

Better? Or Just Different?

Quantifying diversification in trend following portfolios of traditional and alternative markets

February 2020

Summary

"Diversification is the only free lunch", *Harry Markowitz*

It is well known that diversification is a very important feature of a successful trend following strategy; so important in fact that many managers include the term "Diversified" in their flagship strategies' names. In this piece we examine why we believe having good diversification is so critical to the success of a trend following strategy and explain in detail how portfolios can be constructed to exploit diversification between markets. We then examine how to quantify diversification and whether available diversification has changed over time. We provide evidence that it hasn't changed: the strategy has not been suffering from reduced diversification in its opportunities. Finally, we examine portfolios of 'alternative markets', demonstrating their significantly superior diversification.

1. Diversification is Important

In this section we explain the value that diversification brings to a trend following portfolio. The main reason that a trend following investment approach relies so heavily on diversification is that when applied to any one single asset the strategy's performance is relatively weak overall; both intermittent and unpredictable.

This means that on average over the very long-term we would expect a trend following strategy to generate positive returns if applied to one single market, but our expected Sharpe ratio from doing this would be very low with intermittent periods of profitability interspersed with lengthy drawdowns. An investor following this strategy might 'get lucky' and choose a market and time period in which that market displays very strong sustained trends, leading to a higher risk-adjusted return. Alternatively, they might be unlucky and choose a market which sees no sustained trends for an extended period and the strategy loses money. Ultimately trend following is a strategy with relatively low average traction or predictive power in each individual market it is applied to or each trade it puts on.

We do not believe there is any way to predict which markets will be the profitable or loss-making markets in any period or, indeed, when a particular market or asset class will have profitable trends or be more challenging (and this is despite our

best efforts in research – a true trend following strategy can only *follow* trends, and does not have a magic crystal ball to predict them!).

The low traction on average and difficulty in predicting where and when the above-average opportunities will be might on the face of it make the strategy appear unattractive. However, it is exactly the weak nature of the effect which trend following captures which means it is persistent over time and isn't likely to disappear if markets become more efficient. Furthermore, provided there is sufficient true diversification available this weak strategy can be turned into a more attractive risk adjusted return simply by deploying it in lots of different places.

Diversification is a well understood concept across most of finance. But trend following is able to exploit its benefits so significantly because the strategy typically uses futures to access its exposure in the underlying markets. Futures markets generally have only small margin requirements, so are very cash-efficient and thereby allow a portfolio to be leveraged as much as desired without incurring significant leverage costs. It is this special feature of the derivative markets which mean the higher risk-adjusted return afforded by diversification can be captured in the form of higher returns, rather than just the reduced volatility which is the familiar result of increased

diversification in assets requiring full funding, like equities. The next section examines how this is done in more detail.

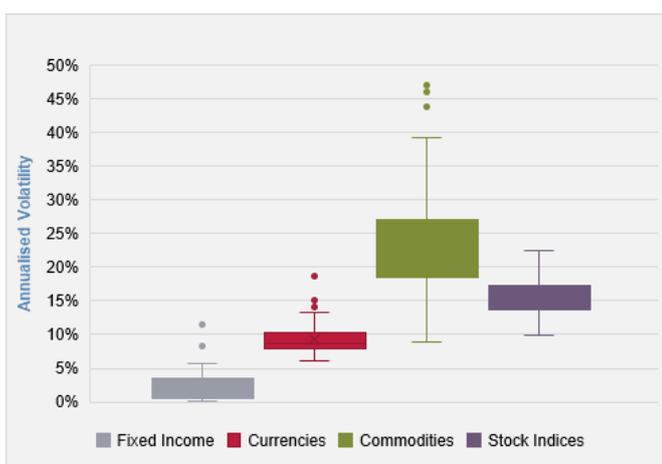
2. Constructing Portfolios to Exploit Diversification

While the concept of diversification described above is generally familiar to investors, the exact mechanics of how to construct a diversified trend following portfolio are often less well understood. In this section, we aim to shed some light on portfolio construction in trend following and what measurements and predictions are relied on.

