When Do Trend Followers Make Money?

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1 Introduction

Investors allocate to long-term trend followers in part because they performed admirably in 2008 (and steadily prior to 2008). Since then, however, performance has been mixed. **Is this under-performance due to a tough environment or alpha decay?** When will trend following make money again?

The common perception is that trend followers are 'long volatility': they make money when asset markets are down significantly or up significantly, and lose money when markets go nowhere[1]. Recent performance, however, belies this notion. The strategy delivered uneven returns during periods of punctuated crisis (May 2010 flash crash) and during periods of extended down (Summer of 2011) and up markets (Q3 & Q4 of 2012).

This paper gives investors a new framework to conceptualize when trend following works. We show that trend followers are neither long nor short volatility, and neither long nor short correlation. Instead, one must consider correlation and volatility jointly to explain their performance. Table 1 summarizes our result: **trend following works when volatility and correlation are both low or both high.**

Below, we explain why this makes sense. Along the way, we will discover interesting facts about how volatility and correlation among assets have evolved over time. We will also formulate a tactical and structural outlook for the space, having better understood its performance drivers. Please note: we are not trend followers.

	Vol Low	**Vol High**
Cor Low	0.9	0.1
Cor High	0.0	1.1

Table 1: Barclay CTA Index Sharpe Ratio by Vol-Cor State. Data from Jan 1991 - Jan 2013.

[1] See the classic paper *The Risk in Hedge Fund Strategies: Theory and Evidence From Trend Followers*, by Fung and Hsieh (2001).

2 Volatility Correlation Dynamics

We begin by forming a universe of the most liquid futures markets: 10 equity indices, 14 fixed income instruments (including short term interest rates), 7 currencies, and 22 commodities.[2] For every asset, at the beginning of each month, we compute the standard deviation of returns for the preceding and succeeding 6 months. This provides information on the historical and future realized volatility for each instrument at every point in time. We take the cross-sectional average[3] to arrive at our 'Realized Volatility'[4] time series (Figure 1):

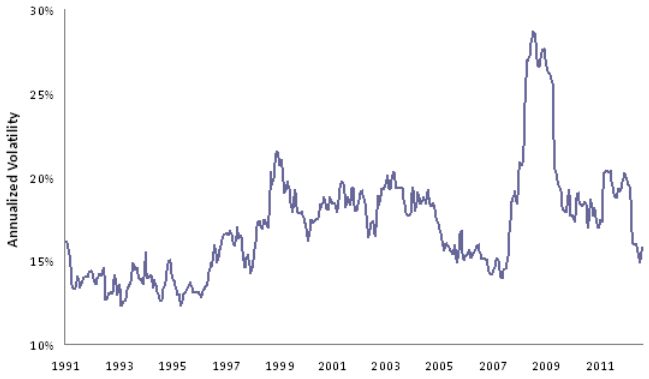

Figure 1: Realized Volatility

This picture is familiar: (1) increasing volatility around the 1998 Russian debt default, the dot com bubble and the 2001 recession in the US, (2) decreasing volatility from 2003 to 2007 due to an extended period of low rates, (3) a spike in volatility in 2008, and (4) decreasing volatility thereafter with intermittent shocks around European bailouts and the US debt downgrade.

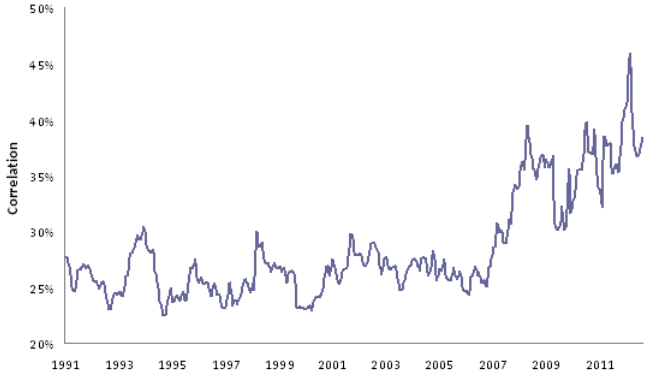

Figure 2: Realized Correlation

[2]Full list of markets available upon request.

[3]Equities and commodities are more volatile than fixed income. If we adjust for cross-sectional differences in volatility, we end up with a volatility picture that is very similar to Figure 1.

[4]We refer to this concept simply as Volatility in the remainder of this paper.

