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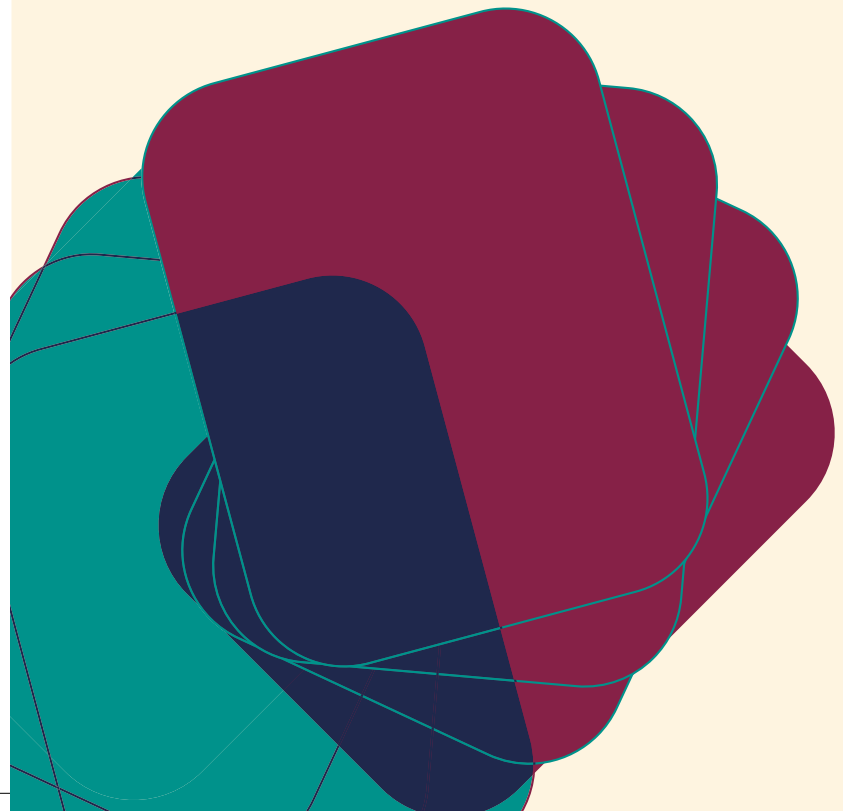
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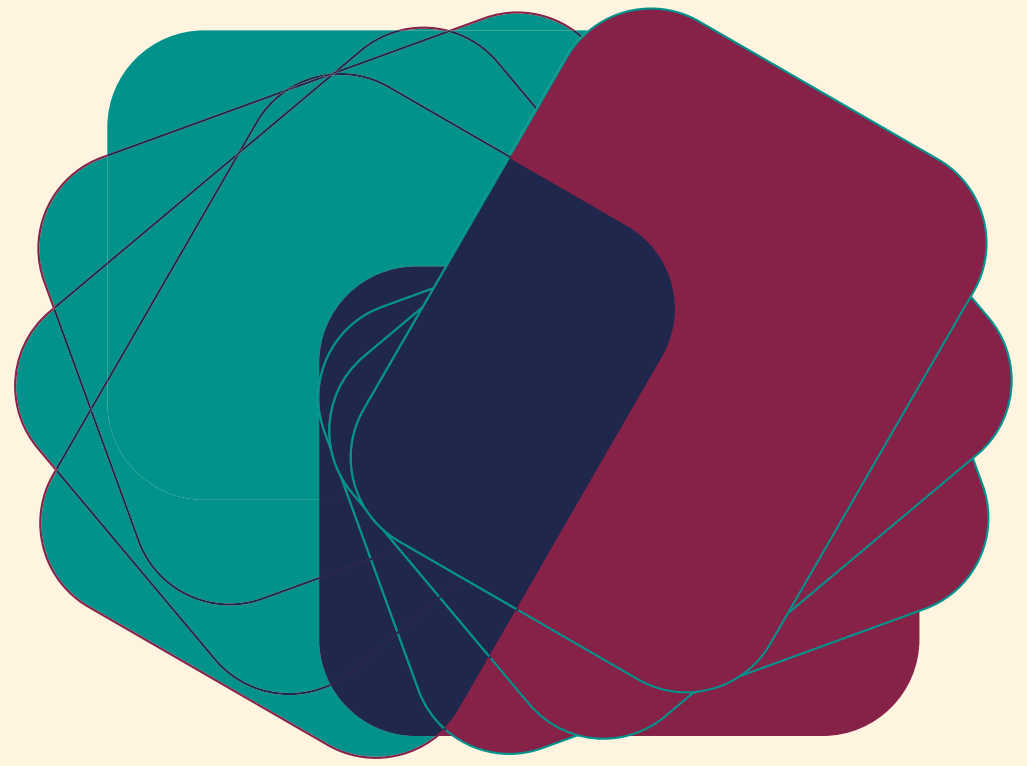
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Trend following as a Long Volatility Strategy By Patrick Kremer, Hari P. Krishnan and Marc Malek



