Diversifying Diversification:
Downside Risk Management with Portfolios of Insurance Securities[1]

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Abstract

Investors are always in search of diversifying securities and strategies to assist in downside risk management. We consider six popular diversifying securities, i.e. Gold, Swiss Franc, Japanese Yen, Bond Futures, S&P 500 80% strike Put Options, and Trend Following strategies in this paper. Using fifty years of data, we demonstrate that a portfolio approach to diversification strategies results in more robust outcomes when combined with a portfolio which has large equity exposure. While each of the individual securities can be more or less beneficial in specific periods and environments, we conclude that a simple portfolio approach to diversification, whether optimized or not, allows investors to robustly manage risk while not being overly concentrated.

Key Takeaways

- Many securities and strategies such as Gold, Yen, Swiss Franc, Bond Futures, S&P 500 Index Put Options, and Trend Following have all been used for downside risk mitigation.
- Over fifty years of history, each one of these strategies assists in mitigating risk and improving the performance of a portfolio with S&P 500 exposure.
- However, by diversifying diversification, i.e. by combining these strategies, we demonstrate that more robust portfolio outcomes can be realized without the possibility of hind-sight bias or over reliance on one risk mitigation strategy.

As global stock markets make record highs, and investors worry about the potential long-term outcomes of the pandemic, there is a natural worry that the next sharp pullback in equity markets might be even more painful than the last one. For instance, given the large future obligations of public pensions to their beneficiaries, one of the most important questions for investors is how they should protect against severe downdrafts in the equity markets. De-risking out of equities and holding large amounts of cash are not the only practical options, since equities are an important asset class that have the potential to deliver returns. Increasing duration exposure, which has traditionally been a great diversifier, via levered fixed income as the only strategy for mitigating equity selloffs might also prove to be dangerous, given the very low level of bond yields and potential losses from rising yields. Buying put options might provide necessary protection, but if managed passively, can result in substantial drag to portfolio returns. Finally, allocating to strategies such as Trend Following might also not be completely satisfactory given the potential lags and trend reversal risk in such systematic strategies.

The best answer, in our analysis, turns out to think of the risk mitigation problem in a portfolio context, repeated twice. First, we take a systematic look at a class of securities we term "insurance" securities, and evaluate their risk-return profile in isolation and also when combined with an underlying equity portfolio. This provides us with some quantification of the benefit each security provides to the total portfolio. The second portfolio context is that instead of thinking of each security in isolation when combined with the underlying equity portfolio, we also perform the analytical exercise of approaching the diversification and risk reduction problem with an open mind about how to create the best mix of insurance securities. Among the allocation methods used here are the simple equal weight mix, as well as an optimized mix using mean-variance analysis. None of these techniques are complex, but they shed important light on what a proper framework for including such securities should look like.

To avoid the problem of overfitting and perfect hindsight, we perform these exercises both in sample and out of sample. This approach suggests that while no one security or methodology is best all the time, having some exposure to insurance securities is better than having none, and also that having some systematic framework for including insurance securities, imperfect as it may be, is better than having no framework.

We have kept our analysis simple and non-exotic by design. Our main reason for this approach is to have more faith in our analysis given the extent of the data available, as well as to ensure that for large investors the strategies outlined here are executable in practice. We also limit our portfolio construction discussion to mean-variance, both for brevity and to bring forth the most important features of risk diversifier diversification, without the added complexity of more complex utility function maximization approaches. In a follow-up article we intend to address the added benefit of using more complex utility functions that show the importance of higher moments in the asset return distributions.

One final word on the term "insurance" securities used here. The reader can substitute the terms "hedging" securities or "diversifying" securities if those terms appeal more to him or her. However, in our practice we have found that both "hedging" and "diversification" have taken on connotations that might be perceived positively or negatively depending on who is using them and who is hearing them. For instance, the use of put options to "hedge" immediately brings forth to the minds of many readers the cost of the put option. On the other hand, the term "diversification" immediately brings to the mind of proponents of the "failure of diversification" school the idea that historical correlations might not be repeated in the future. We think the term "insurance securities" puts the discussion of why these securities are important in the neutral zone, i.e. investors choose to hold these securities to mitigate risk, period. The risk-return tradeoffs that this choice incurs is simply the facts. Also note that we include trend-following, which is a systematic, rules-based strategy made up of many securities, within this definition of "insurance securities".

Insurance Securities

Our security universe consists of the S&P 500 Index and six "insurance" securities that have historically demonstrated persistent diversification characteristics for portfolios with equity exposure: the Swiss Franc, the Japanese Yen, spot gold, US long bond futures, a simple trend program, and a left tail hedge on the S&P 500 Index. The data begins in the early 1970s, i.e. we have roughly fifty years of data for our analysis.

