.90% | 4.57% |
| −10% | 1.32% | 7.14% |

Table 1: Capture measures for multistrategy and pure trend CTAs, for three loss thresholds of the traditional portfolio. (Source: KeyQuant)

The Capture Measure confirms the results found: severe losses of the traditional assets are much better compensated with a pure trend allocation. During months where your traditional portfolio lost more than 5% of its value, the pure trend CTA delivered on average +4.6% while multistrategy CTAs delivered a mere +0.9%. These CTAs may offer a smoother profile and better standalone Sharpe ratio but the protection they offer in crisis mode is quite limited.

Now let's have a look at the strategies that were added in the multistrategy CTA to understand why their diversification properties have been neutralized. What are their characteristics? How do they behave when the traditional portfolio experiences losses?

# The characteristics of non-trend component of Multistrategy CTAs

To answer these questions, we extract the non-trend part of the multistrategy CTA by regressing it on the pure trend CTA, as per the standard linear regression model.

The strategies that were added in the multistrategy CTA are thus captured in the residuals and in the alpha of the regression.[7] We will refer to these strategies as "unexplained" in the remainder of the paper.

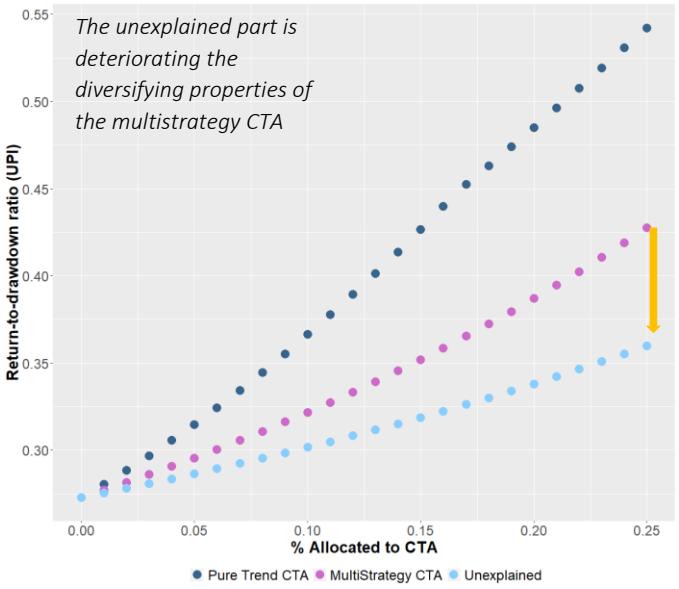


Figure 5: Ulcer Performance Index of the traditional portfolio, diversified with either the pure trend CTA, the multistrategy CTA, or the 'Unexplained' strategies. The proportion of the diversifying asset reads on the x-axis. (Source: KeyQuant)

We perform the same analysis as in the first part of this paper and look at the impact of adding the "unexplained" strategies on a traditional portfolio drawdown profile. As a reminder, we use the return-to-drawdown ratio (Ulcer Performance Index, UPI) as a proxy. The higher the ratio is, the more diversifying the added strategy is.

Figure 5 tells us that the non-trend part of the multistrategy CTA is clearly detrimental to the diversification benefits they offer. Let's have a look at its left convexity profile.

| | $CM_{MultiStrategy\ CTA}$ | $CM_{Pure\ Trend\ CTA}$ | $CM_{Unexplained}$ |
|---|---|---|---|
| 0% | 0.24% | 0.21% | 0.21% |
| −5% | 0.90% | 4.57% | -0.07% |
| −10% | 1.32% | 7.14% | -0.22% |

Table 2: Capture measures for multistrategy, pure trend and Unexplained strategies, for three loss thresholds of the traditional portfolio. (Source: KeyQuant)

Not surprisingly, the unexplained part of the multistrategy index does poorly when the traditional portfolio is losing (see Table 2). Therefore, we can say that the strategies that have been added to diversify the trend returns makes multistrategy CTAs more similar to the equity bonds portfolio.

Indeed, since trendfollowing is a divergent strategy, the potential candidates were among the convergent space. However, it seems convergent strategies experience drawdowns at the same time as equities do, so adding them to the portfolio de facto deteriorates its diversification to a traditional portfolio.

This is consistent with the fact that most strategies employed in the hedge fund industry are convergent, with a negative skew, and drawdowns which are more synchronized with those of a traditional portfolio. We confirmed this in the chart below which shows the Capture Measure for most Hedge Fund strategies.

[7] This model is static, with one set of parameters $(\alpha; \beta)$ estimated for the whole sample. As a result, we implicitly assume a constant allocation of trend within the multistrategy CTA. Which might not be fully representative of the reality, as poor performance of trend could result in the managers reducing their weight in the portfolio unilaterally, despite strong hedging properties. The absence of style drift in the model might be the main reason behind the difficulty to understand what the unexplained part is composed of.