# Trend following as a Long Volatility Strategy

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## *Trend Following as a Long Volatility Strategy*

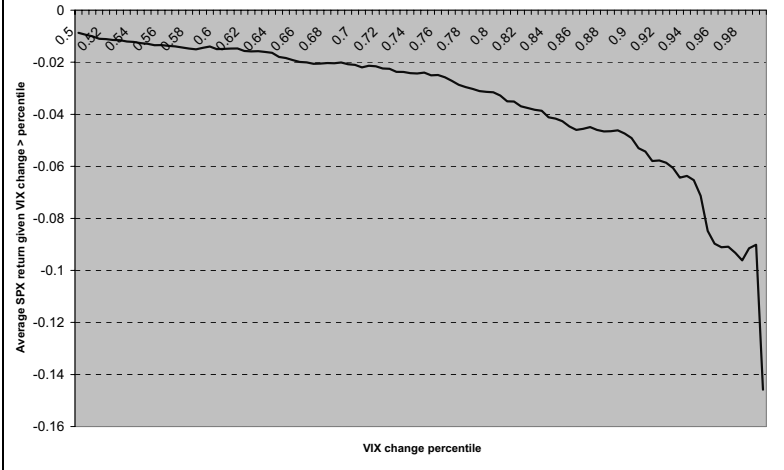
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There is a widespread belief among investors that trend following futures funds are “long volatility”. As equity market volatility (either realised or implied) increases, these managers are thought to do better than usual and provide some protection against global equity market declines. This assumption has often been the primary reason for adding trend followers to an investor’s portfolio. In this chapter, we caution the reader against using trend following funds as reliable portfolio insurance. However, we do provide some evidence that returns are positively correlated to large moves in the VIX (the S&P500 implied volatility index). We also explore the connection between the signal horizon of a trend following breakout system and protection against spikes in the VIX over a specific time interval. Finally, we examine whether trend followers can still provide protection if interest rates are stable or rising.

The graph in Figure 3.1 shows how upward movements in the VIX typically correspond to large negative returns for the S&P500 (also known as the SPX). Here we show the average SPX return for all changes in the VIX larger than a given percentile. This is sometimes thought of as a conditional expected return. For example, the 75th percentile return is an equally weighted average of SPX returns during the largest 25% of VIX moves. While it may seem strange to think of the VIX as an independent variable, the graph does show that any strategy that is long volatility tends to provide protection

