

Special Topic: Thoughts on Portfolio Protection and How Well They Work (or Don't)

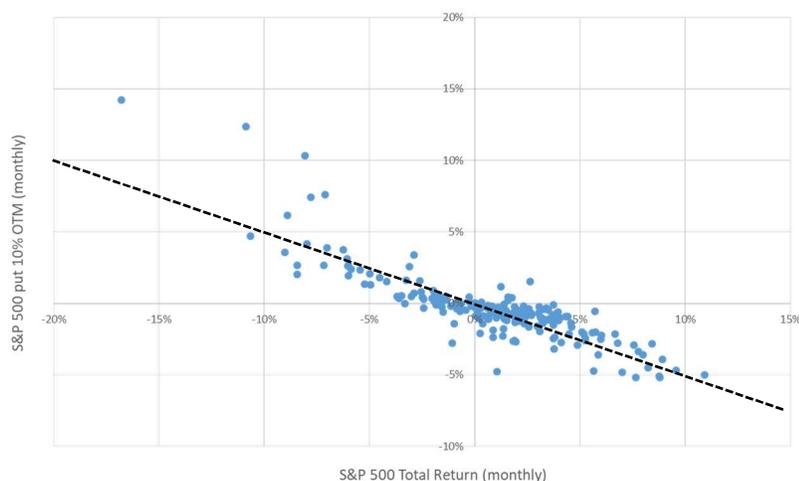
Those no-risk, carefree days of 2017 seem like a distant dream. Investors today have to contend with a multitude of thorny issues ranging from global trade wars and synchronized economic slowdowns to Persian Gulf confrontations. It is perhaps not surprising that a recent BofA Merrill Lynch survey of global fund managers¹ highlights the perception of risk in the current environment – a record high net 50% of those surveyed believe global growth will weaken in the next 12 months, while 87% believe that we are now in the late cycle of this expansion (also a record high).

The more volatile environment of 2019 means investors and hedgers must be ever more vigilant in their portfolio risk management and hedging practices. In this special topic section, we examine some popular hedges that investors often use to mitigate their portfolio downside: buying equity puts, buying credit protection, and increasing allocation to bonds in order to offset equity risk. How well did these strategies actually work historically? As they say on TV, viewer discretion is advised.

I. Put Option Hedging

Option-based hedges are attractive for two main reasons - the asymmetry of the risk (option premium) versus reward, and the floor on the downside (cannot lose more than the initial premium). How well do option hedges work in reality? Let us consider the following example: an investor wants to hedge a S&P 500 index portfolio by buying a 1-year, 10% out-of-the-money put on the S&P index. The investor would roll this hedge periodically (quarterly) to recover time value and to reset the strike. The effectiveness of this hedge is illustrated in the chart below – the x-axis shows the monthly total return of the S&P index since 2000, while the y-axis shows the notional returns of the S&P put hedge over the same period.

FIGURE 5. TOTAL RETURN OF 1-YEAR, 10% OUT-OF-MONEY PUT (Y-AXIS) VERSUS S&P 500 INDEX TOTAL RETURN (X-AXIS). DOTTED LINE IS 50% BETA AGAINST S&P 500 INDEX, 2000 - 2019



