

Tail Risk Insurance with Trend-Followers for Hedge Fund Portfolios

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Trend-followers are said to provide tail risk insurance due to their property of generating a “long lookback straddle” [Fung / Hsieh (1997, 2001)]. In this paper, we study the effectiveness of trend-followers to provide tail risk insurance to a core portfolio of carry hedge fund strategies. We designate carry strategies as investments pursued by hedge funds that tend to generate a risk/return profile similar to a short position in an option on a core asset like the S&P500 index. It is not necessary for the hedge fund to deploy options to generate an implicit short option risk/return profile. The implicit option-like profile is a result of the hedge fund’s trading strategy, cf., for example, Mitchell/Pulvino (2001) for Merger Arbitrage or Fung/Hsieh (2002) for fixed income strategies. A welcome feature of short option risk/return profiles is that they generate small positive returns in many periods. However, they tend to suffer large drawdowns if equity markets lose strongly, resulting in a return distribution with negative skewness and positive kurtosis. The idea is to mitigate the negative characteristics of short option-like carry portfolios with the positive features of a long option position, as provided by trend-followers. As a proxy for trend-followers we utilise the Barclay Systematic Traders Index. For all hedge fund strategies we utilise the Barclay hedge fund indices as given in Table 1. The rightmost column shows the autocorrelation coefficient of order 1, based on quarterly data from 1997-2014.

Index	Short Cut	Category
S&P500	SPX	n/a
Barclay Convertible Arbitrage Index	CA	Carry
Barclay Distressed Securities Index	DS	Carry
Barclay Emerging Markets Index	EM	Carry
Barclay Equity Long Bias Index	ELB	Carry
Barclay Equity Long/Short Index	ELS	Carry
Barclay Equity Market Neutral Index	EMN	Carry
Barclay Event Driven Index	ED	Carry
Barclay Fixed Income Arbitrage Index	FIA	Carry
Barclay Merger Arbitrage Index	MA	Carry
Barclay Systematic Traders Index	STI	Tail Risk Insurance

Table 1: Barclay Hedge Fund Indices and their categorisation in Carry and Tail Risk Insurance strategies

Autocorrelations range from 0.03 [Barclay Equity Long Bias Index] to 0.40 [Barclay Convertible Arbitrage Index]. The Barclay Systematic Traders Index shows an autocorrelation coefficient of -0.10. Table 2 displays the correlation matrix for these hedge fund strategies.

	SPX	CA	DS	EM	ELB	ELS	EMN	ED	FIA	MA	STI
SPX	1.0										
CA	0.4	1.0									
DS	0.6	0.7	1.0								
EM	0.7	0.5	0.7	1.0							
ELB	0.8	0.5	0.8	0.8	1.0						
ELS	0.7	0.5	0.7	0.8	0.9	1.0					
EMN	0.2	0.2	0.3	0.3	0.4	0.5	1.0				
ED	0.7	0.6	0.9	0.8	0.9	0.8	0.4	1.0			
FIA	0.4	0.7	0.7	0.5	0.5	0.4	0.2	0.5	1.0		
MA	0.5	0.5	0.6	0.6	0.7	0.6	0.3	0.7	0.4	1.0	
STI	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.2	0.0	-0.1	0.0	1.0

Table 2: Correlation matrix, quarterly returns from 1997-2014

The correlations between carry strategies themselves and the SPX are high ≥ 0.4 . The exception is Equity Market Neutral which exhibits low correlations with other carry strategies. The Barclay Systematic Trader Index has low to negative correlations with other strategies and the SPX.

To study the potential tail risk insurance capabilities of trend-followers we build hedge fund portfolios: the 9 carry strategies are equal weighted, i.e., each carry strategy receives a weight of 11%. Portfolio PF_EW 0% only comprises the carry strategies. This is our core portfolio or “uninsured” benchmark. To simulate the effect of adding trend-followers to the core portfolio we add the Barclay Systematic Trader Index in steps of 10%-points to the core portfolio. For example, PF_EW 10% contains $0.9 * 11\% = 10\%$ weight for each carry strategy and 10% weight for the Barclay Systematic Trader Index.