How should we define an analogous 'Realized Correlation' time series? Each month, for every pair of assets, we compute the correlation of their returns for the preceding and succeeding 6 months. Unlike Volatility, we don't take the average, because a correlation of 1 between two assets should be treated the same as a correlation of -1: both are equally undiversified. Hence, we first take the absolute value of the correlations, and then compute the cross-sectional average. Figure 2 shows the resulting Realized Correlation[5] time series.

It is striking that Correlation has not retreated since 2008 even though Volatility has. Correlation actually peaked in 2012! What is driving this increase? Note that correlations can be elevated either because correlations are high **within** asset classes (equity indices trading in lock-step with one another) or because correlations are high **across** asset classes (equities trading in lock-step with commodities). Figure 3 decomposes Realized Correlation into these two sources.

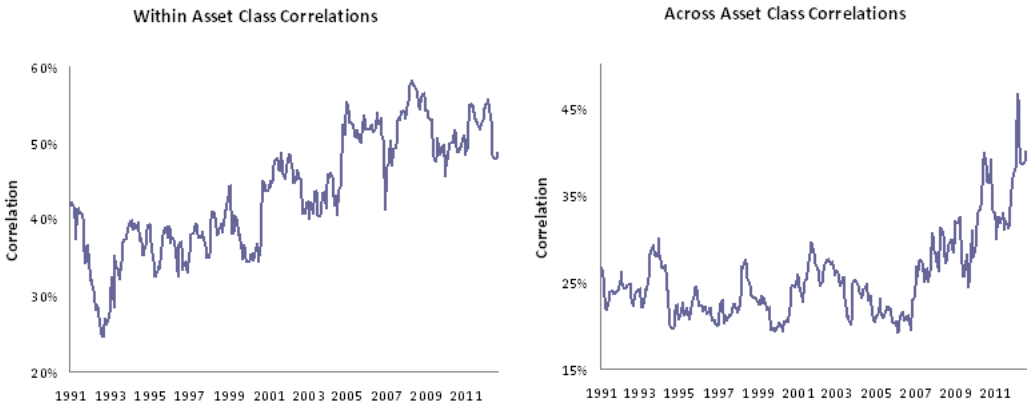

Figure 3: Realized Correlation Components

Interestingly, within asset class correlation appears to be structurally rising over time. This makes sense: as the capital in arbitrage strategies increases, and as mutual fund and retail investors seek global diversification, capital mobility should drive a long-term increase in correlation among similar assets (and hence within asset class).

Correlation across asset classes is another story. It appears to be more cyclical, with a distinct ebb and flow following global market shocks (e.g. 1994, 1998, 2001, 2008). This also makes sense: after a market shock the question is not **where** does value exist (in what sectors, countries, markets), but **when** will the deleveraging end? This reduces the usually large space of risk factors to a compressed set of 'risk-on' and 'risk-off' bets.

Historically such compression has been transitory, except post-2008. Monetary policy is partly to blame. Fed buying of Treasuries has kept long-term interest rates low, and Fed purchases of mortgages have allowed banks to shore up their balance sheets more quickly. This frees up banks to take more risk, and low interest rates encourage capital to be deployed in higher-yield markets, fueling coordinated, indiscriminate rallies in risk assets.

In principle, Volatility and Correlation impact the performance of any technical trader employing homogeneous price-driven models across asset classes. This is because Correlation measures how diversified the trader's bets are, and Volatility provides insight into the potential range of market fluctuations. We explore these concepts in relation to trend follower performance next.

[5]We refer to this concept simply as Correlation in the remainder of this paper.

3 Trend Followers and Volatility-Correlation Regimes

Long-term trend followers employ break-out and moving average cross-over systems to exploit trends. They enter trends that have developed over a few months and hold positions until the trend turns (typically a couple of months). The Barclay CTA Index[6] is an industry-standard benchmark trend followers[7]; its cumulative return is shown in Figure 4.