A quick overview of the economic rationale of why these securities might play an important role in risk mitigation might be helpful. During risk-on periods, which are usually accompanied by increasing leverage to risk assets, many asset classes and strategies play the role of "funding" instruments. Typically the funding instruments are those that have a low cost of carry. Traditionally the Japanese Yen and Swiss Franc have been the lowest yielding currencies in the market, and have been used to implement many such "carry" trades. The same can also be said about the risk-free asset such as US Treasuries. Thus, it is inevitable that when there is a major market shock, many of these carry trades are unwound, and the implicit shorts are covered, resulting in positive returns to these funding instruments. Gold has played the role of safe haven for somewhat different reasons, the primary one being that it is thought of as a long-term store of value. When combined with the fall in real yields, which is typically a consequence of major market shocks, it is clear that Gold becomes relatively attractive during these episodes. We should emphasize that these explanations are based on our empirical observations from historical data, and the future might look very different than the past, and thus there is no assurance that the observed qualitative response of these securities to future market shocks will look like the past. We have chosen to ignore securities such as credit default swaps, or even digital assets such as Bitcoin in this paper given the relatively short history of these assets.

The US long bond futures series uses closing prices when the contract first opened in 1977. Prior to that, the dataset is extended by modeling returns using yield changes, funding costs and an estimate for duration.

The simple trend program is run on the S&P 500 Index, the Swiss Franc, the Japanese Yen, spot gold, wheat, soy, and sugar futures, and US long bond futures. It goes long securities whose close prices are above their respective 252 day moving averages, and short securities whose close prices are below their respective 252 day moving averages. Individual positions are scaled proportional to their inverse volatilities. The choice of this simple rule for the trend following model can be thought of as a benchmark, and many authors have used similar rules for demonstrating the power of trend following as a diversifying strategy.

The left tail hedge on the S&P 500 Index consists of a portfolio that buys a new 1-year 20% out of the money put option every month on 1/12 notional. The returns of the tail hedge are stated in notional terms in the rest of this paper (so, for instance, a 50% allocation to a put means that the notional exposure to the put is 50% of the total value of the portfolio, which, due to the leverage in out of the money options, corresponds to a much lower allocation of cash premium). The obvious benefit of a put option is that for a relatively small amount of premium it affords a significant amount of notional exposure. Further, the hedge is truly insurance, since it has, by construction, the least amount of basis risk if the S&P500 suffers a sharp selloff. This low basis risk thus supplements a portfolio of diversifiers with reliability that we will discuss in the next section.

Option prices are derived from the implied volatility surface. From 1996 onwards, the implied volatility surface is derived from traded listed option contracts. Prior to 1996, the implied volatility surface is modeled by taking the realized volatility of the S&P 500 Index and adding a historical premium estimated from the implied volatility surface after 1996.

In Exhibit 1 we display the statistics of these securities for the last fifty years. It is no surprise that the return of the S&P 500 1Y 80% put is -1.45% per annum. In Exhibit 2 we see how the corresponding benefit of this negative realized return is a very highly convex portfolio outcome.

Exhibit 1: Statistics of S&P 500 Index, Insurance Securities and Strategies

	S&P 500 Index	Swiss Franc Spot	Japanese Yen Spot	Gold Spot	US Long Bond Futures	Trend Program	S&P 500 1Y P80 Index
Start	1/29/1971	1/29/1971	1/29/1971	1/29/1971	1/29/1971	1/29/1971	1/29/1971
End	9/30/2020	9/30/2020	9/30/2020	9/30/2020	9/30/2020	9/30/2020	9/30/2020
Total Return	3407.51%	366.45%	239.28%	4879.72%	393.58%	8750.75%	-51.32%
CAGR	7.42%	3.15%	2.49%	8.19%	3.27%	9.45%	-1.44%
Max Drawdown	-56.78%	-49.71%	-45.24%	-70.29%	-53.58%	-34.97%	-56.02%
Calmar Ratio	0.13	0.06	0.06	0.12	0.06	0.27	-0.03
Daily Sharpe	0.52	0.34	0.30	0.51	0.37	0.80	-0.32
Daily Sortino	0.82	0.61	0.53	0.89	0.61	1.55	-0.50
Daily Mean (ann.)	9.53%	4.16%	3.29%	10.84%	4.16%	10.78%	-1.48%
Daily Vol (ann.)	18.18%	12.33%	10.86%	21.10%	11.18%	13.39%	4.70%
Daily Skew	-0.61	2.70	1.04	1.51	-0.06	8.35	2.94
Daily Kurt	23.80	71.00	19.12	25.40	4.77	348.19	140.77
Best Day	16.30%	21.53%	13.44%	21.06%	6.84%	37.29%	8.52%
Worst Day	-20.47%	-8.56%	-6.19%	-13.24%	-5.89%	-8.05%	-5.49%
Monthly Sharpe	0.56	0.32	0.28	0.50	0.37	0.75	-0.42
Monthly Sortino	0.94	0.58	0.54	1.00	0.69	1.68	-0.71
Monthly Mean (ann.)	8.46%	3.71%	3.08%	9.71%	3.92%	9.98%	-1.40%
Monthly Vol (ann.)	15.16%	11.70%	10.97%	19.48%	10.48%	13.22%	3.34%
Monthly Skew	-0.48	0.23	0.62	0.61	0.24	1.66	2.37
Monthly Kurt	1.95	1.61	2.43	3.21	1.60	13.85	27.89
Best Month	16.30%	15.68%	17.67%	27.54%	13.60%	37.29%	9.53%
Worst Month	-21.76%	-13.54%	-9.84%	-22.37%	-9.82%	-9.11%	-5.48%
Yearly Sharpe	0.53	0.30	0.24	0.40	0.33	0.69	-0.45
Yearly Sortino	1.07	0.74	0.54	1.32	0.77	2.56	-0.75
Yearly Mean	8.79%	3.67%	2.96%	10.78%	3.88%	10.83%	-1.40%
Yearly Vol	16.67%	12.04%	12.28%	27.22%	11.81%	15.71%	3.08%
Yearly Skew	-0.75	0.42	0.36	1.86	0.17	0.59	1.93
Yearly Kurt	0.31	-0.48	-0.43	6.15	-0.56	0.90	10.03
Best Year	34.11%	28.03%	31.87%	126.55%	29.62%	61.41%	12.84%
Worst Year	-38.49%	-16.07%	-19.23%	-32.60%	-21.30%	-17.30%	-9.11%