For our backtesting, we set the weights for the portfolios on 31 December 1996. Each quarter, the weights are re-adjusted to their initial values of, for example, 11%. The portfolio structure is left unchanged for the whole backtesting period as our goal is to maintain a static portfolio to study long-term performance. All performance figures represent returns without transaction costs and without any fund of hedge fund fees. Single hedge fund fees [management and performance fees], however, are included, as we take the hedge fund returns as provided in the Barclay database and most hedge funds report returns net of management of performance fees.

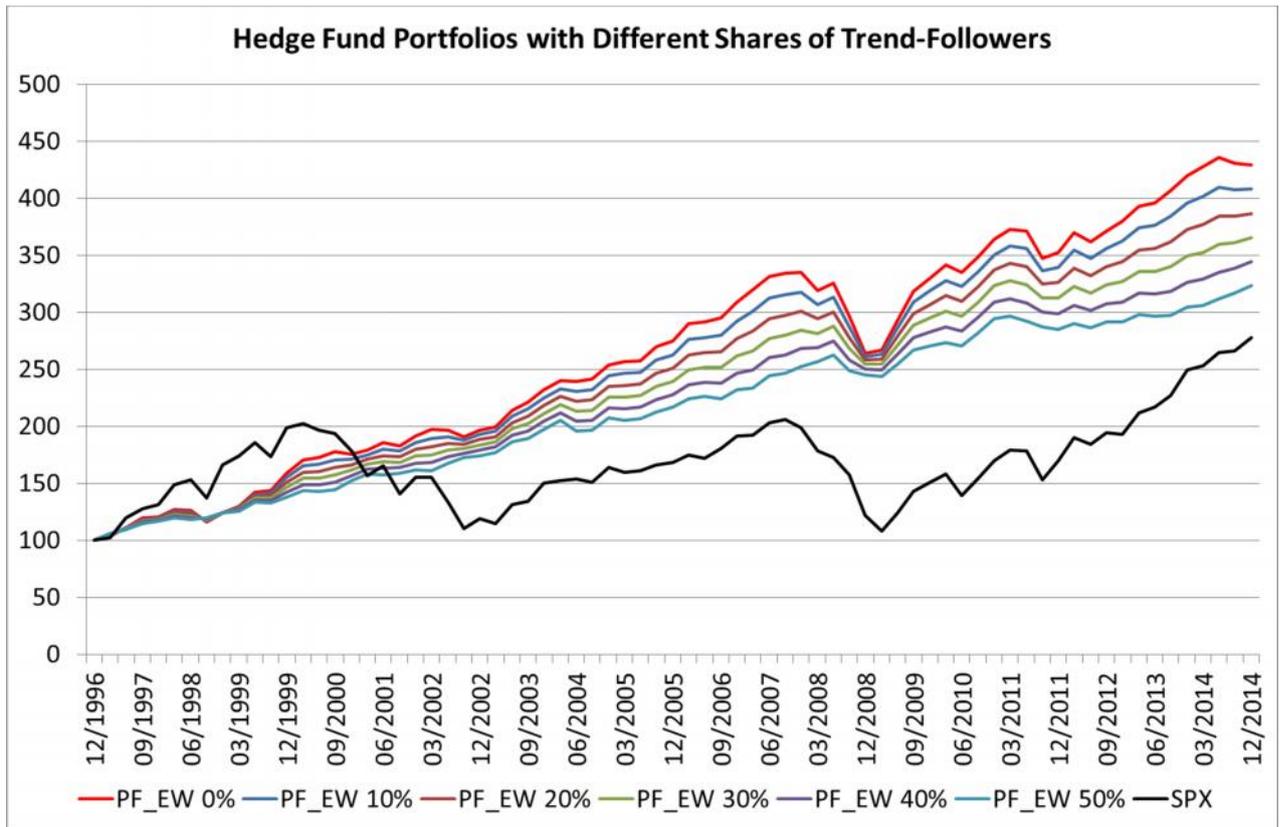


Figure 1: Equity lines for hedge fund portfolios with different shares of trend-followers

Figure 1 shows that trend-followers help to achieve smoother equity lines than the carry portfolio PF_EW 0%, but reduce long-term returns. All hedge fund portfolios outperform the SPX.