**Figure 3.1** Average monthly SPX returns conditioned on size of VIX move.

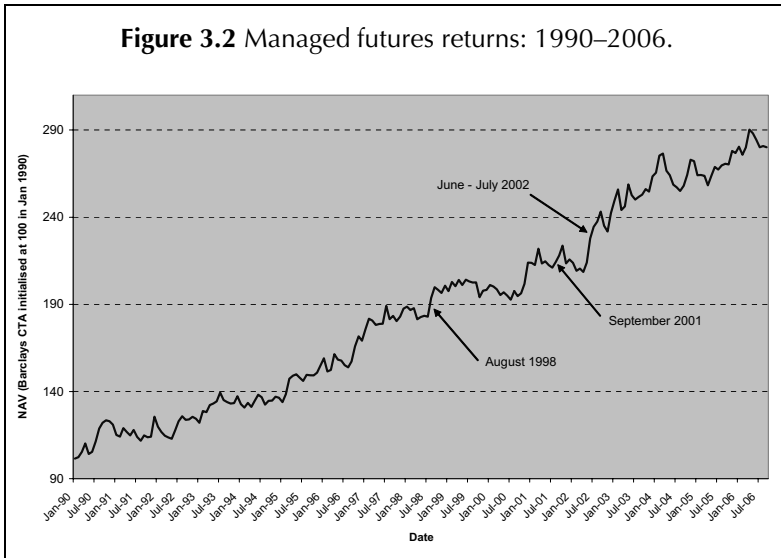


against large downward moves in the SPX. In this chapter, we want to look at the dependence of trend following returns on changes in the VIX rather than the SPX, since a manager can switch between long and short positions in SPX futures depending on the direction of the trend. Thus, a fund's correlation with the SPX will tend to be unstable. In this chapter we establish cases where a trend following system has relatively stable dependence on changes in the VIX.

Since average SPX returns tend to decline as the VIX moves sharply up, the question now is whether managed futures funds are long volatility. There is some empirical evidence that managed futures have performed well during times of crisis. The time series in Figure 3.2 shows the evolution of the Barclays CTA index from January 1990 to September 2006, assuming a base value of 100.

The index returned 5.92%, 1.79% and 9.56% respectively in August 1998 (the Russian default crisis and LTCM), September 2001 (the terrorist attack in New York) and June–July 2002 (the collapse of Enron, Tyco and others).

The academic literature has largely been influenced by Fung and Hsieh's paper (2001), which adapts Merton's model for a perfect market timer to managed futures funds. The idea is that a perfect timer who can go long or short and trade dynamically has a return profile resembling a lookback straddle. Note that a long straddle



position can be created by buying a call and put on an asset at the same strike, and the lookback feature entitles the option holder to the largest payout of the call and put over the life of the option. While trend followers are not perfect market timers (for example, they enter many losing trades and generally do not participate in the beginning of a trend), Fung and Hsieh argue that the analogy roughly applies. They estimate the returns generated by a rolling lookback straddle position in five broad categories (short rates, bonds, commodities, equity indexes and currencies), then perform a multifactor regression against an equally weighted index of more than 400 funds. As it turns out, their regression gives significant results, with an R-squared close to 50% over a roughly 10 year horizon.

It is tempting to conclude from Fung and Hsieh that trend followers are very likely to profit from rising equity volatility, based on the following line of argument.

- A dynamically traded position in each market is qualitatively and to some degree statistically similar to a long straddle in the market.
- By definition, the buyer of a straddle is long volatility.
- The collection of a large number of long volatility positions in different markets is likely to be long equity market volatility,

as there may be some correlation between changes in volatility across different markets.

However, some investors would contend that these results do not imply that managed futures is a long volatility strategy. Trend followers generally had sizable long bond futures positions during the secular US interest rate decline from 1982 to 2004. This was perhaps the most persistent trend available in the market, based on the policy of central banks. Since bonds tend to rally during flights to quality, it may be somewhat accidental that trend followers were properly positioned against extreme event risk. In a rising or non-trending interest rate environment, they might even be short volatility, that is, negatively correlated to changes in the VIX.

Dobrovolsky and Malek (2006) provide a more detailed argument against the widely held idea that trend following is a long volatility strategy. They make the following intuitive points.

