How good is trend following at trend following?

I recently launched a niche CTA and was discussing equities and trend with an allocator last week: equities trend following performance has been very lacklustre in recent years despite equity markets rising substantially over the same period. Why? I was really at a loss to explain this. Worse, I couldn't even quantify what would have been an "acceptable" performance for trend.

Two hours earlier, I had another allocator making a seemingly unrelated comment:

"It is very difficult to allocate to hedge funds: investors run scared when there is a drawdown and want to withdraw their money at the worst possible time".

I asked him about equities: after all equity markets had big drawdowns too. His reply was telling:

"When Nestlé goes down, many of my clients are value investors and want more Nestlé, not less."

There are certain participants in the equity markets that actively fight trend: day traders that must close their positions by end of day at the very fast end, value investors at the very slow end. But this blog is not about these, rather it is about finding out what an "acceptable" performance for trend is. This should be the first step in isolating the impact of such mean-reverting players.

How does trend translate long term growth into performance?

When we come to evaluating how good trend is for a specific asset class, we are biased by what the underlying asset happened to have done. The S&P has had an amazing run recently and we would be very surprised if trend lost money. However, how strongly can we *expect* trend to have performed? Can we benchmark how the mechanical construction of trend translates into performance?

It turns out we can…

Suppose we have an asset X(t) whose vol-adjusted daily returns are:

$$dX(t)/sigma(t) = LTG\ dt + dZ(t)$$

LTG is a daily constant representing long-term growth. dZ(t) is a simple, uncorrelated Brownian motion. If the S&P had a Sharpe 0.8 year, LTG ≈ 0.8/16 = 0.05 would be the average (vol adjusted) daily drift upwards we have experienced. Had we known this *in advance* the optimal investment policy would have been to go long equities but how good is a trend trading system in capturing that 0.8 Sharpe long term growth?

Trend predictors are defined as the weighted sum of past (vol-adjusted) returns. For example, a three-month trend may have weights of 1/8 on the last 64 days of returns.

No, the above isn't a typo, the weights are 1/8 over 64 days. We want our predictor to have a unit risk in distribution so it is the *variance* of returns that must add up to 1. Each vol-normalized return has a variance of 1 so we must have sum(weights^2) = 1.

If daily vol-normalized returns are distributed ~ N(LTG, 1), Three-months trend predictor ~ N(m, 1):

$$m = sum(trend\ weights) \times LTG = 8 \times LTG \approx 0.5 \times Long\text{-}only\text{-}Sharpe.$$

Unfortunately, N(m,1) is not quite unit RMS, so when we multiply by the underlying returns and calculate Sharpe, our returns will have a variance which is ever so slightly too big. To adjust for this, we can scale our predictor to:

Trend ~ N(m,1)/sqrt(1+m^2)

Performance for trend is driven by the predictor's average positive drift, leading to our main result:

Trend's expected Sharpe = m/sqrt(1+m^2) * Long only Sharpe

m = sum(Trend's weights) * Long only Sharpe / 16

The formula checks out when we use Monte-Carlo to simulate it for multiple trend predictors:

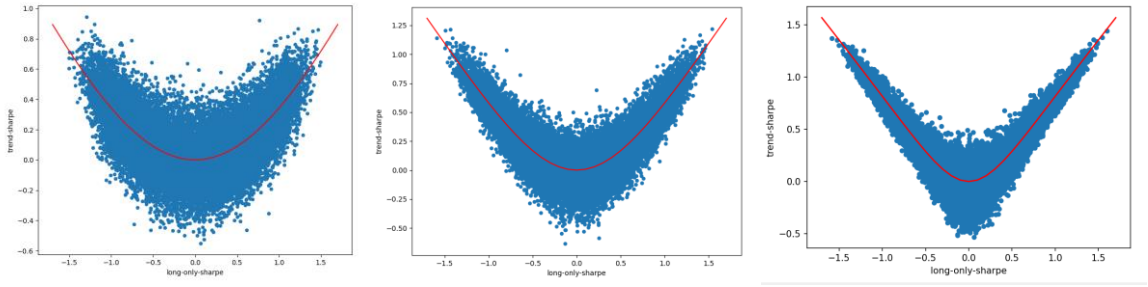

Figure 1: Expected trend Sharpe versus underlying asset Sharpe: realised for 20,000 simulations. Fast (LHS), Mid-Freq (MID) Slow (RHS) predictors