¹ BofA Merrill Lynch Global Fund Manager Survey, June 2019

Sources: Bloomberg, Advocate

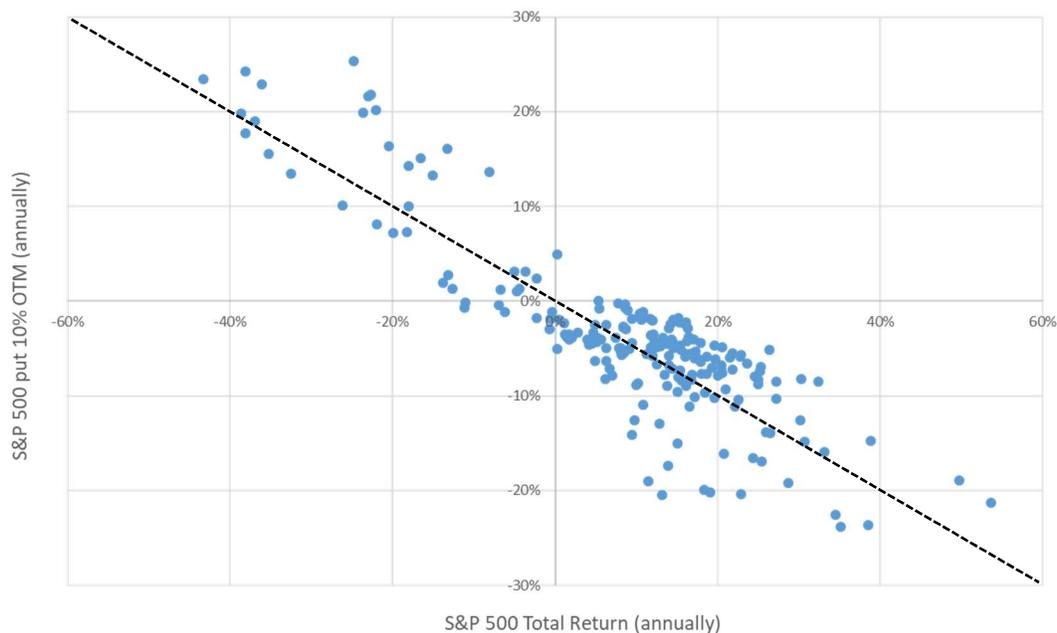
The monthly return comparison highlights two important features of option-based hedging:

- 1) The S&P put hedge performance is rather linear.
- 2) There is considerable hedge payoff uncertainty. For example, the months in which S&P dropped 7-8% saw the rolling S&P put strategy return between 2% to 10% of notional. That 25-to-125% range of hedge effectiveness is a far cry from a definitive hedge payoff.

Why is there so much performance uncertainty for our put option example? The three contributors to this “basis risk” are time, strike drift and implied volatility. The timing and extent of a shock affects option hedge effectiveness due to differing time decay prior to and during the shock. Strike drift reflects the impact of the drift of the index away from or closer to the option strike before the shock takes place. This effect is unavoidable unless one is constantly readjusting the option strike to nullify the drift, which would be quite costly. Change in implied volatility also contributes to differing hedge effectiveness due to the sensitivity of option value to implied volatility (vega).

How does the put hedge perform over a longer horizon? The chart below shows the performance of the hedge on a rolling annual basis (using overlapping annual return data).

FIGURE 5. HISTORICAL ROLLING ANNUAL TOTAL RETURN OF 1-YEAR, 10% OUT-OF-MONEY PUT (Y-AXIS) VERSUS S&P 500 INDEX TOTAL RETURN (X-AXIS). DOTTED LINE IS 50% BETA AGAINST S&P 500 INDEX, 2000 - 2019