2.1. Position sizing

Starting at the individual market level, the concept of volatility scaling is well-known – and is used in many well-known investment strategies such as Risk Parity. For equivalent levels of trend conviction, a portfolio will take smaller positions in more volatile markets and larger positions in less volatile markets. In this way, the risk taken, and the potential to profit or incur losses in a position, is in proportion to the conviction in the trade, regardless of whether it is a stable government bond market or something intrinsically riskier like Natural Gas. However, to do this effectively requires some ability to predict volatility, which varies wildly between markets and asset classes as shown in Figure 1 below.

Figure 1: Market volatility across asset classes: 31st Dec 2019



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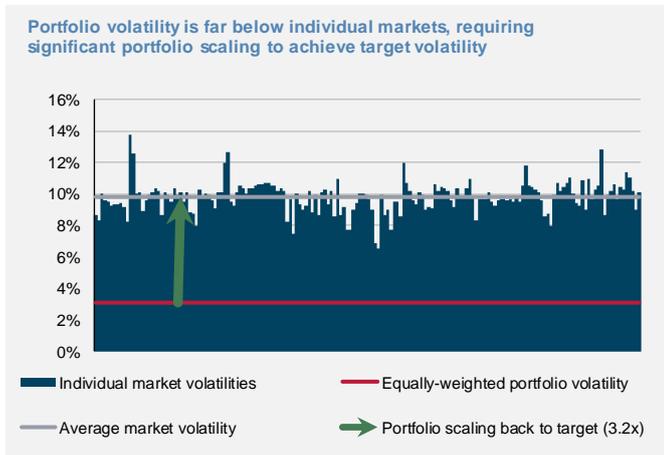
Fortunately, it is relatively easy to predict a market's volatility with reasonable accuracy using its recent historic volatility. (Certainly, using recent realised volatility levels as a predictor of future volatility has far greater traction than the weak traction the strategy obtains when using the trend in recent returns to predict future returns!) However, market volatility levels are not totally stable through time and a trend following strategy will typically be vulnerable to mis-estimating volatility. A sharp increase in the market's volatility will magnify profits or losses which will then themselves be more volatile than the manager's target until the position sizing can react. Conversely, a continued decrease in market volatility would most likely mean the strategy's returns are less volatile than the desired level, which can pose its own problems. Increasing position sizes to correct for lower volatility can require exposures which are uncomfortably large, and the risk of larger losses should volatility increase suddenly. For these reasons, managers typically devote considerable research to building the best predictive measure of volatility to use for sizing positions and will often also include limits on how low a volatility level can be believed and therefore how large a position can become.

2.2. Portfolio risk targeting

Thus far we have discussed the sizing of individual positions. But as explained in section 1, trend following relies on diversification to generate attractive risk adjusted returns. This diversification between markets acts to average out the performance: portfolio returns converge on the (weighted) average individual market return, while portfolio volatility reduces far below that of the individual markets and, as a result, the Sharpe ratio or other measures of risk-adjusted return are increased considerably. However, a higher risk-adjusted return with very low volatility may not be the most appealing portfolio, and so all positions in a portfolio are typically scaled up again to account for this diversification and target a chosen level of overall volatility.

This process is illustrated in Figure 2: trend following strategies in individual markets can be sized to deliver relatively accurate target volatility, but the diversification of combining these into a portfolio gives a realised volatility less than a third of the average market, requiring a multiplier of 3.2x to get back to the original target.

Figure 2: Diversification and portfolio scaling example: Jan 1999 to Dec 2019



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Just as sizing the individual components in a portfolio relies on being able to estimate the volatility of the underlying markets, this final portfolio-level sizing relies on being able to estimate the correlations between those components. In this way, the amount of diversification benefit which is expected can be accounted for with a final sizing multiplier on all positions. If correlations are underestimated when setting this multiplier (or increase significantly) then there will be less diversification than expected and portfolio returns will be more volatile than the target. And conversely, an overestimation of the correlations will mean the portfolio experiences more diversification than expected and overall returns will be less volatile than targeted.