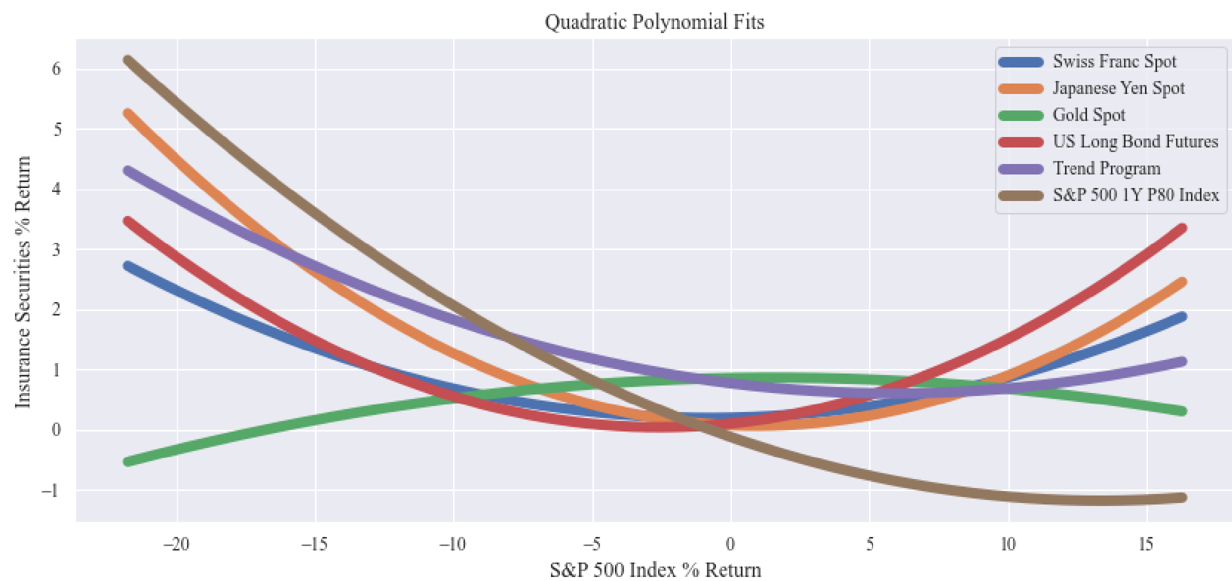
Avg. Drawdown	-2.57%	-4.51%	-3.13%	-4.89%	-3.01%	-2.54%	-28.97%
Avg. Drawdown Days	44.54	210.13	170.51	178.59	125.56	51.17	9011.00
Avg. Up Month	3.40%	2.71%	2.53%	4.66%	2.44%	3.16%	0.64%
Avg. Down Month	-3.33%	-2.36%	-2.07%	-3.37%	-2.13%	-2.36%	-0.39%
Win Year %	73.47%	55.10%	59.18%	59.18%	59.18%	71.43%	12.24%
Win 12m %	74.06%	58.36%	57.51%	60.07%	61.26%	73.55%	10.41%
Beta S&P 500 Index	1.00	-0.05	-0.09	-0.02	0.00	-0.06	-0.21
Corr S&P 500 Index	1.00	-0.07	-0.15	-0.02	0.00	-0.08	-0.80

Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 2 shows the second order polynomial fits of the returns of each insurance security versus the S&P 500 Index returns. To create this chart we plotted the outcomes for each security on the y axis and the corresponding S&P 500 Index return on the x axis, and fit a quadratic polynomial to the data. As we can see, while the put option has the most convexity on the downside, other assets such as gold have negligible or even negative convexity to the stock market. Looking at Exhibit 1, we can see that the security with the highest convexity (80% Put) is the one with the most negative realized return and realized Sharpe ratio, while gold has the second highest Sharpe ratio. The Trend program seems to be well positioned in both of these categories, having the highest Sharpe ratio and the third best convexity profile for declines in the S&P 500 Index, and explains why it is sometimes referred to as a “cheap” way to replicate long volatility positions without buying explicit options. Note that in this 50 year sample, it is somewhat surprising that systematic trend following has delivered a high rate of return, almost equivalent to the total rate of return of the S&P500 index. However, what is striking is that the trend following approach has a lower maximum drawdown than any other approach, and the average number of days in drawdown (51) is also quite low. This supports the idea of trend following as a powerful diversifier against equity market drawdowns, as investors have known for a long time. However, it can play an even more important role in portfolios when combined with a simple basket of other insurance securities with their own unique convexity characteristics.

The convexity characteristics highlight the fact that looking simply at returns or Sharpe ratios in isolation might not be the best gauge for how valuable an insurance security is. A very important criterion is the convexity, and like all things, convexity has a price. For options contracts, it is clear that the convexity is much higher than a linear security, hence the expectation of a lower return over time should not be a big shock.

Exhibit 2: Convexity of Insurance Securities



Source: LongTail Alpha, Bloomberg, OptionMetrics

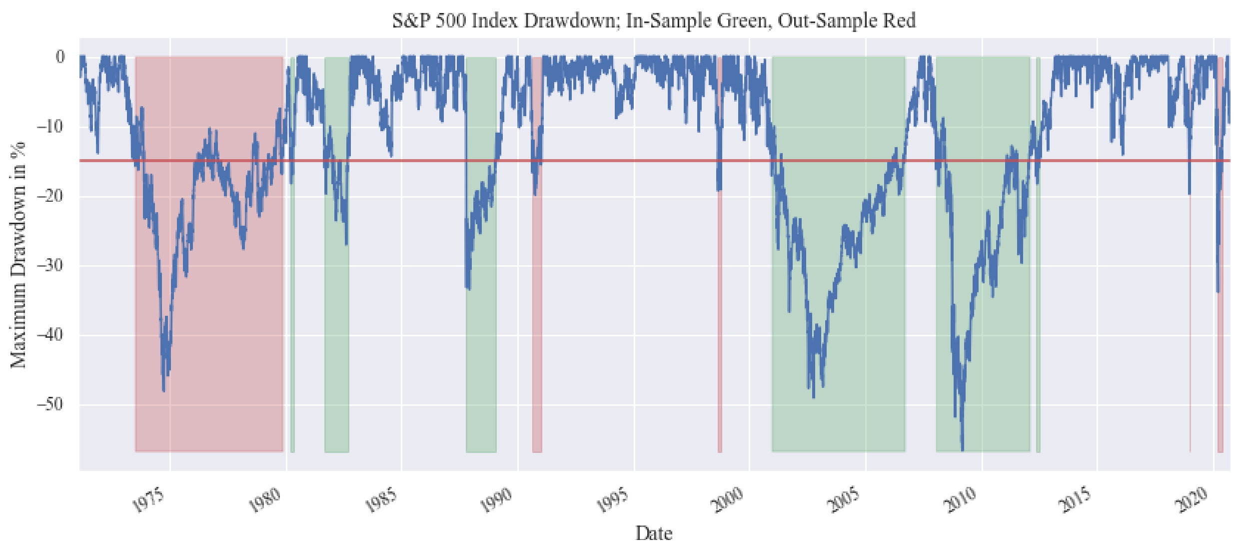
How Reliable Is The Performance of Various Insurance Securities?

One important criterion for selecting an insurance security is whether it will continue to perform in the future. Too often what works as a good diversifier in the past does not work in the future. Reliability is an important criterion for how much trust one should put in any combination of risk management strategies.

We approach this problem in two ways. First, we analyze both the performance of each individual security and a combination of such securities in sample. We randomly selected the in-sample data set (see the data partitions in Exhibit 3). Then we apply the same weights to the out of sample data. Our goal is not to find the best data-mined result, but a qualitative idea of what works well in general and whether there is any persistence in the relative rankings of various strategies.

