Hedge Fund Risk and Drawdowns

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Abstract

I review the relative risks of hedge fund investing using various commonly used measures including market betas, correlations, and portfolio drawdowns. The data show that historically hedge funds have hedged a fair degree of systematic market risk, especially in the early years, offering meaningful diversification benefits to traditional stock/bond portfolios. However, the diversification benefits for investors in hedge funds have since seemingly lessened, though not altogether eliminated. Most recently during the 2020 pandemic, modest drawdown benefits bore out for hedge fund investors, although again much less so than in the earlier years.

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In a recent JAI article, I discussed how risk-adjusted alpha for hedge funds has been in a slow but steady decline since the 2008 Global Financial Crisis (see Sullivan 2021). The observed degradation of alpha over the most recent decade has come as a surprise to many, perhaps most especially that the performance has been so persistently weak, as it followed quite strong performance in the prior decade. As I've been presenting the paper's findings at industry events, some have keenly asked me about the extent to which hedge funds have provided downside benefits during the occasional periods of severe market turbulence visiting markets over the past 25 years. More pointedly, have hedge funds helped to protect investor wealth by mitigating portfolio drawdowns during periods market decline? After all, and as my earlier paper reports, hedge funds do in fact hedge (at least to some degree) possessing an average beta to stocks of around 0.4 on average over the past 25 years. This equates to about a 40% exposure to stocks and 60% exposure to "other things" that hedge funds do. This suggests, in part, that hedge funds might experience smaller drawdowns in returns relative to stocks during market declines, depending of course on what "other things" they are doing. Such return diversification is a key reason why investors seek to invest in hedge funds in the first place. So then what do the data say about the relative drawdowns of hedge funds versus the stock market? Here, I extend my earlier paper (Sullivan 2021) by taking a closer look at hedge fund drawdown risk.

To conduct the analysis, I use data provided by the two leading providers, Hedge Fund Research (HFRI) and Backstop Barclay Hedge from Jan 1994 through Dec 2020. Following Sullivan (2021), I create a hedge fund index composite using the monthly after-fee returns of the overall Barclay Hedge Fund Index and the HFRI Fund Weighted Composite Index (weighted 50/50).

Hedge Fund Market Exposure

To begin, let's review hedge fund market exposure as measured by both their beta and correlation versus stocks as measured by the S&P 500. Correlation as we all already know, tells us the degree to which two variables move relative to one another. Exhibit 1a reports the ten year trailing correlation between our hedge fund composite and the S&P 500 index with the first data point being Jan 2004 and ending Dec 2020. A clear rising trend between the two over the full period is present, with correlations gradually increasing from around 65% in the early period before bumping up to 75% following the GFC and then continuing to rise to its current level in Dec 20 of 87%.

Exhibit 1b reports the two-year rolling correlation between stocks and hedge funds providing us a clearer picture of the variability of the pair's correlation through time. As we can see, hedge funds had a higher degree of variability relative to stocks —they moved more independently versus stocks— in the earlier years. But that independence became less so, that is the pairwise correlation gradually rose, in the decade post GFC. We also notice from observing the two-year trailing correlation that correlations between hedge funds and stocks tend to rise in periods of crisis as can be seen from the 2001-2002 and 2008-2009 periods. This is in part due to the result of a mathematical artifact that occurs when market volatility spikes higher. Even still, the oft-repeated comment that during a crisis "all correlations go to one" is an exaggeration of what actually happens. While the rise in correlations is notable, perhaps even more notable is that while the rolling hedge fund/stock correlation was 78% as of Dec 2008, correlations continued to rise following the GFC reaching their all-time high of 91% in June 2011.