- Managers tend to increase long or short exposure as a trend builds, which corresponds to a long gamma position but really does not have a direct connection to vega.
- As market returns become increasingly choppy, realised volatility can go up without the formation of a trend; this can be the worst scenario for a trend follower as many false signals are generated.
- Movements in the VIX are not necessarily connected with implied volatility changes in other markets, such as commodities.

Their empirical results are based on returns for the Conquest Managed Futures Select (MFS) fund. Conquest MFS is an investable strategy designed to replicate the returns of major trend following indexes using breakout systems across a variety of markets and trading horizons. In the next section, we describe the methodology behind MFS in more detail. For now, we simply summarise the conclusions in Dobrovolsky and Malek. Dobrovolsky and Malek choose five representative markets and calculate the correlation between realised volatility and the performance of different breakout systems in each market. The correlation between the performance of different breakout systems and changes in realised volatility for a given market turns out to be fairly small. More

generally, they find that the correlation between changes in the VIX and composite MFS returns is also quite low (roughly 25% from 1990 to 2006, using a daily time step).

However, there is some interesting structure in the data. The correlation between VIX changes and MFS returns is highly dependent on move size. If either VIX changes or MFS returns are more than two standard deviations away from average, the correlation increases from under 10% to over 40% (based on several hundred daily realisations above two standard deviations). This suggests that the VIX–MFS correlation conditioned on large moves of the VIX may also be quite large. An investor who wants to protect against spiking VIX levels, which tend to correspond to extreme market events, may then want to include managed futures in a diversified portfolio. The analysis suggests that sharp moves in the VIX usually coincide with global market trends, while smaller changes may simply imply that equity markets have become choppier. The reader might wonder why it is not more efficient simply to buy a put on the SPX to protect against sharp equity declines. We would argue that, while allocating to a fund that has been statistically long volatility is far less accurate, an investor is not paying a premium for protection and may in fact be positively compensated in the long term.

### THE CONQUEST MFS STRATEGY

Since returns from the Conquest MFS programme have been used in the analysis, it is worth describing why these returns are relevant. The MFS programme is designed to replicate the returns of most trend following indexes with complete transparency and minimal backfitting. Positions are initiated based on a simple  $n$ -day breakout system that is always in the market, according to the following trading rules.

- If today's high price is higher than the high over the past  $n$  days, a buy signal is initiated.
- Conversely, if today's low price is lower than the low over the past  $n$  days, a sell signal is initiated.
- The US dollar amount invested in a breakout system is inversely proportional to the volatility of the underlying contract.

- For example, if a 200-day breakout is triggered in markets A and B and A's historical volatility is twice as large as B's, half as much is invested in A as in B.
- Multiple breakout system triggers in a single market are aggregated.
- For example, if a contract is at its five- and seven-day high, twice as much is bought as would be if the contract were only at its five-day high.
- If no new signals are generated, the current long or short position is maintained.

MFS applies these trading rules to roughly 50 markets over 20 time frequencies ranging from five to 200 days. For example, the decision to go long or short corn futures will depend on whether the sum of the breakout signals across different horizons is positive or negative. The sector allocations to stock indexes, bonds, currencies and commodities are then chosen to match roughly some of the larger managed futures funds in the industry.

