

## Trend-Following with ETFs

### Published Research on Momentum and Trend-Following

When I was studying Economics as an undergrad and Finance as an MBA student in the 70s and 80s, the overwhelming consensus among academics was that markets were efficient. Most adherents to the Efficient Market Hypothesis (EMH) believed in the “semi-strong form” of market efficiency—that current market prices reflect all publicly available information (past prices, fundamentals, news, etc.). Nearly everyone held at least the less-restrictive “weak form” of market efficiency—that past returns could not help forecast future returns. Respectable opinion was that any use of technical analysis, trend-following, or use of price momentum was essentially the financial equivalent of reading entrails.

Within the professional investment community, many have “looked at charts” for many decades, but their use has been mostly subjective and unscientific. A few technical analysts developed “systems,” particularly in asset classes such as currencies and commodities, but most stock and bond professionals preferred the more respectable “fundamental” approach of analyzing investments based upon some combination of top-down economic forecasting and bottom-up analysis of assets, earnings, cash flow, and dividends. That was certainly the case at the large investment firms where I spent my early career in the late 80s and 90s.

Meanwhile, back in academia, some published research was finding chinks in the EMH armor. Stocks with certain characteristics, such as low price/earnings ratios, small market capitalizations, upward revisions of earnings estimates, were shown to have provided significantly more return over the long term than their risks would have justified. Believers in market efficiency explained these “anomalies” by suggesting that flawed methodologies, hidden data biases, or hard-to-measure risks must lie behind the results. But over time many academics became more open to evidence of persistent market inefficiency. A new group arose within financial economics, the “behavioral finance” school, suggesting that investors did not behave in the purely rational way assumed by efficient market theory. By studying actual decision-making by real people, behavioral economists documented widespread patterns of irrational behavior that might explain many market anomalies.

When Jegadeesh and Titman published their paper, [“Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency”](#) in the *Journal of Finance* in 1993, it was a direct challenge to the Efficient Market Hypothesis, even in its weakest form. They found compelling evidence that past stock returns were helpful in predicting future stock returns—winners tended to keep winning and losers tended to keep losing. Most academic studies ever since have pointed back to this paper as the opening salvo in the debate regarding the causes of superior risk-adjusted returns from momentum and trend-following investment.

A brief digression on the difference between momentum and trend-following is in order. Momentum is a “cross-sectional” factor that compares all stocks (or other securities) within a given universe to each other using some measure of trailing return. Most often, it is measured by comparing the top group (highest trailing return) to the bottom group (lowest trailing return). Momentum is therefore a relative factor, and often the term “relative strength” is used to describe it.

Trend-following, on the other hand, is a “time-series” factor most often used to improve absolute return by timing when to have long or short exposures. Whereas momentum is most often used to select from a large group of stocks, trend-following is most often used to decide how much exposure to have to the stock market overall, or when to have exposure to groups of stocks, such as industries, sectors, or countries. It can also be used to time exposures to other risk factors, such as interest rate risk, credit risk, and currency risk. The returns to all of these risk factors are highly volatile, but there is some evidence that there is “serial correlation” in the returns—periods of positive and negative return cluster together more than would be expected if they were perfectly random.

Most published studies of momentum or trend-following have focused on momentum among individual stocks. [Some studies](#) have found that momentum is mostly a sector or industry effect. [Other studies](#) have found impressive returns from momentum effects using “style” portfolios of large vs. small and growth vs. value portfolios. Still [other studies](#) find that momentum works well when applied to international stock market indexes, government bond market indexes, commodities, and currencies:

“The existence of momentum is a well-established empirical fact. The return premium is evident in 212 years (yes, this is not a typo, two hundred and twelve years of data from 1801 to 2012) of U.S. equity data, dating back to the Victorian age in U.K equity data, in over 20 years of out-of-sample evidence from its original discovery, in 40 other countries, and in more than a dozen other asset classes. Some of this evidence predates academic research in financial economics, suggesting that the momentum premium has been a part of markets since their very existence, well before researchers studied them as a science.” (“Fact, Fiction and Momentum Investing,” Asness, et. al., *Journal of Portfolio Management*, Fall 2014.)

The evidence for a momentum anomaly is so strong that even those high priests of market efficiency, Fama and French, in a [2008 Journal of Finance article](#) called it “an anomaly that is above suspicion...the premier market anomaly.”