Putting it together, our rolling correlation measures suggest that the diversification benefits of hedge funds overall has been gradually declining over the years. Furthermore, whether measured by the rolling two-year or ten-year periods, the correlation between hedge funds and stocks are at an all-time high of 90% as of Dec 2020. So stocks and hedge funds are now moving together (in the same direction) nearly 90% of the time. While the two are not perfectly correlated, stocks and hedge funds could hardly be considered lowly correlated as one might expect them to be.
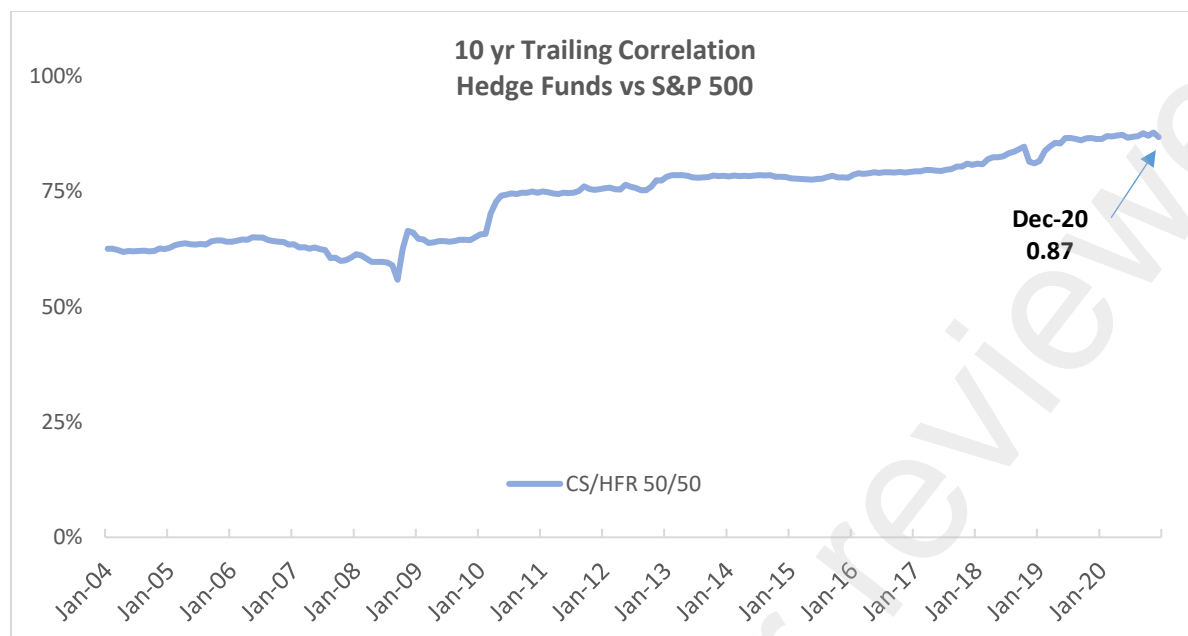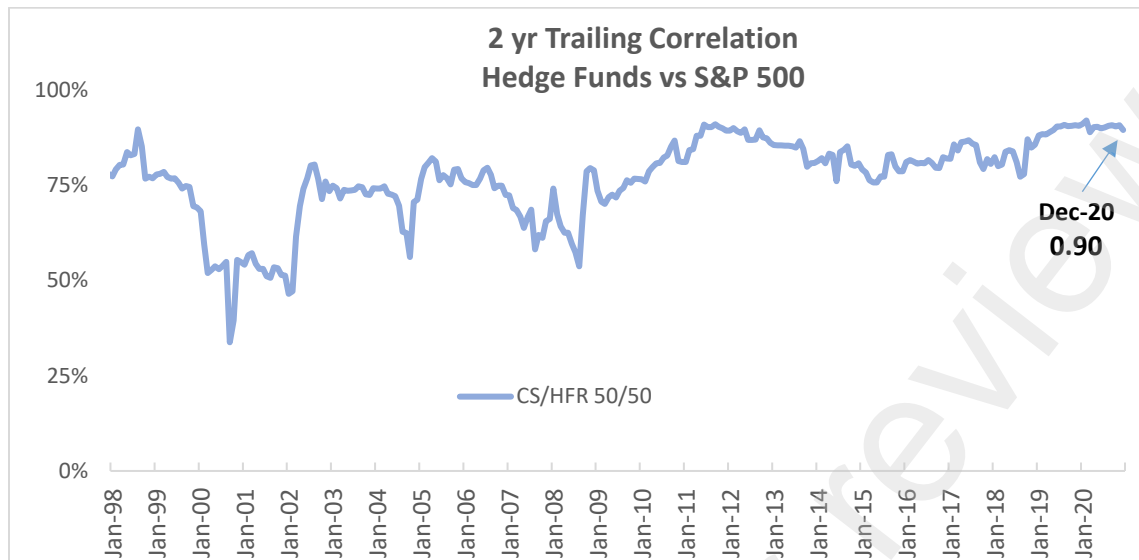
Exhibit 1a