	PF_EW 0%	PF_EW 10%	PF_EW 20%	PF_EW 30%	PF_EW 40%	PF_EW 50%
1997	20%	19%	19%	18%	17%	16%
1998	4%	4%	5%	5%	6%	6%
1999	28%	25%	21%	18%	15%	11%
2000	10%	10%	10%	10%	10%	10%
2001	9%	9%	8%	8%	7%	6%
2002	3%	4%	5%	6%	7%	8%
2003	18%	17%	16%	15%	14%	13%
2004	10%	9%	8%	7%	6%	5%
2005	8%	7%	7%	6%	5%	5%
2006	12%	11%	10%	9%	8%	7%
2007	9%	9%	9%	9%	9%	9%
2008	-21%	-18%	-14%	-11%	-7%	-3%
2009	25%	22%	19%	16%	13%	10%
2010	10%	10%	10%	9%	9%	9%
2011	-3%	-3%	-3%	-3%	-3%	-3%
2012	8%	7%	6%	4%	3%	2%
2013	10%	9%	8%	7%	6%	5%
2014	2%	3%	4%	5%	5%	6%
return p.a.	8.4%	8.1%	7.8%	7.5%	7.1%	6.7%
vol	8.0%	7.0%	6.1%	5.4%	4.9%	4.7%
SR	1.06	1.16	1.27	1.38	1.45	1.44
skew	-0.80	-0.69	-0.57	-0.46	-0.37	-0.32
E-kurt	1.93	1.70	1.37	0.94	0.53	0.25
ret. '09-14	8.5%	7.7%	7.0%	6.2%	5.5%	4.7%
ret. '97-07	9.8%	9.3%	8.8%	8.3%	7.8%	7.3%
p(HAC)	n/a	0.0200	0.0360	0.0750	0.1840	0.4250
p(HAC.pw)	n/a	0.0200	0.0330	0.0700	0.1780	0.4250

Table 3: Annual returns and performance statistics

PF_EW 0% only suffers 2 negative out of the 18 years from 1997 to 2014: 2008 [-21%] and 2011 [-3%], while the SPX delivered sub-zero returns in 4 years, most notably 2008 with a loss of -38%. It is worth mentioning that the core portfolio PF_EW 0% is diversified enough to deliver positive returns during the 2000-2002 period, when the SPX lost cumulative -40%. The contribution of trend-followers during these 3 years is hence less powerful than in 2008. In 2011, PF_EW 0% retreated -3%. Adding trend-followers does not change this. In summary, it is not always clear from the outset how trend-followers will behave and how much value in terms of tail risk insurance they might add in an adverse market scenario.

Average annual returns decrease by adding trend-followers: PF_EW 30% generates 7.5% on average, while PF_EW 0% achieves 8.4%. But all other performance statistics are enhanced: volatility and excess kurtosis are lower, while Sharpe Ratio and skewness are higher. By adding trend-followers, the heavy losses of 2008 are reduced and volatility remarkably dampened. Accordingly, Sharpe Ratios rise, for example, from 1.06 for PF_EW 5% to 1.38 for PF_EW 30%, an increase of 30%. A test

of the null hypothesis that the Sharpe Ratios PF_EW 0% vs. PF_EW X% are equal can be rejected for trend-follower weights from 10% to 30%: $p(\text{HAC}) < 0.1$, $p(\text{HAC.pw}) < 0.1$ [Ledoit/Wolf (2008), see the last 2 rows in Table 3].¹ PF_EW 30% loses -11% in 2008, in contrast to PF_EW 0%'s -21%.