While academics have tended to focus most of their attention on momentum, practitioners have been just as interested in its cousin, trend-following. The reluctance of academics to study trend-following probably has to do with the fact that it is by nature time period specific. That is, the results of trend-following studies may be criticized as an artifact of the particular time period being studied (though to some extent the same criticism may also be applied to

momentum studies). However, trend-following techniques proved their worth for many investors in the 2000-2002 bursting of the tech bubble and in the 2007-2008 market meltdown.

[Trend-following](#) is hardly a new fad. The economist David Ricardo, a very successful trader in the London markets from the 1790s to 1818, first coined the phrase “Cut short your losses; let your profits run on.” The Dow Theory, originated by Charles H. Dow in a series of articles in *The Wall Street Journal* between 1899 and 1902, is a famous example of a trend-following system, but certainly not the first. Trend-following has had dedicated adherents throughout the 19<sup>th</sup> and 20<sup>th</sup> century and into the 21<sup>st</sup>.

The basic concept is fairly simple and draws upon a principle of physics: “a body in motion tends to stay in motion.” This principle also seems to apply to social phenomena, including market behavior. The behavioral finance body of research suggests several behavioral explanations for trend-following, including:

- Herding – the tendency for investors to seek the psychological comfort of the herd
- Confirmation bias—the tendency for investors to seek confirming information and ignore disconfirming information
- Anchoring bias—the tendency for investors to over-emphasize recent price in estimating fair value
- Overreaction—the tendency for investors to over-emphasize new information

Some of the best-known practitioners who favor trend-following investment techniques include [Clifford Asness](#), [Mebane Faber](#), and [Gary Antonacci](#). I link recent articles by each with their names.

### My Research Methodology

My research is focused exclusively on ETFs. I invest long-only and long/short in three ETF universes:

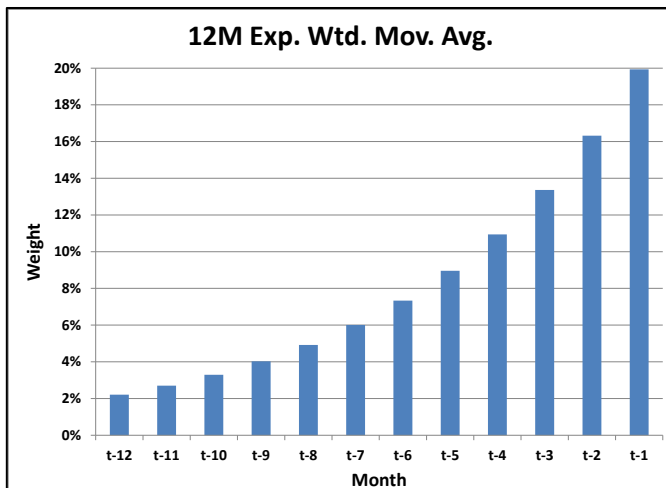
- Sector and industry ETFs
- International ETFs
- Alternative ETFs

In three upcoming articles, I will apply the same trend-following factor within a highly liquid subset of each of the three ETF universes, analyzing its effectiveness within each. First, let me describe the trend-following factor that I will use.

Most published research on momentum as applied to stock selection follows the lead of the groundbreaking Jagadeesh and Titman (1993) study and defines a momentum factor as the sum or average of trailing stock return for the previous twelve months, leaving out the most recent month. The reason for omitting the most recent month is the strong evidence that stocks with extreme returns in the most recent month tend to mean-revert, moving in the opposite direction over the following time period. These stocks tend to revert towards the average return for their group, such as industry, sector, or country. Since the ETFs I study are based

upon industry, sector, country, and other aggregate indexes, and therefore largely diversify away stock-specific return, I do not omit the returns for the latest month. My research indicates that including the latest month may be somewhat helpful.

Also, I define my trend-following factor as the exponentially-weighted moving average of total returns for the previous twelve months (weights shown in the graph at right). This gives more weight to more recent returns. Without such a weighting scheme, the factor is as dependent upon the level of the return twelve months ago as it is upon the level of the return for the latest. I've tested both an equal-weighted moving average and an exponentially-weighted moving average, and the results are admittedly mixed. However, I have a strong intuitive preference for the exponentially-weighted method.