Thus, to calculate the benefit from the use of insurance securities, we first select all periods where the S&P 500 Index suffers drawdowns more than 15% and split these periods into two randomly selected sets: an in-sample and an out-sample. Exhibit 3 plots the S&P 500 Index drawdown over time and highlights the two partitions. The shaded green areas will be used as the in-sample and the shaded red areas will be used as the out-sample. Exhibit 4 lists the periods and the correspnding drawdowns.

Exhibit 3: Data Partitions for In-Sample and Out-Sample Analysis



Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 4: Period Drawdown Statistics Both In-Sample and Out-Sample

Sample	Start	End	Max Drawdown	Number of Days
In-Sample	**3/24/1980**	**4/21/1980**	-18.31%	28
	9/8/1981	**9/1/1982**	-27.11%	358
	10/16/1987	**1/23/1989**	-33.51%	465
	12/20/2000	**9/7/2006**	-49.15%	2087
	1/18/2008	**2/2/2012**	-56.78%	1476
	5/16/2012	**6/28/2012**	-18.34%	43
Out-Sample	**7/3/1973**	**11/9/1979**	-48.20%	2320
	8/23/1990	**1/14/1991**	-19.92%	144
	8/31/1998	**10/14/1998**	-19.34%	44
	12/20/2018	**1/3/2019**	-19.78%	14
	3/9/2020	**5/15/2020**	-33.92%	67

Source: LongTail Alpha, Bloomberg, OptionMetrics

In-Sample Portfolio Construction

We will construct five portfolios using monthly returns of the in-sample dataset. The S&P 500 Index by itself is displayed in the first column, and subsequent columns display the weights of insurance security portfolios, and the weight of the S&P 500 Index with insurance security portfolios. All portfolios are constructed to target 15% volatility. To summarize the last four columns and our definitions:

1. An equal risk contribution insurance portfolio (Equal RC Insurance). This portfolio allocates to the insurance securities such that each security contributes to equal risk to the insurance portfolio. We assume zero correlation between the securities when calculating the risk contribution. This can be thought of as a naïve formulation of a risk parity approach applied to the insurance securities.
2. An optimal risk contribution insurance portfolio (Optimal RC Insurance). This portfolio tries to find an optimal risk contribution for each insurance security such that the sum of the risk contributions is equal to 1 and we assume zero correlation between the securities when calculating the risk contribution. It solves for the risk contributions that maximize the Sharpe ratio of a portfolio consisting of the S&P 500 Index and the insurance portfolio. Note here we are limiting ourselves to mean-variance optimality for the insurance security basket.
3. The S&P 500 Index with the equal risk contribution insurance portfolio.
4. The S&P 500 Index with the optimal risk contribution insurance portfolio.

As discussed above, many insurance securities, such as the put option, would be under-emphasized when performing mean-variance optimization, since the benefit of the put option is the positive skew and kurtosis. A CRRA (Constant Relative Risk Aversion) utility function would benefit the put option due to higher weight to these higher moments. The main reason for us to limit ourselves to mean-variance optimization is simply to focus on the benefits of a portfolio approach in this paper.

Exhibit 5 shows the average portfolio weights under these five different construction methodologies. Note that the weights can add up to larger than 100%, due to leverage. For instance, bond futures provide leverage to the duration factor. It is easy to see that given the significant historical benefit from holding levered long duration treasuries, all methodologies based on history will prefer to hold a lot of duration, but in particular the optimal insurance portfolio owns close to 100% given the low historical volatility of the duration risk factor. It remains an open question if this approach can continue, given the very low levels of yields today, which is one of the primary reasons investors are searching for other diversifiers.

Exhibit 5: Portfolio Weights In-Sample For 15% Target Volatility Portfolios					
Weights	**S&P 500 Index**	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
S&P 500 Index	0.83	0.00	0.00	0.73	0.67
Swiss Franc Spot	0.00	0.33	0.01	0.29	0.01
Japanese Yen Spot	0.00	0.41	0.00	0.36	0.00
Gold Spot	0.00	0.22	0.14	0.19	0.11
US Long Bond Futures	0.00	0.37	0.91	0.33	0.73
Trend Program	0.00	0.38	0.62	0.33	0.50
S&P 500 1Y P80 Index	0.00	0.80	0.00	0.70	0.00

Source: LongTail Alpha, Bloomberg, OptionMetrics

The risk contributions are displayed in Exhibit 6. Here, it is again clear that in the optimal insurance portfolio the long bond futures category has the highest risk contribution.