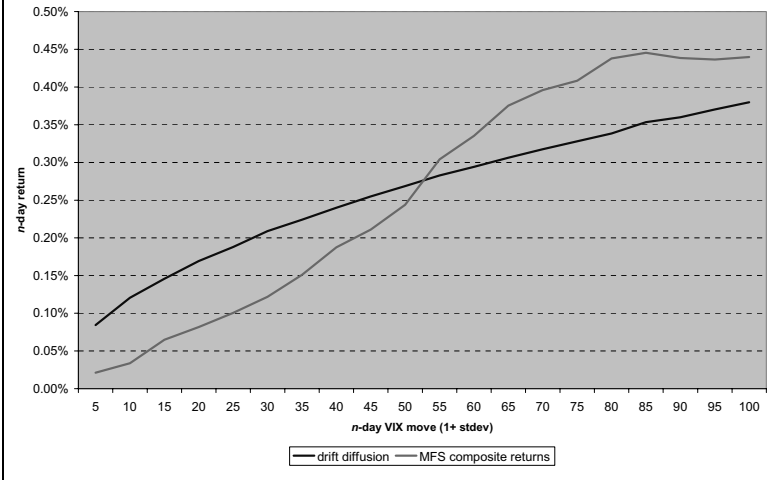
While no explicit attempt is made to optimise the signal-generation process or the allocation to different markets, the returns of MFS have a high (>80% using simulated returns from 1990 to 2004 and realised returns thereafter) correlation to the major managed futures indexes. Thus, MFS appears to be a statistically robust and intuitive proxy for trend followers. The advantage of using MFS over a peer group index is that breakout systems can be tested over different horizons against changes in volatility. This will then demonstrate which systems have tended to provide the most protection in the past and choose specific managed futures funds accordingly.

## EMPIRICAL RESULTS

Here, we show that there is a reasonably strong correlation between large moves in the VIX and MFS returns. We identify large VIX changes over an  $n$ -day horizon using a simple two-step process.

- First, we calculate changes in the VIX over an  $n$ -day moving window from 1990 to 2006.
- Next, we select all changes that are more than 1 standard deviation in magnitude.

**Figure 3.3** Profitability of MFS versus drift diffusion for large VIX moves.

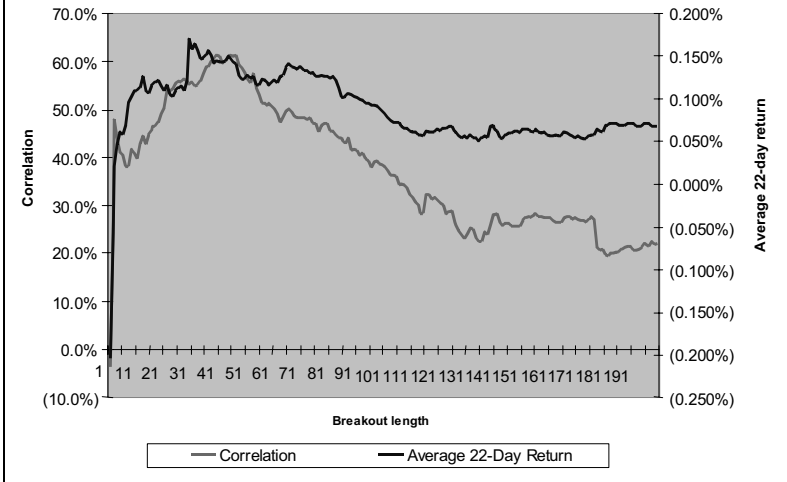


Although we have eliminated large blocks of data, we are still left with a rich sample set of roughly 500 realisations for each  $n$ -day horizon. Note that large moves are not symmetrical: a jump in the VIX is more likely to be up than down. More precisely, the skewness of monthly VIX changes from January 1990 to August 2006 was roughly  $+0.75$ , compared with 0 for a theoretical normal distribution. Figure 3.3 shows performance of various  $n$ -day break-out systems for VIX moves of 1 standard deviation or larger. We specify the length (in trading days, ranging from five to 100) of large changes in the VIX along the  $x$ -axis and average performance over the same horizon along the  $y$ -axis.