In constructing my three highly liquid ETF universes, I included only those ETFs with more than \$1 billion in assets under management. This helps to ensure that the strategies could be easily implemented with relatively low transaction costs and reasonable short borrowing costs for a long/short implementation. The resulting ETF universes contain the following number of ETFs as of March 31, 2015:

- Sector and industry ETFs - 23
- International ETFs - 21
- Alternative ETFs - 41

My historical simulations all begin on December 31, 2002, which provides over twelve years of historical returns. Instead of requiring that all ETFs included have live fund returns for that entire time period, I included pro-forma returns for earlier time periods based upon the fact that all of the ETFs in all three universes are index funds tied to well-recognized benchmark indexes. Where live fund returns were available, I used them, but for prior periods I used the following formula to estimate pro-forma ETF performance:

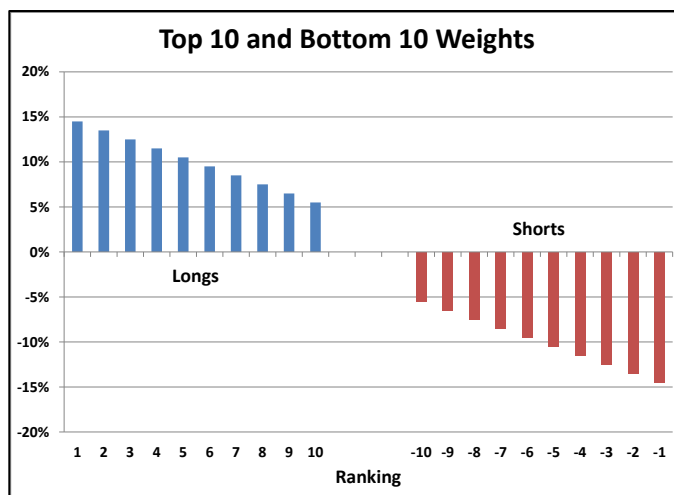
$$\text{Benchmark index return} - \text{expense ratio} = \text{pro-forma fund return}$$

The live performance of ETFs strongly confirms that this formula provides an extremely accurate set of pro-forma historical returns.

For each ETF universe, I constructed a top 10 and a bottom 10 portfolio based upon the 12-month exponentially-weighted trend-following factor at the end of each month, calculating the

holding period return for the portfolio for the following month after subtracting applicable transaction costs and borrowing costs.

My methodology for portfolio construction is also a bit different than the norm. Most studies equally weight all of the securities in a portfolio. This works well enough with a large universe of individual stocks when the weight on each stock is likely to be modest. However, my ETF universes are small in number, so the weight on each is high. I use the weighting scheme depicted in the graph at right for two reasons—to enhance return and to reduce turnover. This scheme was not optimized to provide the highest in-sample historical return. Rather, it was a judgmentally-derived system to include 10 long and short positions, avoiding undue weight on the most attractive ETFs while giving them a meaningfully high weight relative to the lower-ranked ETFs.



### Momentum vs Trend-Following Results

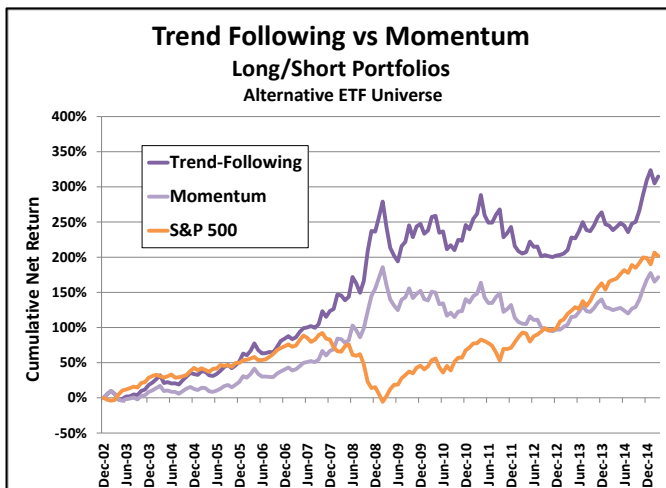
It is certainly possible to use 12-month exponentially-weighted moving average return as a momentum factor, ranking all ETFs according to that factor, and weighting them according to the scheme outlined above, either with shorts (long/short) or without (long-only). The long-only portfolio would always have 100% invested long in the top 10 ETFs, and the long/short portfolio would have the same long investments as well as always have 100% invested short in the bottom 10 ETFs.