**10 yr Trailing Correlation
Hedge Funds vs S&P 500**

Dec-20
0.87

CS/HFR 50/50

4

Exhibit 1b

2 yr Trailing Correlation
Hedge Funds vs S&P 500

Dec-20
0.90

CS/HFR 50/50

While pairwise correlations are certainly helpful in understanding how hedge fund returns move relative to stocks across time and differing market environments, correlations don't tell us about the magnitude that hedge funds move relative to stocks, or their overall volatility, compared to that of the market. We also want to know to what degree hedge fund returns respond to changes in the market— that is, their systematic risk exposure. To more clearly gauge their systematic risk exposure, we need to estimate hedge fund beta. To do so, we'll use equation 1 below.[1]

Equation 1

$$HF_t = \alpha_1 + \beta_1 S\&P500_t + \varepsilon_t$$

Where

HF is the monthly excess of cash return of the hedge fund composite, net of fees, in month t
$S\&P500_t$ is the excess of cash return of the S&P500 in month t
α_1 is the average annualized alpha, β is the regression coefficient, and ε is the error term.

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[1] For a detailed analysis of hedge fund alpha, please see Hedge Fund Alpha: Cycle or Sunset?, I do not repeat that analysis here.

5

Exhibit 2a

**5 yr Trailing Beta
Hedge Funds vs S&P500**

**Dec-20
0.43**

(chart: CS/HFR 50/50, y-axis 0.0 to 0.6, x-axis Dec-99 to Dec-20)