3. Measuring Diversification

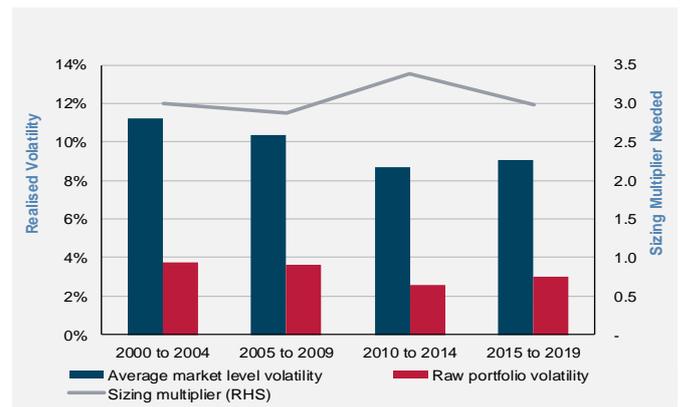
There are a few different ways in which we can quantify or proxy the diversification in a portfolio. We will consider some of them and their pros and cons in this section.

3.1. Portfolio diversification multiplier

As described above, trend following portfolios are usually constructed to target an overall level of risk by accounting for the diversification between their components using a portfolio sizing multiplier. There are different possible ways of deriving this multiplier, and managers conduct research into how best to set it. One simple and commonly-used method is a long-

term backward-looking approach using a rolling window (typically a small number of years) to measure portfolio volatility and adjust the multiplier accordingly in order to achieve the desired risk level, illustrated in Figure 3. This multiplier can therefore act as a proxy for the level of diversification in the portfolio over the historic period. The drawback of this approach is that the multiplier will also be affected by the prevalence of trends, which drive position-taking and therefore realised volatility at the market level. More trends in a five-year period on average will mean stronger signals, bigger positions and therefore more risk-taking in the portfolio, which in turn will result in a lower portfolio sizing multiplier to achieve the desired risk target.

Figure 3: Market and portfolio volatility, showing sizing multiplier needed to maintain risk target after diversification



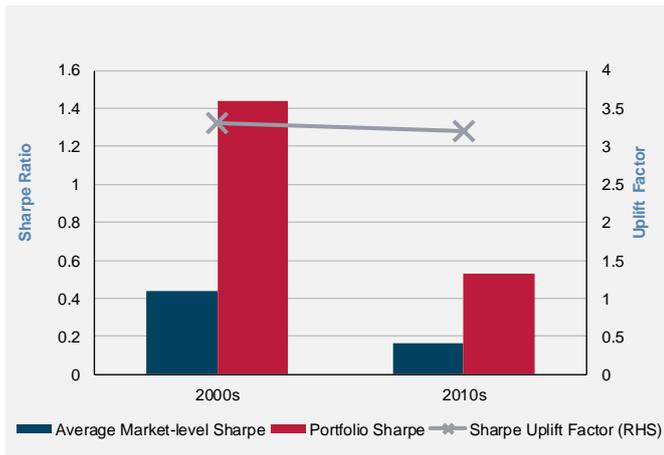
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3.2. Sharpe ratio uplift

An alternative approach, shown in Figure 4, is to look at the realised performance of the trend following portfolio, and compare the results of the individual components with the overall portfolio. As described above, we expect that diversification will mean a far better Sharpe ratio at portfolio level than from the average market. So over any given period we can observe the average of the individual market-level Sharpe ratios and the overall portfolio Sharpe. The ratio between these two measures is a proxy for the diversification achieved by the portfolio. It benefits from looking directly at achieved diversification, but will therefore depend on the

portfolio's allocations to its different constituent markets, rather than being an inherent measure of available diversification in the markets.

Figure 4: Measuring diversification by realised Sharpe ratio uplift



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3.3. Average pairwise correlation measures

A final measure which looks at available diversification in a trading universe of markets (rather than being dependent on the allocations in a particular portfolio) is to measure the average of the pairwise inter-market correlations between the price returns of the underlying markets. Or, as an alternative, we can apply the same calculation to the returns generated from trading a trend following strategy in the chosen group of markets, shown in Figure 5.

(While related, these two measures are clearly not equivalent: applying a trend following strategy to two strongly negatively correlated markets will produce positively correlated returns by holding opposite positions in the two markets. But in absolute terms we'd expect to see the trend following returns in a pair of assets to show lower correlation than their underlying prices.)