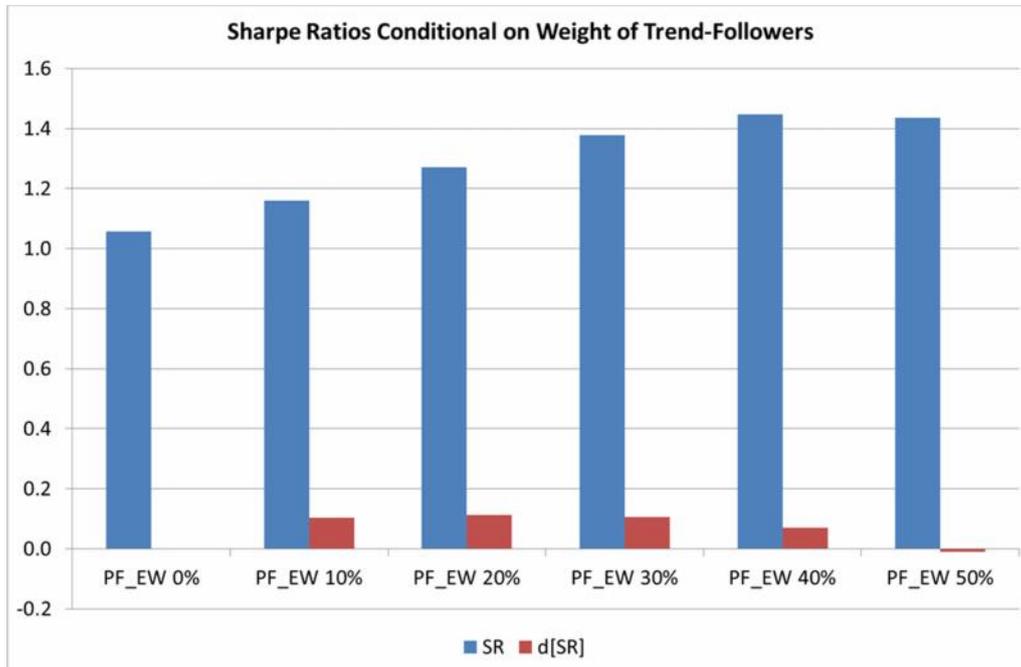


Figure 2: Sharpe Ratios conditional on the weight of trend-followers and their changes vs. lower allocations to trend-followers

The blue bars in Figure 2 exhibit the Sharpe Ratios of hedge fund carry portfolios with different allocations to trend-followers. The highest Sharpe Ratio of 1.45 is generated by PF_EW 40%. The red bars show the marginal increase of the Sharpe Ratio compared to a lower allocation to trend-followers. Example: from PF_EW 30% to PF_EW 20% the SR increases by 0.11. According to the red bars, adding 10% to 30% trend-followers provides the most marginal value added.

In order to better understand the diversification benefits of trend-followers when the core portfolio experiences strongly negative returns, we sort the 72 quarterly returns for the period 1997-2014 in ascending order. The lowest return gets rank 1, the highest return gets rank 72. Figure 3 displays these returns for PF_EW 0%, i.e., the core portfolio, and the corresponding returns of PF_EW 30%. For example, the lowest quarterly return of PF_EW 0% [rank 1] was -11.1% in Q4, 2008. For the same period, PF_EW 30%'s return was -5.2%. Both are plotted for rank 1 in Figure 3.

¹ The Ledoit/Wolf (2008) test was calculated with excess returns over 1M T-Bills.