Exhibit 2b

**2 yr Trailing Beta vs S&P 500
Hedge Funds vs S&P 500**

Dec-20
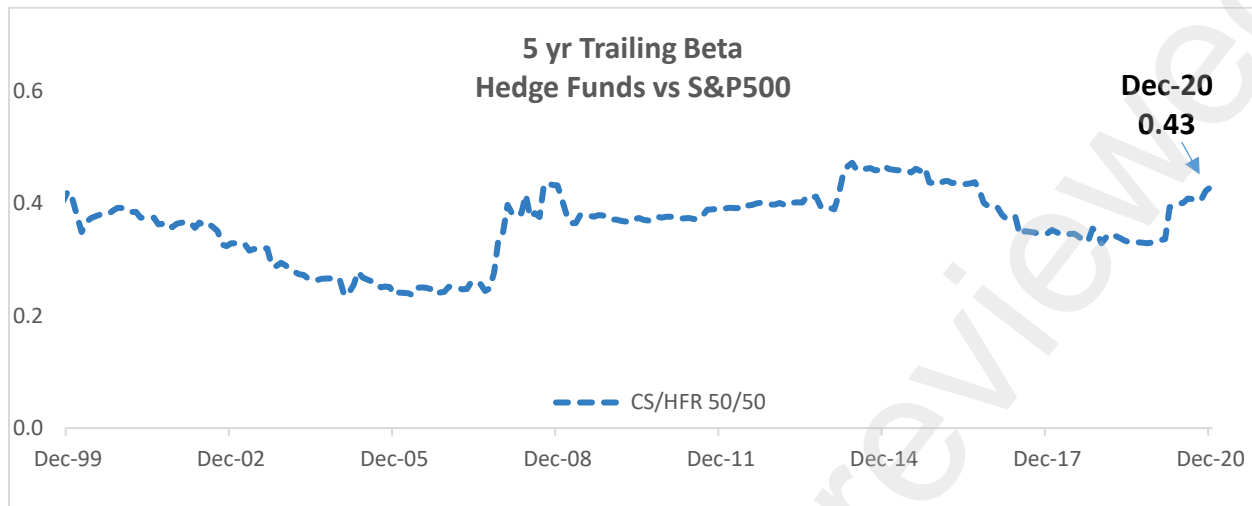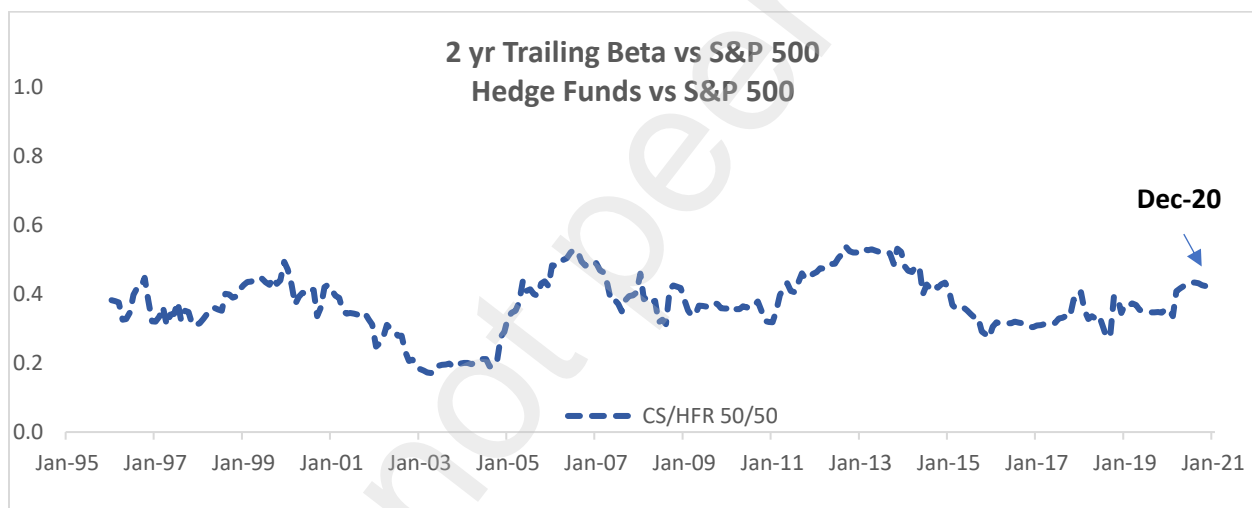
(chart: CS/HFR 50/50, y-axis 0.0 to 1.0, x-axis Jan-95 to Jan-21)

Exhibits 2a and 2b report betas for the overall hedge fund composite to the market on both a rolling five-year and a two-year basis. As you can see although, as expected, two-year beta varies more than the longer ten-year rolling period, there appears little contrast between the two rolling periods as they demonstrate quite similar patterns. Here, we see that beta, similar to correlations, has varied over time with hedge fund beta varying between a low of around 0.20 in the early 2000s to a high of around 0.5 in 2006 and now approaching that high at its current level of 0.43. So with a systematic risk exposure of between 20% and 50% to stocks over time, hedge funds clearly do partially hedge against market risk. Beta tells us, for instance, that when the S&P 500 declines by 1%, the average hedge fund falls between

6

0.2% and 0.5%, all else equal. This means that hedge funds do indeed provide some degree of hedging, at least on average over time, which should provide a degree of downside protection during market declines. Now, let's dig even deeper to explore hedge fund drawdowns more explicitly.

Hedge Fund Drawdowns

With that backdrop, let's now move on to explore the motivating question behind the point of this paper: What about hedge fund drawdowns? In order to make the analysis more insightful and to provide a more apples-to-apples comparison of results, I first create two additional composite portfolios. Each portfolio has the same level of volatility as a traditional 50/50 portfolio (50% US large cap stocks and 50% US investment grade bonds) rebalanced monthly.[2] Summary statistics for these and all of the relevant portfolios are reported in Exhibit 3. The first composite portfolio I call "50/50 CS/HFR 7vol." It is a pure hedge fund portfolio created by adjusting historic monthly returns of the unadjusted 50/50 CS/HFR portfolio discussed above such that the resulting portfolio volatility is 7.6% on average over time— again the same volatility as the 50/50 US stock/bond portfolio. For the second composite, I create a blended 40/30/30 portfolio consisting of 40% stocks, 30% bonds, and 30% hedge funds. Again, and as can be seen in row 3 of Exhibit 3, this blended portfolio has an overall volatility equal to that of the traditional 50/50 portfolio over the full period.