Exhibit 6: Portfolio Risk Contributions In-Sample					
Risk Contributions	**S&P 500 Index**	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
S&P 500 Index	1.00	0.00	0.00	0.66	0.56
Swiss Franc Spot	0.00	0.17	0.00	0.06	0.00
Japanese Yen Spot	0.00	0.17	0.00	0.06	0.00
Gold Spot	0.00	0.17	0.05	0.06	0.02
US Long Bond Futures	0.00	0.17	0.65	0.06	0.29
Trend Program	0.00	0.17	0.30	0.06	0.13
S&P 500 1Y P80 Index	0.00	0.17	0.00	0.06	0.00

Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 7 shows that while conditional on being in these drawdown periods the return and Sharpe ratio of the S&P 500 was negative, insuring the portfolio using the optimal or equal-weighted methodologies was an improvement over the “naked” S&P 500 strategy. Similarly in these periods the drawdown of an insured S&P portfolio was almost half as large as the naked S&P 500 portfolio (see Exhibit 8).

Exhibit 7: Portfolio Summary Statistics In-Sample					
	S&P 500 Index	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
Total Return	-17.29%	183.47%	405.72%	135.14%	244.89%
CAGR	-1.51%	8.69%	13.84%	7.08%	10.41%
Average Annualized Return	-0.37%	9.46%	14.14%	7.97%	11.06%
Annualized Volatility	15.00%	15.00%	15.00%	15.00%	15.00%
Sharpe	-0.02	0.63	0.94	0.53	0.74

Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 8: Portfolio Drawdowns In-Sample							
Sample	**Start**	**End**	**S&P 500 Index**	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
In-Sample	**2/29/1980**	**3/31/1980**	-8.48%	-6.64%	-3.59%	-13.25%	-9.69%
	8/30/1981	**8/31/1982**	-11.08%	-11.61%	-3.75%	-17.44%	-6.76%
	9/30/1987	**12/31/1988**	-23.94%	-18.23%	-8.38%	-11.85%	-8.43%
	11/30/2000	**8/31/2006**	-34.62%	-11.36%	-15.02%	-15.66%	-13.25%
	12/31/2007	**1/31/2012**	-43.94%	-12.39%	-13.12%	-23.63%	-29.22%
	4/30/2012	**5/31/2012**	-5.22%	0.00%	0.00%	-3.77%	0.00%
Average			-21.21%	-10.04%	-7.31%	-14.27%	-11.23%

Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 9: Total Return Contributions In-Sample					
Total Return Contributions	**S&P 500 Index**	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
S&P 500 Index	-17.29%	0.00%	0.00%	5.97%	11.26%
Swiss Franc Spot	0.00%	26.71%	0.78%	17.03%	0.41%
Japanese Yen Spot	0.00%	23.56%	0.00%	14.66%	0.00%
Gold Spot	0.00%	54.43%	57.65%	35.68%	30.47%
US Long Bond Futures	0.00%	70.06%	245.70%	49.45%	141.97%
Trend Program	0.00%	42.73%	101.60%	30.90%	60.78%
S&P 500 1Y P80 Index	0.00%	-34.02%	0.00%	-18.56%	0.00%
Total	-17.29%	183.47%	405.72%	135.14%	244.89%

Source: LongTail Alpha, Bloomberg, OptionMetrics

Out-Sample

Having gained some knowledge of the various tradeoffs from insurance securities in a randomly selected test period, the next question is if these methodologies are robust over time. The following exhibits show the same portfolio statistics of the out-sample. Note that all weights remain unchanged from the in-sample.

Note that in the out-sample statistics displayed in Exhibit 10, the average return to bond futures was negative, yet both the optimized and the equal weighted insurance portfolio diversifiers were successful in risk mitigation of an unhedged portfolio. This point highlights that even though a particular diversifier might fail to perform as it has done in other periods, diversifying the diversifiers can assist in maintaining the robustness since other insurance securities “step-up” (here, Gold, Swiss Franc, Yen, and Trend) to take the responsibility of helping hedge the downside risk.

Exhibit 10: Insurance Securities and Portfolio Summary Statistics Out-Sample											
	S&P 500 Index	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**	**Swiss Franc Spot**	**Japanese Yen Spot**	**Gold Spot**	**US Long Bond Futures**	**Trend Program**	**S&P 500 1Y P80 Index**
Total Return	-10.41%	194.12%	127.76%	145.64%	83.21%	107.40%	58.50%	224.04%	-6.36%	193.33%	-4.69%
CAGR	-1.56%	16.66%	12.48%	13.70%	9.03%	10.98%	6.80%	18.29%	-0.93%	16.62%	-0.68%
Average Annualized Return	-0.18%	16.48%	12.59%	14.29%	9.97%	11.23%	7.31%	19.57%	-0.51%	16.52%	-0.59%
Annualized Volatility	16.76%	13.87%	12.49%	16.62%	16.16%	12.33%	12.18%	23.32%	9.25%	14.65%	4.53%
Sharpe	-0.01	1.19	1.01	0.86	0.62	0.91	0.6	0.84	-0.06	1.13	-0.13

Source: LongTail Alpha, Bloomberg, OptionMetrics

Again, as illustrated in Exhibit 11, the average drawdown is reduced by using any mix of insurance strategies, and yet again, the optimal weights selected in-sample previously deliver substantial reduction in drawdown. Finally, the obvious benefits of combining the S&P 500 with a portfolio of insurance securities is displayed in Exhibit 12.