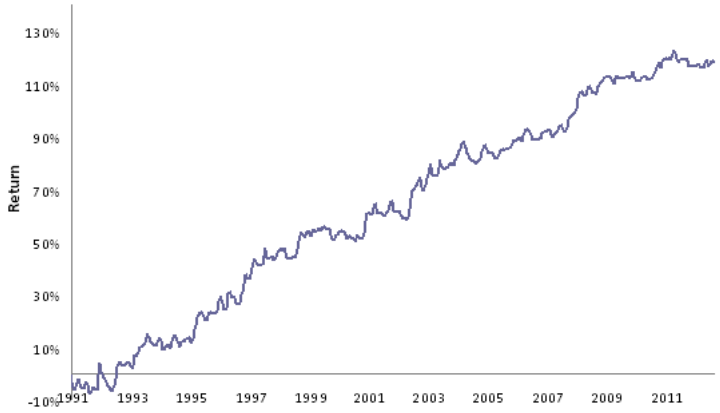

Figure 4: Barclay CTA Index performance

Returns historically held steady with marked outperformance in 2008. But (excluding a tailwind in Q4 2010 from QE2-induced asset class drift) performance has been flat to down since 2009. To understand what drives periods of under and outperformance, we turn to Volatility Correlation dynamics.

At every point in time, Volatility is either high or low and Correlation either is high or low[8], giving rise to one of four Volatility-Correlation states. The sharpe ratio of the Barclay CTA Index varies strongly by state (see Table 1). To visualize this, Figure 5 plots the cumulative returns of the Barclay CTA Index in each quandrant. Trend followers do well when Volatility and Correlation are both low or both high, and struggle when one is high and the other low. We conceptualize each state below.

Low Volatility, Low Correlation. In low Volatility environments, assets do not react violently to information arrival. This increases the likelihood of *underreaction* to news (and thereby follow-on momentum), which is good for trend followers. In addition, low Correlation implies that related markets are not moving in lock-step. For instance, suppose that a crop report sends corn but not lean hogs higher. Eventually, high corn prices will cause higher hog prices. Thus, low Correlation makes it more likely that information diffuses across markets slowly. This gives trend followers an opportunity to exploit the coming trend in lean hogs (implicitly capitalizing on lead-lag relationships). We expect this environment to be ideal for trend following, and Figure 5 bears this out.[9]

High Volatility, Low Correlation. As argued above, low Correlation implies that trend followers can profit from lead-lag relationships. But the above also implies that high Volatility increases the likelihood of *overreaction* to news (and hence reversals), which is bad for trend followers. These two forces compete, leaving trend followers treading water in this state (Figure 5).

[6]The index consists of over 600 programs and is rebalanced yearly. More information is available at http://www.barclayhedge.com/research/indices/cta/sub/cta.html.

[7]The Newedge CTA Index is another standard benchmark. In unreported results, we conducted the analysis in Section 3 using the Newedge Index and reached similar conclusions.

[8]By high or low, we mean above or below its own median.

[9]We noted, in our companion paper 'The Opportunity Set for Quants in 2011', that low volatility and low correlation among individual stocks provides a good environment for momentum investing in cash equity markets.