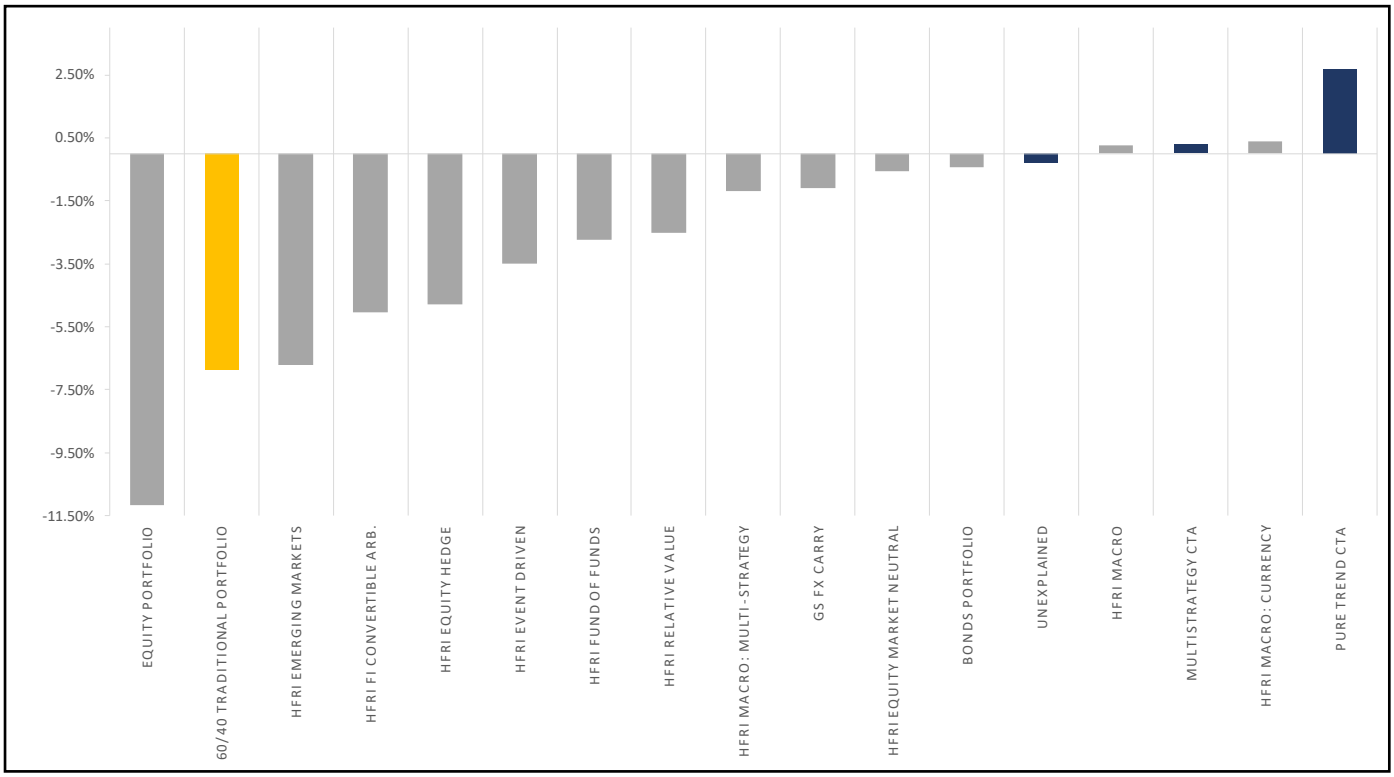


Figure 6: Capture measures of our CTA proxies and hedge fund indices, for a minimum loss of the traditional portfolio of 5% (calendar monthly returns). (Source: KeyQuant)

What Figure 6 tells is crystal clear: the pure trend CTA is the only hedge fund strategy that delivers on average a positive performance when the traditional portfolio is losing. This is consistent with the hypothesis formulated above, that the non-trend component of the multistrategy portfolio is detrimental to the desired diversification properties of CTA strategies.

# Conclusion

Let's dismiss the "zero risk of crisis" hypothesis before resuming our reasoning. Yes, we're not there yet, (as of mid-February 2020) equity markets have been on the longest bull run in history. But, can we reasonably discount the crisis risk and build a portfolio on the assumption that such an event will never happen again? Even if you believe that the risk is low, when it does occur, the consequences to an un-protected portfolio are so permanent that it cannot be ignored.

Now, some market experts will say that CTAs have not offered protection in the recent past, but as explained in the first part of this paper, CTAs do not aim to protect portfolio from short-lived drawdowns. If these drawdowns are short-lived, then by definition, losses will be recouped after a couple of months. The bigger risk is when the recovery is slow, and this is exactly when CTAs strive.

Yet, CTAs are not all equal when it comes to providing these diversification and risk mitigation benefits.

Multistrategy CTAs offer more of an absolute return type of profile with undoubtedly a much smoother ride than pure trend strategies. For that reason, they are easier to defend but they do not provide similar diversification and risk mitigation properties. The type of strategies that were added alongside trend have effectively deteriorated their diversification benefits. One of the explanations could be that what has been added to improve the stand-alone Sharpe ratios is convergent and experiences drawdowns synchronously with equity markets.

Trendfollowing returns are overall positive but more erratic and therefore, it is harder to hold on to the strategy. Nevertheless, they are by construction positively skewed and convex, which means that they can provide strong positive returns when the traditional portfolio (be it equity/bonds or hedge funds) is experiencing painful drawdowns. They offer true diversification. In short, no pain, no gain.

The choice between multistrategy and pure trend CTAs is not an easy one. It depends on your investment objectives and what you have in your portfolio. But for those who have already engaged in adding alternative strategies to their portfolio, the question is "are they really diversifying or just diversified?"

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*We are more than happy to receive feedback, questions or to engage in discussions regarding CTAs or quantitative investments in general.*

# Appendices

## Definitions

| | |
|---|---|
| Sharpe Ratio | $\frac{Annualized\ Return}{Annualized\ Volatility}$ |
| Ulcer Index | $Average\ Drawdown$ |
| Ulcer Performance Index | $\frac{Annualized\ Return}{Average\ Drawdown}$ |

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