Figure 5: Rolling 2-year correlation of market price changes and market-level trend following returns



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While on the face of it this is the most obvious measure, it is dependent on the number of markets and therefore becomes less useful for portfolios with large groups of markets which are similar to each other but still diversifying, such as the sectors typically found in multi-asset futures portfolios. Consider adding to a portfolio with an average pairwise correlation of 0.3 an extra market with a correlation of 0.5 to all the existing markets. The resulting portfolio is unarguably more diversified, since we have added something new which isn't perfectly correlated. But the 'average correlation' measure will have gone up, misleadingly implying there is less diversification.

4. Trends in Trend Diversification

Armed with our potential measures of diversification, we discuss in this section whether the diversification available to trend following portfolios has changed through time. There are two key effects which might have changed available diversification:

- Markets becoming more (or less) correlated to each other (or to general global 'factors' such as risk appetite).
- Increased availability of new diversified markets for trend following as new futures launch and become liquid.

4.1. Diversification trends in markets

We start by assessing the first potential effect of changes in the diversification between markets over time. The results in section 3 above all use a static portfolio of futures and FX markets which have complete histories over the entire twenty-year analysis window, so can be used to assess the changes from the perspective of a trend following strategy using a fixed portfolio. We conclude that available diversification has remained pretty stable over a long period.

When looking at the realised volatility of a trend model in Figure 3, we see small fluctuations in both market and portfolio level volatility, with a noticeable dip in volatility during the most recent decade and especially in the 2010 to 2014 period where market volatility was declining. But the sizing multiplier between the two for each period which is our proxy for diversification has remained relatively stable.

Similarly, when looking at the Sharpe ratio uplift in Figure 4, we see a clear drop in Sharpe ratio at both market level and portfolio level in the most recent decade, which reflects the well documented challenging recent environment for the strategy. However, the reductions at market level and portfolio level are in proportion with each other and the resulting uplift factor has remained remarkably stable for this set of markets at around 3x. This implies that the less impressive performance in the 2010s was not caused by any drop in diversification but instead driven by the reduction in trend opportunities at the market level.

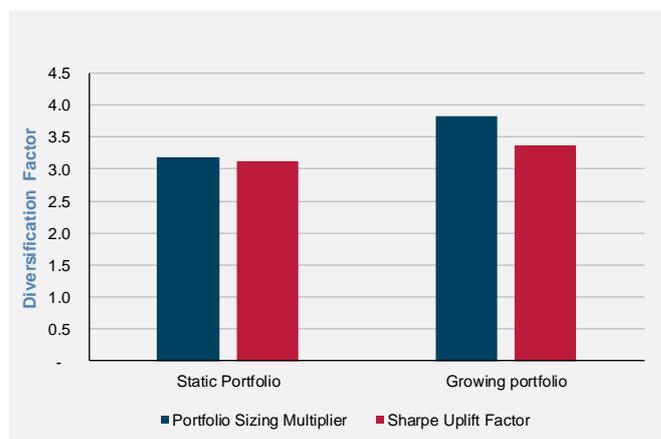
We can also see in section 3.3. that the average correlations between market prices and between the returns from trend following individual markets has remained broadly consistent. There are noticeable increases in market correlations around the financial crisis period in 2008 and again more recently in 2016 but these are less pronounced when looking at the correlations between market-level trend following returns and there doesn't appear to be any structural increasing trend.

4.2. Growth in available markets

The above analysis used a consistent portfolio of futures and FX markets with continuous twenty-year histories in order to draw consistent and like-for-like comparisons between periods. We now focus on the more recent periods and therefore include newer markets with shorter histories.

We identify 29 futures and FX markets currently traded in the Aspect Diversified Programme that did not exist twenty years ago. The results in Figure 6 show that a simulation of a growing portfolio which adds these markets as they become available does display greater diversification on both measures: the portfolio scaling factor needed for volatility targeting is clearly higher, reflecting higher diversification, and the Sharpe ratio uplift factor is also slightly higher (reflecting these markets' shorter histories and on average lower allocations in a real portfolio).