Note that this transformation is purely mechanical: it is to do with the construction of trend and is not making any claims on how predictive trend is. If you like, think of it as a perpetual portfolio insurance scheme. We should note the following:

- 0.4/sqrt(1+0.16) ≈ 37% is but a small fraction: it is the price we pay for convexity.
- The faster the predictor, the less m is. A monthly trend will capture 27% of 0.8 Long-only-Sharpe.
- The stronger the long-term growth, the bigger the proportion we can expect trend to capture.
- The actual *realised* Sharpe of trend is not guaranteed. However, as LTG gets bigger, not only are we likely to capture more of LTG, but also the distribution likely outcome, has volatility 1/sqrt(1+m^2) which drops too: i.e. It is more certain trend will capture strong growth.

Real life and auto correlations

Real life rarely follows model: returns are not Normal, long-term-growth is not long term, volatility needs to be estimated and is not constant. In short, that benchmark above is too idealistic to achieve. There is one real-life factor that acts in favour of trend: auto correlation. The higher the auto correlation, the more predictive trend becomes and in principle, we may even exceed our benchmark.

Some asset classes may have more autocorrelation: price moves day to day are driven by flows that "assist trend". High autocorrelation asset classes trend will track our benchmark better, while low (or even negative!) autocorrelation asset classes will tend to have poorer shortfalls vs the benchmark.

We can examine these autocorrelations and the resulting shortfall from the benchmark.

Liquid futures markets

We first examine autocorrelation since 2010 in liquid futures. Commodity correlation is liquidity/shock driven and is concentrated at low lags. Fixed income is higher on average but is more spread out reflecting persistent flows.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Avg
CO	2.2	0.5	0.4	-0	0.3	0.1	0.6	-0	0.8	-0	0.2	0.7	0.1	0.6	0.1	-0	-1	-0	1	0.1	-0	0.26%
EQ	0.1	0.7	0.3	-0	-1	-1	1.3	-1	0.6	0.8	-0	-1	-1	-0	-1	-1	0.6	0.3	-0	1	-1	-0.14%
FI	0.9	-0	0.4	1.1	-1	0.8	-2	0.1	0.8	2	0.7	-0	-0	1	-0	0.2	1.1	0.7	1.2	0.2	-0	0.36%
FX	0.1	-0	-0	-0	-0	-1	0.5	-0	0.1	-1	1.9	0.2	-1	0.5	-1	-0	0.6	-0	-0	0.3	1.8	0.00%

Figure 2: Average autocorrelation(vol-adjusted rtn, vol-adjusted rtn(lag)) since 2010 across 103 liquid future markets and lags spanning one business month.

These correlation numbers are interesting but how do they translate into actual realised Sharpe? Now that we have the benchmark, we can see the impact on how well the asset class tracks the benchmark:

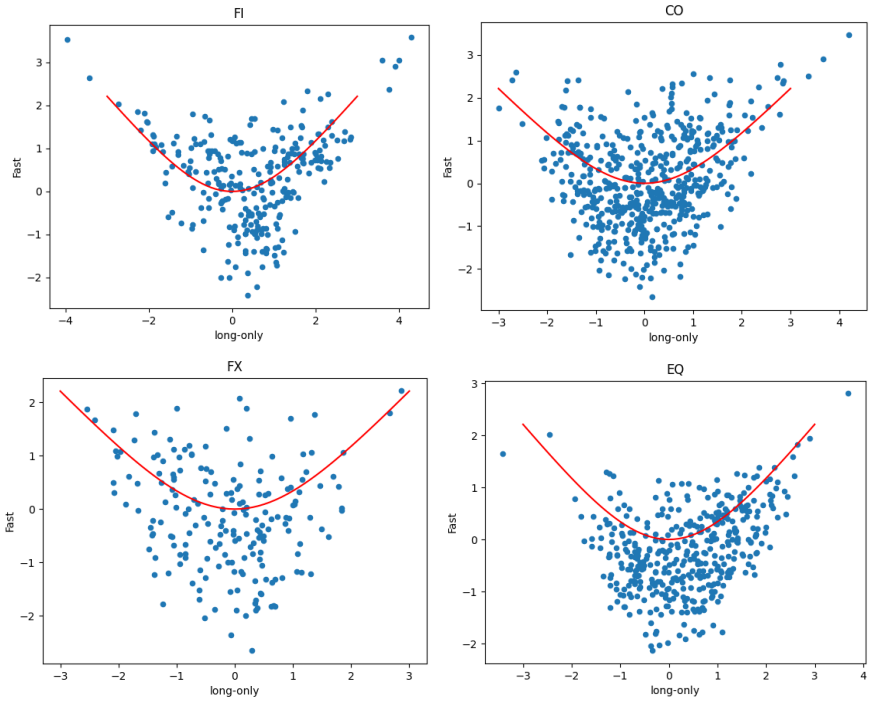

Figure 3: Realised Sharpe vs benchmark for 103 futures market between 2010 and 2024. Each point is a single asset and year.

We can summarize the charts above as follows:

sec	benchmark	actual	shortfall
CO	0.35	0.08	-0.27
EQ	0.37	-0.2	-0.57
FI	0.53	0.33	-0.2
FX	0.31	-0.14	-0.45

Figure 4: benchmark, realised performance and correlation shortfall since 2010 for a fast trend predictor over 103 liquid futures.

The shortfall follows the autocorrelation we measured earlier: The higher the autocorrelation, the less the shortfall: e.g. Fixed income happened to have strong trends, but it also benefited from less shortfall.

And why has equity trend been so lacklustre? Equities did exhibit strong underlying asset growth with the 2nd highest benchmark score. However, though it is important to have strong trends in the underlying asset, it's also important to have flow: the autocorrelations that allow us to convert long term growth to realised trend performance. In the last 15 years, that has been equities trend's downfall.

Alternative markets

As we move to alternative markets, auto correlation increases further. This is partially due to liquidity and partially to do with the nature of the underlying markets. For these markets, not only do we have more pronounced trends, and not only do we match the expected benchmark, but we exceed it.

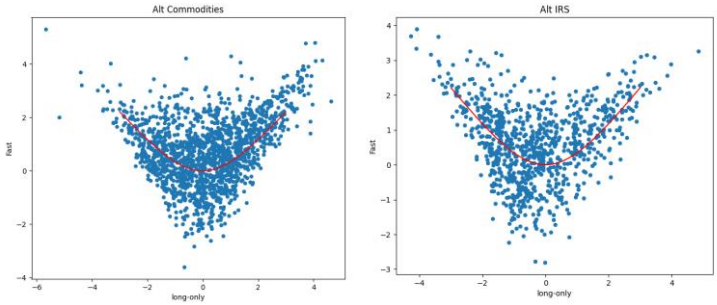

Figure 5: Realised versus benchmark performance for alternative commodities (LHS) and alternative interest rate swaps (RHS) for fast momentum since 2010. Each point represents a single market and year.

It seems that not only that trend has moved to trendier neighbourhoods, it's also much easier to monetize. When we contemplate conviction vs concentration in our asset selection process, we must remember that assets with higher autocorrelation win on multiple fronts:

- They are likely to have longer, extended trends.
- These strong trends will have lower variability of trend performance.
- Trend is likely to have a lower shortfall versus the target benchmark.

And just in case you wondered, you can probably guess my niche CTA is not equity focus.

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