Exhibit 3

Summary Statistics (Jan 1994 - Dec 2020)						
	BarCap Agg	**SP500**	**US Stock/Bond 50/50**	**CS/HFR 50/50**	**50/50 CS/HFR_7vol**	**40/30/30 Stocks/Bonds/HF**
Correl to S&P500	1.1%	100.0%	97.3%	71.5%	71.5%	97.1%
Beta to S&P500	0.00	1.00	0.50	0.31	0.37	0.49
Standard Dev (ann)	3.5%	14.7%	7.6%	6.4%	7.7%	7.5%
Avg Excess Return (ann)	2.9%	7.2%	5.0%	4.6%	6.2%	5.1%
Sortino Ratio	0.39	0.14	0.29	0.31	0.37	0.29
Sharpe Ratio	0.81	0.49	0.67	0.71	0.82	0.69

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[2] The data source for this analysis is Bloomberg. I use total returns. Tickers are as follows: S&P500 (SPXT) and Bloomberg Barclays US Aggregate (LBUSTRUU).

With these portfolios in place I now turn attention once again to explore risk of our various portfolios. The bottom two rows of Exhibit 3 report the Sharpe and Sortino ratios for each portfolio for the full period as defined in Equation 2 and Equation 3. Recall that the Sharpe ratio tells us a portfolio's excess return adjusted for the total portfolio risk while the Sortino ratio adjusts portfolio risk by using only the portfolio's downside deviation. For both measures, a higher result is better.

Equation 2

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p}$$

Where:

R_p = return of portfolio
R_f = risk-free rate
σ_p = standard deviation of the portfolio's excess return

Equation 3

$$Sortino\ Ratio = \frac{R_p - R_f}{\sigma_d}$$

Where:

R_p = return of portfolio
R_f = risk-free rate
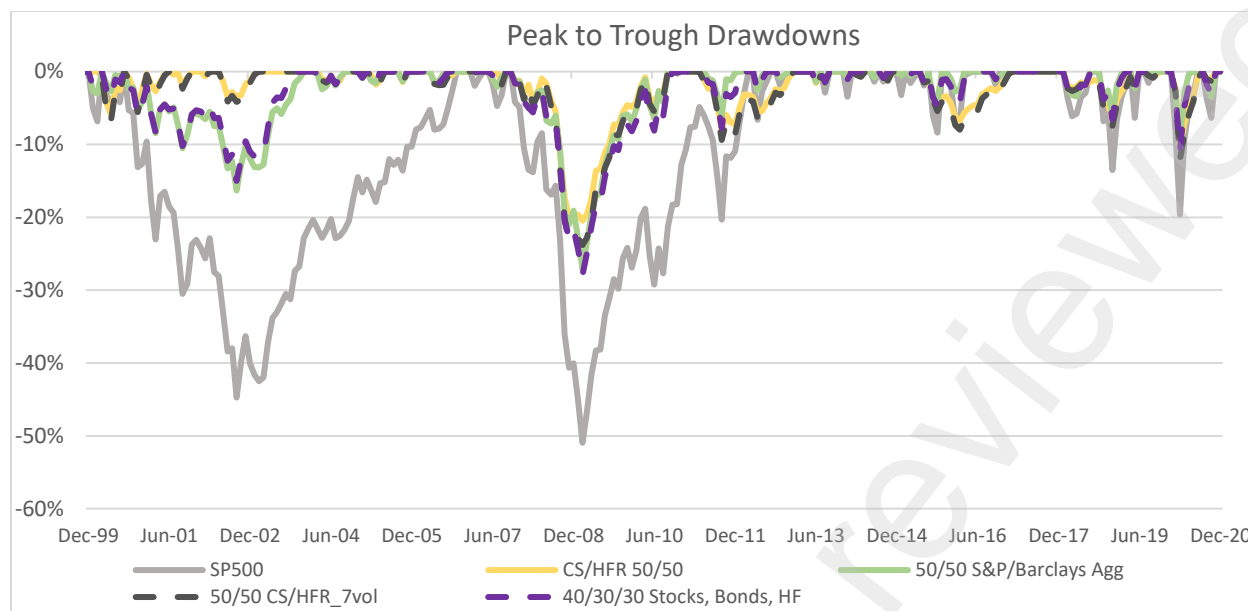σ_d = standard deviation of the portfolio's downside return