The drift diffusion is generated from a simulated discrete diffusion process over different  $n$ -day horizons. We include only returns greater than 1 standard deviation above the mean and take the average over any given horizon. Meanwhile, the MFS composite returns line gives average MFS returns for VIX moves greater than 1 standard deviation. It can be seen that the conditional distribution of returns scales very differently from a normal distribution and that average returns improve most sharply in the 45–55 trading day range. Note that returns are net of estimated trading costs from 1990 to 2004 and realised costs thereafter. Assuming that MFS is a



**Figure 3.4** Average return of MFS breakout sub-systems and correlation with VIX moves (22-trading day horizon).

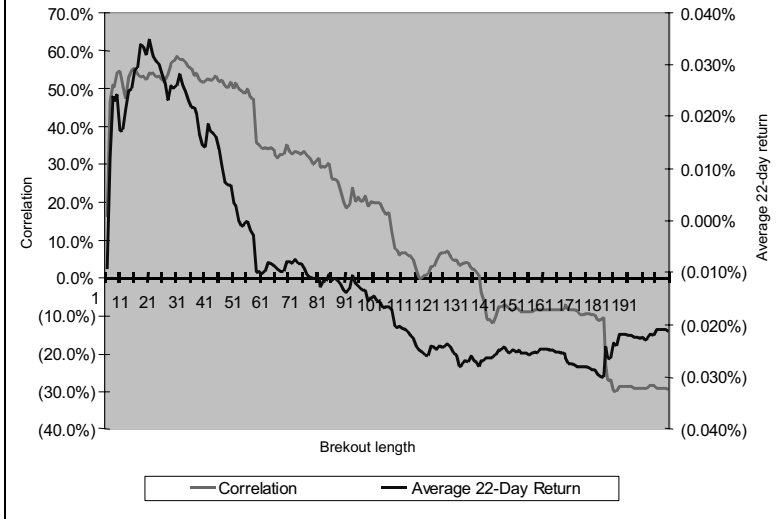


reasonable proxy, this implies that a typical trend follower is more likely to provide protection over a quarterly than monthly window.

In Figure 3.3, we looked at how MFS composite returns vary as a function of large VIX changes over different horizons. We now fix the horizon and examine the performance of breakout systems over different frequencies. Figure 3.4 details performance over a 22-day trading horizon, which covers nearly all calendar months. We have chosen a period of roughly one month because fund of funds managers generally provide monthly NAVs and try to minimise variation around a target return over monthly horizons.

While the top line gives the average 22-day MFS return of each breakout system, the bottom line shows the correlation of each system to large VIX changes. The average return rises rapidly, then is reasonably stable for all systems larger than 10 days. However, there is a mild decay as the breakout horizon goes beyond 85 days. This means that an investor's conditional expected return given large changes in the VIX is not very sensitive to the breakout horizon, though short to medium term systems tend to give the best results. The correlation line shows much more sensitivity to the horizon. For breakout horizons beyond 50 days, there is a sustained decline in correlation, from 60% to 20%. For very large

**Figure 3.5** Average return of MFS breakout sub-systems and correlation with VIX moves (22-day trading horizon, equities only).

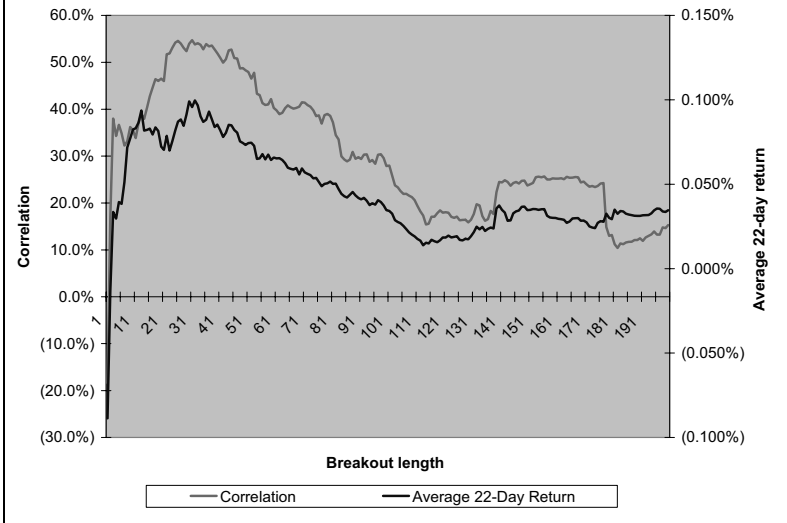


VIX changes, 40–50 day breakout systems tend to provide the best monthly protection.