A cross-sectional or relative factor such as momentum works best when the return spread among the securities in the universe is high. The more homogeneous the returns, the less chance a factor that attempts to distinguish among them will have much of an effect. My three ETF universes are somewhat different in the level of return spreads that may be expected within each:

- Sector and industry ETFs – All equity ETFs containing nearly all U.S. stocks
- International ETFs – All non-U.S. equity ETFs
- Alternative ETFs – A wide mix of equity, fixed-income, and commodity ETFs

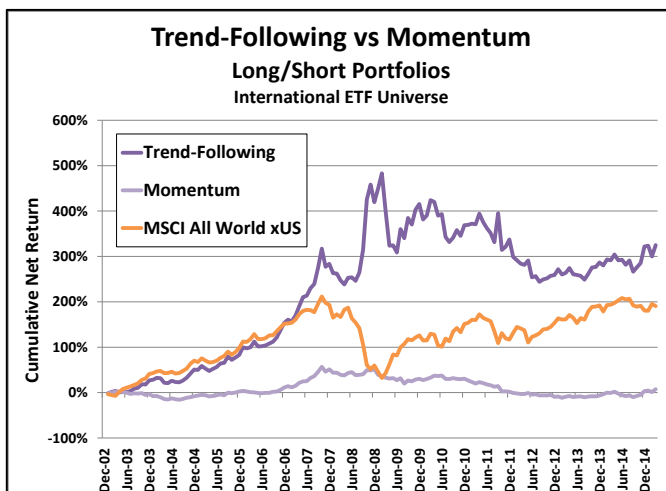
In the graphs to follow I use long/short portfolio implementations to illustrate the differences between momentum and trend following results since the differences are more pronounced than with long-only implementations. In all cases portfolios are rebalanced monthly based upon the trailing twelve month exponentially-weighted moving average return. From monthly gross returns I subtracted estimated bid-ask spread and commission for each transaction as well as short borrow cost for short positions. (These are explained more fully below.)

The alternative ETF universe is the most diverse, and therefore has the best chance of adding value with a momentum approach. And indeed, momentum worked quite well in the alternative ETF universe during the time period tested, adding over 170% cumulatively, almost keeping up with the 200% attained by the S&P 500. However, the trend-following approach posted a cumulative gain of over 300%!



What explains the difference? A momentum approach requires that longs and shorts are always 100% each. A trend-following approach only invests long in an ETF when its trend-following factor is positive, and only shorts it when the factor is negative. Historically, with trend-following there have been times when long positions have been substantially reduced or even completely eliminated, such as late 2008. Also, there have been many periods when short positions have been small or zero. This turns out to have been exceedingly helpful, at least during the time period tested.

The international ETF universe had the most extreme return spread between momentum and trend-following. As with the alternative ETF universe, the trend-following approach achieved a cumulative return of over 300%, but in contrast, the momentum approach added very little value. Since all of the ETFs in the international universe are equity-only, there was not an effective way to lower overall portfolio risk when market momentum was negative or increase overall portfolio risk when market momentum was positive. Even though international ETFs offer different country and currency exposures, these differences were not enough to provide pronounced return spread differences. Global markets have become more integrated in recent years, and consequently all global stock markets tend to be affected by many of the same systematic factors.

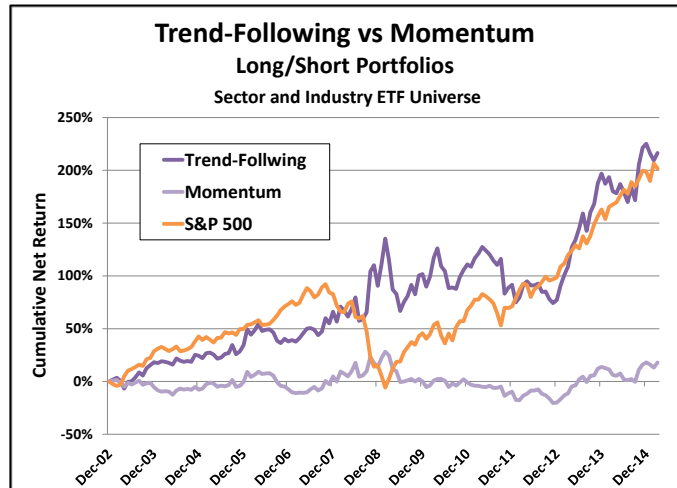


In a similar vein, the sector and industry ETF universe is somewhat homogeneous in that all of the constituent ETFs are equity-only. In addition, nearly all of the underlying equities are U.S. companies, making the return spreads in this universe even tighter and further constraining the ability of any factor to add value. As was the case in the international ETF universe, the momentum approach failed to add much value over time, but the trend-following approach

worked quite well, though not quite as well as in the alternative and international ETF universes, achieving a cumulative return of just over 200%. This is still a remarkable level of value-added, particularly for a single factor.