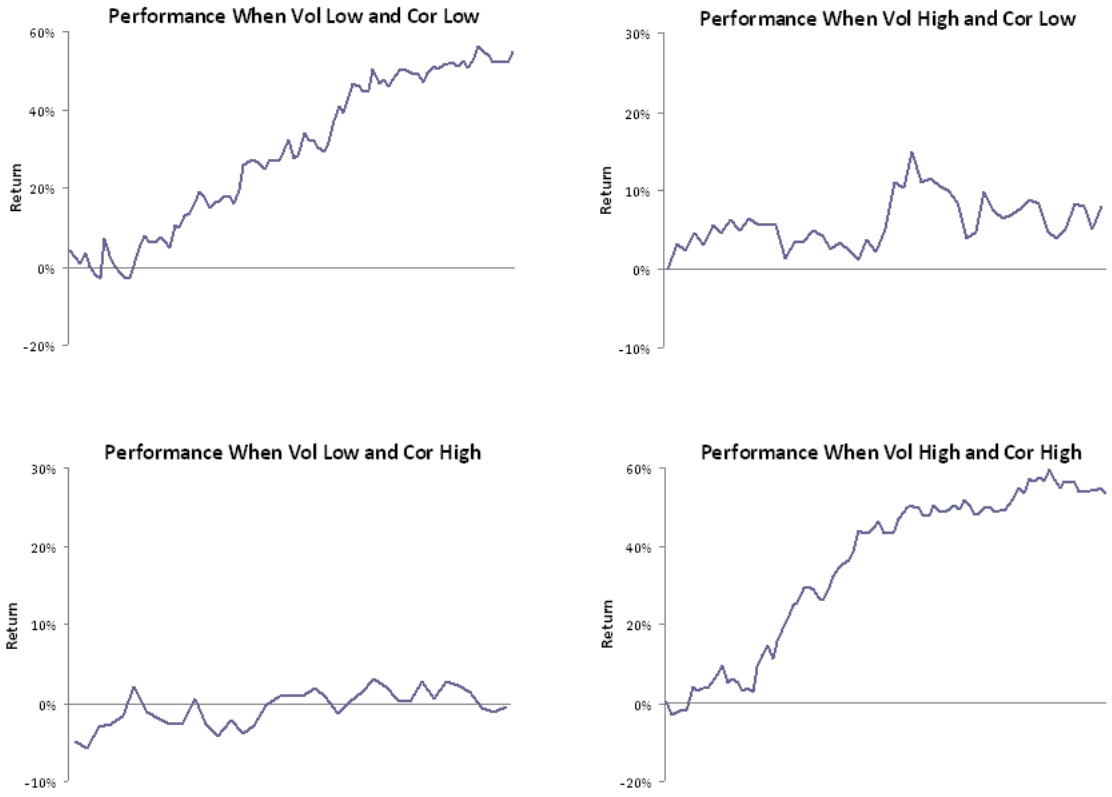

Figure 5: Barclay CTA Index Performance by Vol-Cor State

Low Volatility, High Correlation. High Correlation reduces lead-lag profits. It also causes trend followers to accumulate large net exposures to asset classes at the worst times. To see this, suppose positive economic data drives US equities persistently higher. Since correlations are high within asset classes, all equity indices move up together. Soon, trend followers are very long global equities. The problem is that, because *across* asset class Correlation is high, any news that moves commodities or bonds would also cause equities to move in lock-step. Thus, trend followers become most exposed precisely when likelihood of exogenous shocks is highest. Low Volatility, as we saw, provides asset-specific momentum opportunities, making this state overall a wash for trend followers.

High Volatility, High Correlation. This state indicates crisis. A good example is 2008, and before that the state materialized in (e.g.) 1998, the 2001-2002 recession, and during the pullback in 2004. High Volatility reduces asset-specific drift. High Correlation diminishes lead-lag profits and induces large net exposures to asset classes. These forces are all directionally bad for trend followers. But the big opposing force is that crisis causes persistent deleveraging, driving positively autocorrelated asset class returns. In this state, the large net exposures can actually pay off. So long as deleveraging happens over an extended window, CTAs will benefit as they tactically get long or short in the middle of a cycle of outflows. We can see from Figure 5 that CTAs did well in this state in the early part of the sample but have been struggling towards the end of the sample, suggesting that deleveraging speeds have been increasing since 2008.

4 Conclusion and Outlook

We opened by asking: is trend follower underperformance due to a tough environment or alpha decay? The answer is that both contribute. On the one hand, environment matters: performance depends on Volatility-Correlation state, and recently a low Volatility, high Correlation regime has hurt returns.

On the other hand, bad environments will become increasingly common, lowering strategy alpha. This is because within asset class correlations are structurally rising (Figure 3), reducing lead-lag profits. And across asset correlations remain elevated (due partly to monetary policy), which is bad for trend followers unless accompanied by deleveraging and autocorrelated flows. The problem is that deleveraging speeds are increasing, leaving trend followers reduced alpha even in states of crisis (Figure 5).

Moreover, the barriers to entry for trend following are decreasing rapidly. Reliable historical data and backtesting software are readily available. This heightens competition among trend followers and structurally lowers alpha. Trend follower AUM is now $330BB, up from about $170BB in 2006[10], making crowding a bigger risk.

Structurally, then, the outlook for long-term trend followers is challenging. *Tactically*, flows out of bonds and into equities and other risk assets—i.e., an extended period of risk re-leveraging (and concomitant asset class autocorrelation)—could drive good performance for trend followers in the next few quarters, especially if markets enter a state of low Volatility and low Correlation. Such outperformance would depend heavily on re-leveraging speeds.

The alternative is to find new and uncorrelated alpha sources in futures markets. These alphas exist[11], but are harder to find and not as scalable as trend following strategies. Much like multi-factor quant investing in 2007, this space is primed for evolution, and we think macro investors will increasingly look for niche alpha players to complement their trend following allocations.

[10] http://www.barclayhedge.com/research/indices/cta/mum/CTA_Fund_Industry.html.
[11] We have added a collection of such alphas into our Stat Arb portfolio.

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