If we restrict our attention to equity indexes, the decay in returns is much more pronounced. It appears as though the longer-term systems do not have much time to get into a trending market within the 22-day horizon. The correlation of long-term breakout systems to large VIX changes is negative, implying that longer-term equity index trends often reverse when the VIX moves much more than usual. The average holding period across markets for an  $n$ -day MFS breakout system from 1990 to 2006 was roughly equal to  $1.7 \times n$ . This means that, at any point in time, an  $n$ -day system had maintained a long or short position for an average of  $0.85 \times n$  trading days. On average, a 100-day breakout system would have been triggered 85 days ago, based on trend formation from the previous 100 days.

In Figure 3.6, we analyse conditional performance and correlation for equity and fixed income markets. While the average 22-day return is higher for nearly all breakout systems, the maximum (large VIX change, breakout system return) correlation does not increase. This allows us to reach the following tentative conclusions.

**Figure 3.6** Average return of MFS breakout sub-systems and correlation with XIV moves (22-day trading horizon, equities and fixed income).



- Trend following in bond markets clearly boosted realised returns when the VIX moved a lot, but did not necessarily improve diversification around a short volatility portfolio.
- In the absence of rising bond prices, an investor needs to focus on shorter-term breakout systems to protect against a sharp rise in the VIX.

### PRACTICAL CONCLUSIONS

An investor should not take the idea of trend following as a put on the equity market too literally. There are times when the instantaneous correlation between global equities and trend followers will be large and positive. This was apparent in 2005 and 2006, as many managers established long positions in equity index futures and commodities. At the same time, commodities have become increasingly equity sensitive based on demand from India and China.

However, there are ways to improve the odds that managed futures will provide protection when it is needed most.

- An active fund of funds manager can try to estimate short-term correlation to the market using position-level data or a consolidated risk report. If the correlation is thought to be high, it may be worth shifting capital from managed futures into short-biased hedge funds or index puts.
- A buy-and-hold investor may want to identify funds that trade over short to medium-term horizons, without too much exposure to bonds. Note that a short-term contrarian fund generally has a very different return profile from a short-term trend follower and may be vulnerable to large changes in the VIX.
- A more sophisticated client can invest in a separate account where the fund manager explicitly avoids trading bull market signals – for example, buying stock index futures. This fund may have a lower risk-adjusted return, as only a subset of signals are traded. However, the constrained portfolio is more likely to provide protection if the VIX rises.

Trend following is one of the few strategies in the investment universe that have low to negative correlations with equities, yet positive expected returns over the risk-free rate. Accordingly, we believe it plays a valuable role in an investor's overall portfolio. However, an investor should be careful to distinguish between statistical protection and insurance, which is much more precise but almost invariably has a negative expected return.

- 1 Marc Malek and Patrick Kremer are principals and employees of Conquest Capital Group LLC. No fund or investment programme is offered hereby and this article is not intended to and does not constitute investment advice. Hari P. Krishnan is an executive director at Morgan Stanley. This article was written in his personal capacity and not in his capacity as an employee of Morgan Stanley. Morgan Stanley has not sponsored this article and does not endorse its views. This does not constitute investment, legal, tax or accounting advice of Morgan Stanley.

#### REFERENCES

**Fung, W. and D. A. Hsieh**, 2001, "The Risk in Hedge Fund Strategies: Theory and Evidence from Trend Followers", *Review of Financial Studies* 14, pp 313–341.

**Dobrovolsky, S. and M. Malek**, 2006, "Volatility Exposure of CTA Programs and Other Hedge Fund Strategies", preprint, August.