In all three cases, the trend-following approach worked extremely well. Perhaps even suspiciously well. If making these kinds of returns was easy and obvious, everyone would have done it.

Why didn't they? Probably because actively managing exposure to the big risks (stock market, interest rate, credit, currency, etc.) is a very dangerous undertaking—wonderful when it works and devastating when it doesn't. As an investment manager, I believe that managing these risks is what the clients pay me for, but most managers would rather safely hug the benchmark.



For trend-following to work well, returns must cluster together in sustained positive and negative “runs.” It also really helps if the positive and negative returns within the runs are extreme. That has certainly been the case during the period since 2002. Both the duration and directional volatility of the runs were unusually strong. This could not have been foreseen.

Also, even during periods when it works quite well on average, trend-following involves significant month-to-month volatility. For example, in February of 2015 (just last month), the S&P 500 was up 5.75%, but the trend-following portfolio within the alternative ETF universe was down -4.44%! Even worse, in October of 2011, when the S&P 500 was up 10.93%, the alternative universe trend-following portfolio was down -10.79%! Most investors could not withstand that kind of volatility. In practice, I use a variety of techniques, including diversifying among the three universes, to help dampen volatility without sacrificing too much return.

Even if the future returns to trend following are not quite as attractive as they were in recent years, a trend-following factor may still be worth including in a multi-factor model. The returns to momentum and/or trend following tend to be negatively correlated with returns to value and/or long-term mean reversion, so these two types of factors generally do an excellent job of diversifying each other.

### Long-Only and Long/Short Trend Following Results

Hopefully the graphs above are enough to pique your interest. Any time a long/short strategy is able to beat a long-only benchmark, like the S&P 500 or the MSCI All World xUS index, that's quite impressive (and quite rare). The fact that the trend-following strategy did this in three different ETF universes provides added evidence of its long-term future efficacy, though of course no one knows what the future holds, including me.

Most investors do not use shorting. Although I used long/short implementations of momentum and trend-following strategy in the graphs above to illustrate the superiority of trend-following, in three upcoming articles focusing on each of my three ETF universes, I will show results for both long/short and long-only implementations of the trend-following approach.

In the table below I provide a “sneak peek” at the trend-following results within each of the three ETF universes. Gross and net returns are annualized monthly averages. I also provide annualized monthly averages for turnover, transaction costs, and borrowing costs. Not surprisingly, turnover and transaction costs were roughly doubled for a long/short implementation compared to a long-only implementation, and borrowing costs were a further drag on the long/short implementation when compared to long-only. In all cases, transaction costs included both the recent median bid-ask spread for each individual ETF and the commission rate charged by my custodian of choice, Interactive Brokers. For borrow cost on shorts I used the recent average rate charged by Interactive Brokers.

<b>12M Exp. Wtd. Mov. Avg. Trend-Following Portfolios</b>						
<b>12/31/2002 to 3/31/2015</b>						
	<u>Sector and Industry ETFs</u>		<u>International ETFs</u>		<u>Alternative ETFs</u>	
	<u>Long-Only</u>	<u>Long/Short</u>	<u>Long-Only</u>	<u>Long/Short</u>	<u>Long-Only</u>	<u>Long/Short</u>
Gross Return	14.59%	11.75%	15.44%	14.70%	9.06%	14.11%
Turnover	60%	122%	56%	115%	76%	141%
Transaction Cost	0.10%	0.21%	0.11%	0.24%	0.15%	0.25%
Borrow Cost		0.48%		0.75%		1.10%
Net Return	14.49%	11.06%	15.33%	13.71%	8.94%	12.74%

The sector and industry ETF universe and the international ETF universe are both equity-only universes, so their long-only portfolios were up even more than their long/short portfolios, since the equity markets were strong overall during the period studied. The alternative ETF universe is much more diversified, so its long-only implementation had its return (and volatility) dampened by the inclusion of fixed income and commodity ETFs. Still, both the long-only and the long/short results in all three universes were quite impressive.

More to come! Watch your inbox!

Kevin Means, CFA  
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April 24, 2015



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