Exhibit 11: Portfolio Drawdowns Out-Sample							
Sample	**Start**	**End**	**S&P 500 Index**	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
Out-Sample	**6/30/1973**	**10/31/1979**	-37.59%	-18.40%	-18.25%	-20.94%	-23.00%
	7/31/1990	**11/30/1990**	-12.27%	-0.09%	-2.22%	-4.88%	-9.73%
	7/31/1998	**9/30/1998**	-12.14%	0.00%	0.00%	-4.60%	-5.88%
	11/30/2018	**12/31/2018**	-7.64%	0.00%	0.00%	-2.48%	-3.61%
	2/29/2020	**4/30/2020**	-10.42%	-0.55%	0.00%	-3.39%	-2.78%
Average			-16.01%	-3.81%	-4.09%	-7.26%	-9.00%

Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 12: Total Return Contributions Out-Sample					
Total Return Contributions	**S&P 500 Index**	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
S&P 500 Index	-10.41%	0.00%	0.00%	-1.01%	-4.39%
Swiss Franc Spot	0.00%	43.10%	0.75%	31.48%	0.49%
Japanese Yen Spot	0.00%	46.64%	0.00%	33.00%	0.00%
Gold Spot	0.00%	52.50%	30.76%	39.76%	20.86%
US Long Bond Futures	0.00%	3.45%	1.62%	0.72%	-2.26%
Trend Program	0.00%	58.60%	94.63%	47.25%	68.51%
S&P 500 1Y P80 Index	0.00%	-10.18%	0.00%	-5.56%	0.00%
Total	-10.41%	194.12%	127.76%	145.64%	83.21%

Source: LongTail Alpha, Bloomberg, OptionMetrics

Entire Sample

What about the results over the whole sample, which includes both periods with and without drawdowns? This exercise can help quantify the cost of running a hedging strategy over time. We would logically prefer the strategy that does not lose too much during normal bull markets, but at the same time reduces downside risk during significant drawdowns in the market.

The following exhibits show the same portfolio statistics over the full sample. Note that all weights remain unchanged from the in-sample.

As we can see in Exhibit 13, almost all the hedged strategies do well in risk-adjusted terms, but the optimized strategy is slightly better than the equal weights strategy. The results are close enough that we cannot conclusively say whether equal weighting or optimized weights are better. However, looking at Exhibit 15, it seems that equal weighting has a better left tail profile. More importantly, it appears that both portfolio approaches to hedging have better convexity than any of the individual securities in isolation.

Finally, Exhibit 14 displays the contributions to total returns from combining the S&P500 with the two portfolio approaches to risk mitigation.

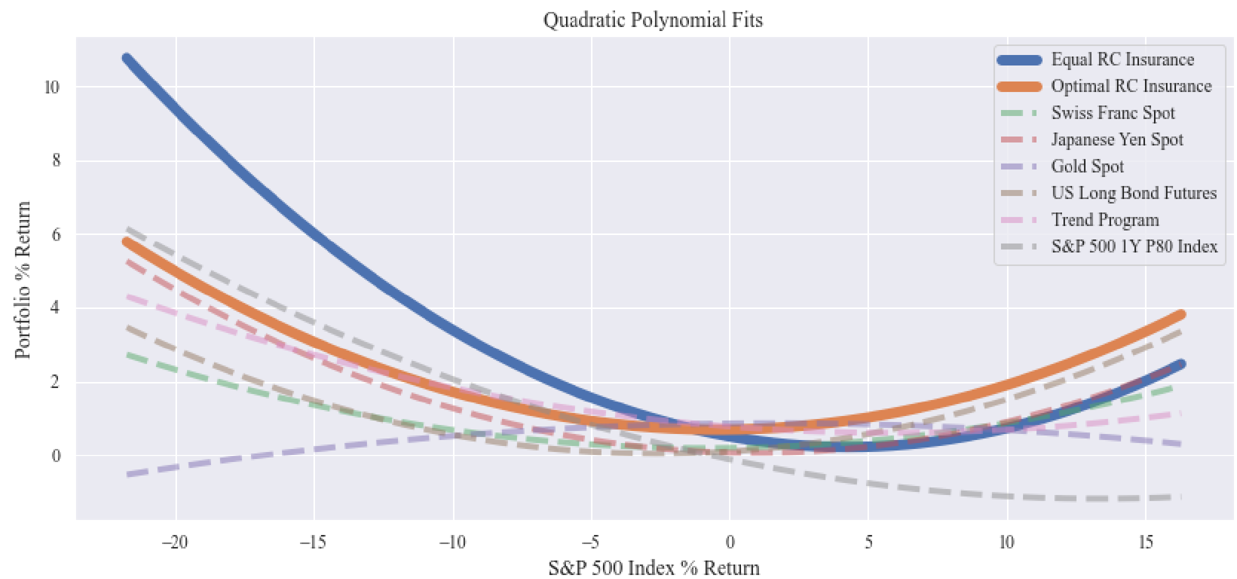
Exhibit 13: Portfolio Summary Statistics: Full Sample					
	S&P 500 Index	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
Total Return	2000.14%	4529.25%	14397.51%	49788.07%	70859.16%
CAGR	6.32%	8.03%	10.54%	13.32%	14.13%
Average Annualized Return	6.95%	8.61%	10.96%	13.63%	14.38%
Annualized Volatility	12.61%	13.25%	13.57%	14.67%	14.90%
Sharpe	0.55	0.65	0.81	0.93	0.97

Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 14: Total Return Contributions					
Total Return Contributions	**S&P 500 Index**	**Equal RC Insurance**	**Optimal RC Insurance**	**S&P w/ Equal RC Insurance**	**S&P w/ Optimal RC Insurance**
S&P 500 Index	2000.14%	0.00%	0.00%	33249.75%	37176.98%
Swiss Franc Spot	0.00%	668.69%	23.95%	2400.52%	50.71%
Japanese Yen Spot	0.00%	345.96%	0.00%	333.91%	0.00%
Gold Spot	0.00%	1490.62%	2007.60%	7150.28%	5181.75%
US Long Bond Futures	0.00%	1802.62%	8945.96%	9070.09%	23744.07%
Trend Program	0.00%	1708.68%	3420.01%	4277.62%	4705.68%
S&P 500 1Y P80 Index	0.00%	-1487.33%	-0.02%	-6694.10%	-0.04%
Total	2000.14%	4529.25%	14397.51%	49788.07%	70859.16%

Source: LongTail Alpha, Bloomberg, OptionMetrics

Exhibit 15: Insurance Portfolio Convexity: Full Sample



Source: LongTail Alpha, Bloomberg, OptionMetrics

Weight Stabilities

Exhibit 16 shows the weights of the S&P 500 Index with the equal risk contribution insurance portfolio and the optimal risk contribution insurance portfolio over the full dataset, the in-sample and the out-sample. We can see that the naïve risk parity type equal risk formulation is much more stable when we change the samples.

Exhibit 16: Portfolio Weights Across Samples

	S&P w/ Equal RC Insurance			**S&P w/ Optimal RC Insurance**		
Weights	**Full**	**In-Sample**	**Out-Sample**	**Full**	**In-Sample**	**Out-Sample**
S&P 500 Index	0.80	0.73	0.62	0.72	0.67	0.69
Swiss Franc Spot	0.32	0.29	0.33	0.01	0.01	0.00
Japanese Yen Spot	0.35	0.36	0.34	0.10	0.00	0.37
Gold Spot	0.19	0.19	0.18	0.21	0.11	0.22
US Long Bond Futures	0.36	0.33	0.44	0.26	0.73	0.00
Trend Program	0.29	0.33	0.28	0.64	0.50	0.65
S&P 500 1Y P80 Index	1.13	0.70	0.90	0.02	0.00	1.01

Source: LongTail Alpha, Bloomberg, OptionMetrics

Conclusion

Rather than taking the approach of selecting one methodology for downside risk mitigation, we take the approach of creating a portfolio of insurance securities. We find that even though optimization of the insurance security basket might marginally improve the performance in cherry-picked scenarios, a simple approach of equally risk weighting insurance securities in a portfolio does just as well on average, and increases the reliability of diversification in mitigation of downside risk. The added benefit of using this simple "Occam's Razor" approach is that it eliminates the need for perfect foresight of correlations, volatilities, and prospective performance. We believe that together these results show that when diversying portfolios, the best approach is to diversify the diversifiers. Investors are thus best positioned to manage downside risks when they use every tool in the toolkit, rather than selecting just one or two that might be the fashion of the day.

We would like to thank our colleagues at LongTail Alpha, especially Linda Chang and Ken Miller, for extensive discussions on these topics.

IMPORTANT DISCLOSURES

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Several processes, assumptions and data sources were used to create the charts and exhibits presented herein. It is possible that a different methodology may have resulted in a different outcome. This paper may not reflect the effect of all material economic and market factors that warrant consideration. General analysis contained within this paper regarding the market or market conditions represent the view of the source cited, the authors, or the contributors. Nothing contained herein is intended to predict the performance of any investment. There can be no assurance that actual outcomes will match the assumptions or that actual returns will match any expected returns.

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