We see from Exhibit 3 that our first hedge fund composite portfolio, the hypothetical 50/50 CS/HFR 7vol portfolio, historically generated higher risk-adjusted returns versus the traditional 50/50 stock/bond portfolio as measured by both Sortino and Sharpe ratios. Versus the traditional 50/50 stock/bond portfolio, the standard 50/50 CS/HFR portfolio and the blended 40/30/30 stock/bond/HF portfolios both report similar risk adjusted returns using the Sortino ratio and slightly higher Sharpe ratios over the full sample. Taken together, over the full 25 year sample period the results from the Sharpe and Sortino ratios suggest a modest improvement in average risk-adjusted returns from including a portfolio of hedge funds to a traditional stock/bond portfolio.

Another useful tool for exploring the downside performance of hedge funds is through a reporting of peak-to-trough drawdowns through time. This useful risk metric tells us to what degree, percentage-wise, an asset declines cumulatively from its prior peak to its lowest level before (hopefully!) rising again. Exhibit 4a shows the drawdowns for stocks, our two hedge fund composites, and the 50/50

stock/bond portfolio (US stocks and bonds) from 2000 to present. For this analysis, the similar risk exposure of our two hedge fund composite portfolios to the commonly used traditional 50/50 portfolio once again provides representative performance comparisons.

From Exhibit 4a, we can see the sharp drawdowns in stocks, and to a lesser degree the traditional 50/50 portfolio, in 2001-2002 and then again during the GFC of 2008-2009. Hedge funds provided especially robust downside mitigation during the 2001-02 crisis period. The two "pure" hedge fund portfolios (the CS/HFR 50/50 and the 7vol CS/HFR50/50) each declined less than 5% during the 2001-02 period as compared to the S&P500 cumulative decline of over 40% and the 15% drop for a traditional 50/50 portfolio during that same period. Six years hence, during the 2008-09 GFC, our two pure hedge fund portfolios again provided some, albeit less, downside protection, falling around 20% versus a decline of over 50% for stocks and nearly 30% for the traditional 50/50 portfolio. By comparison, our blended 40/30/30 portfolio performed closely in line with the traditional 50/50 stock/bond portfolio during each of these two major drawdown periods. In the ten-year period since the GFC, we have (fortunately!) not seen such a degree of stock market turbulence, even including the 2020 COVID-19 pandemic.

Exhibit 4a

Peak to Trough Drawdowns

Legend: SP500 · CS/HFR 50/50 · 50/50 S&P/Barclays Agg · 50/50 CS/HFR_7vol · 40/30/30 Stocks, Bonds, HF

As it's a bit difficult to discern the relative drawdowns in 2020 from Exhibit 4a, I shorten the period in Exhibit 4b showing the just the drawdowns during 2020 alone thereby making it much easier to gauge the results. What we can see in Exhibit 4b is that during the COVID-19 March 2020 period, all of our composite portfolios declined around 10% and thus provided some padding versus the all-stock S&P 500 portfolio which fell 20% (I used month-end data for all periods). Interestingly, in this most recent period, each of our composite hedge fund portfolios roughly matched the drawdown performance of the traditional 50/50 portfolio, each declining about 10%.