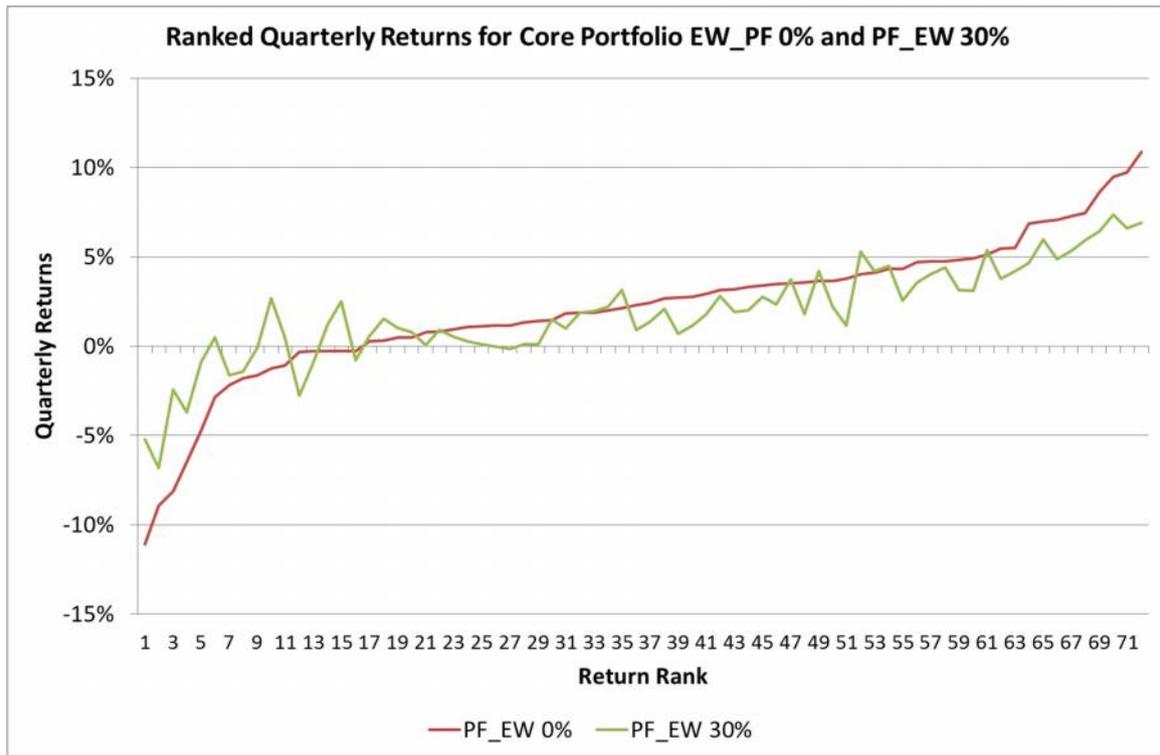


Figure 3: Ranked quarterly returns for core portfolio EW_PF 0% vs. PF_EW 30%

For the lowest 12 [i.e., 12/72 = 17%] quarterly returns trend-followers play out their diversification potential and mitigate the strongly negative returns of PF_EW 0%, cf. the left side of Figure 3. It is clear from the right side of Figure 3 that trend-followers tend to reduce returns when carry strategies perform strongly.

Table 4 shows the 4 largest drawdowns over several quarters during the period 1997-2014. For example, the largest drawdown concurs with calendar year 2008 [4 quarters] where PF_EW 0% loses -21%. During that period, trend-followers provide effective tail risk insurance and the drawdown reduces to -11%. The other 3 drawdowns of PF_EW 0% are also reduced, even though the impact is not as pronounced as for the first one. We conclude that trend-followers have provided effective tail risk insurance.

start	end	SPX	PF_EW 0%	PF_EW 10%	PF_EW 20%	PF_EW 30%	PF_EW 40%	PF_EW 50%
12/07	12/08	-38%	-21%	-18%	-14%	-11%	-7%	-3%
03/11	09/11	-15%	-7%	-6%	-5%	-5%	-4%	-3%
03/98	09/98	-8%	-8%	-7%	-5%	-3%	-1%	0%
03/02	09/02	-29%	-3%	-1%	1%	3%	5%	7%

Table 4: The 4 largest drawdown periods between 1997 and 2014

Summary and Conclusion

We study the impact of adding different shares of trend-followers to a portfolio of 9 hedge fund carry strategies with static allocations. All hedge fund strategies were represented by Barclay hedge fund indices. The diversification effect of trend-followers is most pronounced when the core portfolio experiences large negative returns, like, for example, during equity markets' heavy losses of 2008. Generally, adding trend-followers reduces volatility remarkably. However, as trend-followers also can suffer conditional on the market environment, they also can reduce returns. This is the case when carry strategies perform strongly, for example, during a period of rising equity markets, but of less exploitable trends, as experienced in the period 2009-2013. Based on the marginal increase of the Sharpe Ratio, we quantify the optimal allocation to trend-followers in the area of 10 to 30%.

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