Figure 6: Diversification comparison showing the impact of adding new markets as they become available: Jan 2000 to Dec 2019



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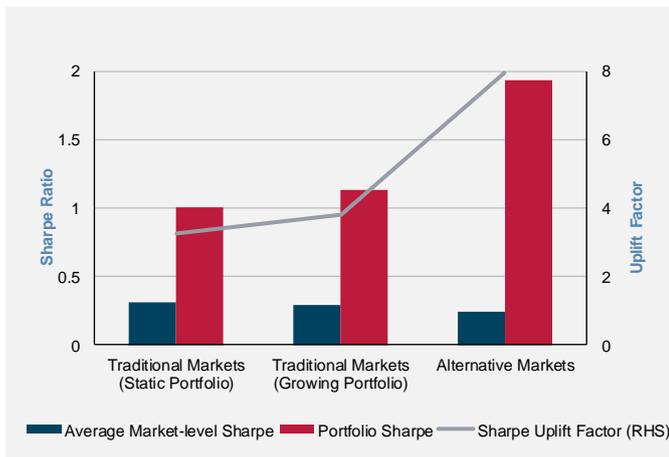
5. Diversification from Alternative Markets

A further source of diversifying opportunities which we believe are critical to successful trend following comes from looking outside traditional futures and forwards to markets which are harder to access and trade. These can include OTC swaps, ETFs, emerging markets and commodity futures with opaque liquidity or unusual trading or settlement terms.

Repeating the diversification analysis for the portfolio of over 200 alternative markets traded in the Aspect Alternative Markets Programme shows that this portfolio has clearly superior diversification benefits when compared to a traditional futures portfolio. We see some evidence of this on all three of the diversification measures outlined in previous sections.

Most notably, the Sharpe ratio uplift appears markedly better and, as shown in Figure 7, this creates a higher portfolio Sharpe ratio in simulation from a portfolio of markets whose average individual trend following Sharpe ratio is no different over the last twenty years from the average traditional trend following market. This is an important result, demonstrating that stronger risk adjusted returns observed in alternative market portfolios is achieved through broader diversification than in traditional market portfolios and not as a result of any 'novelty premium' or any greater propensity for these markets to exhibit trends at the individual market level.

Figure 7: Higher diversification leads to better Sharpe ratio uplift factor in Alternative Markets Portfolio: Jan 2000 to Dec 2019



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6. Conclusions

In this piece we have explained the importance of diversification for a trend following strategy and how portfolios can be constructed to benefit from it. We have also examined the available diversification opportunities and the impact this has on trend following risk-adjusted performance, both over time and across different portfolios. Our conclusions are:

- Trend following signals in individual markets have low predictive power and low risk-adjusted returns on average. In the absence of any ability to predict where the strongest trends will occur, the strategy relies heavily on diversification to transform its weak predictive power in any one market into a potentially attractive risk-adjusted return at portfolio level.
- Trend following portfolios can be constructed to capture the enhanced risk-adjusted return offered by diversification while using an appropriate portfolio sizing multiplier to target the chosen risk level.
- This analysis demonstrates that diversification does vary in the short-term, but has not declined significantly in recent years. Trend following's relatively uninspiring performance in the 2010s appears to be a function of weaker or fewer trending opportunities in futures markets, rather than a structural drop in diversification.
- While alternative markets do not appear to have offered better individual market returns than traditional markets, they do appear to offer clearly superior diversification, which has also remained steady in recent years. Such portfolios therefore have the potential for superior risk-adjusted returns and an even healthier free lunch.

Definitions

- **Static portfolio:** the 'Static' portfolio used in Figures 2 to 7 consists of all traditional futures and FX markets currently traded in the Aspect Diversified Programme for which complete price histories are available back to 1st January 2000 to enable trend following returns to be simulated.
- **Growing portfolio:** the 'Growing' portfolio used in Figures 6 and 7 includes all traditional futures and FX markets currently traded in the Aspect Diversified Programme, with no constraints on minimum price histories. The number of markets included in the portfolio therefore grows over time.
- **Alternative markets:** the Alternative Markets portfolio used in Figure 7 is the current portfolio of markets traded by the Aspect Alternative Markets Programme. There is a small overlap with the other portfolios (emerging market currencies and futures), and the portfolio also includes OTC swaps, ETFs and specialised commodity markets.

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