10

Exhibit 4b

Peak to Trough Drawdowns
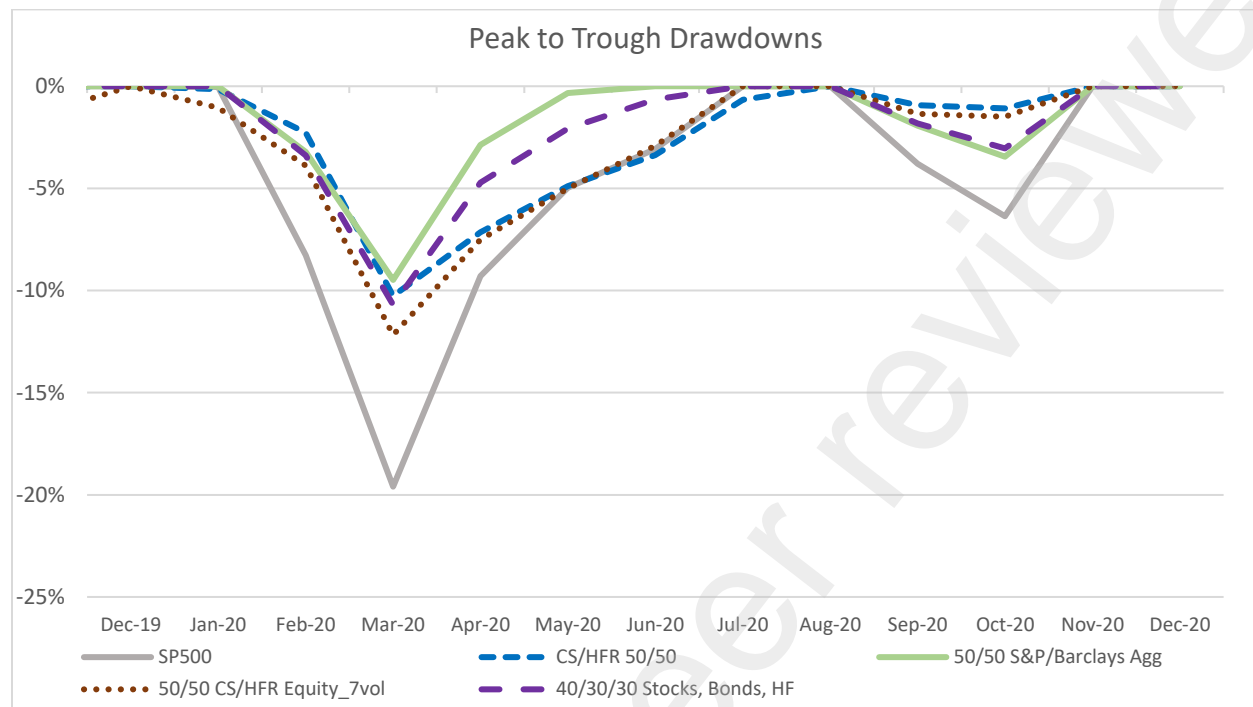
Putting all the above discussion together, we see a picture emerge that shows hedge funds have historically hedged a fair degree of systematic market risk, especially in the earlier period. The diversification benefits of improved drawdowns for investors in hedge funds have since seemingly lessened, however they have not been altogether eliminated. Most recently, benefits bore out for hedge fund investors during the 2020 pandemic, although again much less so than in the earlier years.

Although it is too soon to judge, as there is insufficient data, the degree of hedging away of systematic risk by hedge funds appears to be diminishing as evidenced by rising correlations between stocks and hedge funds now approaching 90% and equity betas approaching their highs of 0.45. Also, the observed drawdowns of our various hedge fund composite portfolios during the turbulent periods of 2008-09 and 2020, have been more in line with that seen by a traditional 50/50 portfolio, arguably a reasonable benchmark portfolio given the typical level of hedging of systematic risk exposure by hedge funds overall.

Finally as mentioned at the outset, in this short piece I extend the findings of Sullivan (2021) by reporting relative risk results for an aggregated composite of hedge funds over the past 25 years. It's

11

important to note that my results are for hedge funds overall. Within the universe of hedge funds and sub-categories of strategies, there certainly will be those that have delivered much greater diversification benefits than shown in the results presented here. Just as one example, the rolling two-year correlations for the sub-category of global macro managers ranges quite widely over time from nearly -0.8% to +0.8%. Furthermore, global macro managers have provided more meaningful drawdown protection over the past 25 years than the overall hedge fund composites reported above. So we should be careful to not paint all hedge funds with the same brush as there will certainly be variation across managers and strategies.

References
Sullivan, Rodney N. 2021. "Hedge Fund Alpha: Cycle or Sunset." *The Journal of Alternative Investments.* Winter, 23 (3) 55-79; DOI: https://doi.org/10.3905/jai.2020.1.118