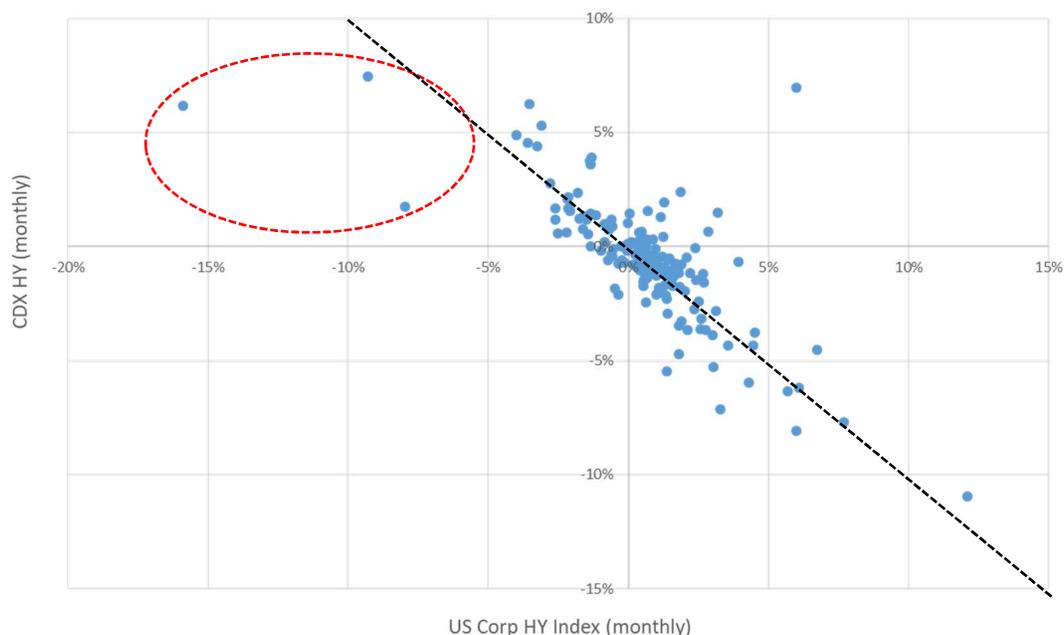
Sources: Bloomberg, Advocate

The 1-year horizon analysis further accentuates the features we noted for the monthly horizon - the linearity of the put hedge performance is even more pronounced over the longer horizon, and the hedge uncertainty is even greater. Since 2000, one standard deviation of S&P put hedge uncertainty against 50% beta of the underlying index is 1.3% on a monthly basis and 4.4% on an annual basis. That's quite a large "basis risk" for a direct option hedge with the same index as the underlying portfolio.

II. Credit Default Swap Index Hedging

Another common hedge is to buy credit default swap protection to hedge a similarly-rated credit-based portfolio? Surely this hedge should have a low basis risk since it is a "delta-one" hedge and thus is absent the 3 contributors of hedge mismatch in the option example to spoil its hedge effectiveness. The chart below shows monthly returns of the Barclays US High Yield Index against a CDX-HY hedge.

FIGURE 5. MONTHLY RETURNS OF THE BARCLAYS US CORP HIGH YIELD INDEX (X-AXIS) AND MONTHLY HEDGE TOTAL RETURNS FROM BUYING CREDIT PROTECTION VIA CDX-HY INDEX SWAP (Y-AXIS). DOTTED LINE IS 100% BETA VS INDEX, 2000 - 2019

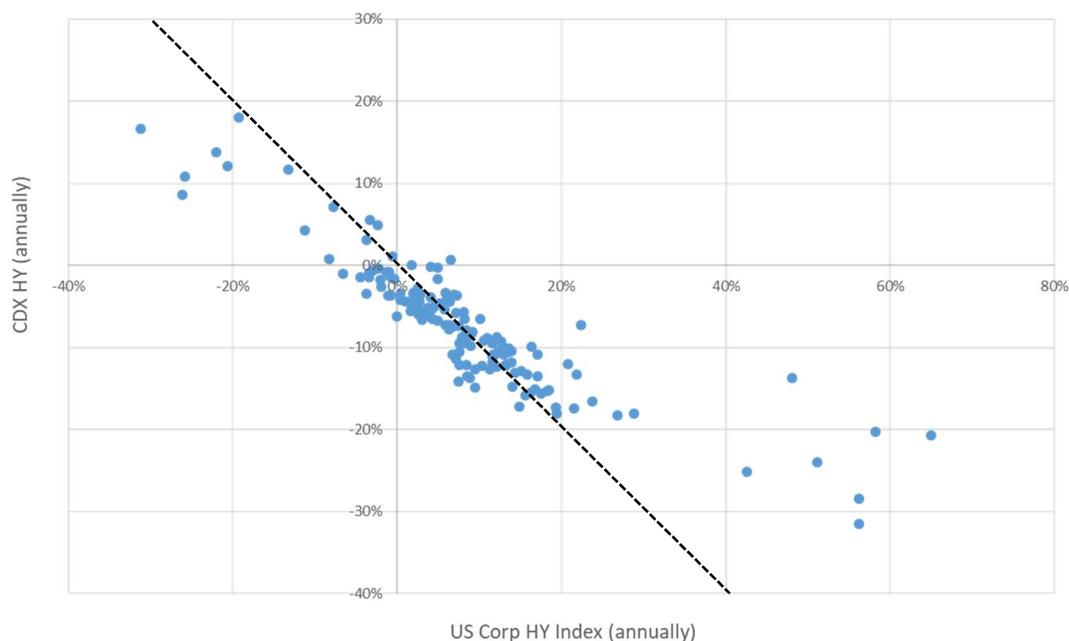


Sources: Barclays, Bloomberg, Advocate

The CDX-HY hedge generally tracked the one-delta line but with significant performance uncertainty. It also significantly underperformed the High Yield Index during some of its worst months during the Global Financial Crisis in 2008. There are three sources of tracking error for CDX-HY relative to the HY bond index: Duration and compositional differences, and bond-index basis. Any or all of the three sources of tracking error can contribute to the hedge mismatch.

The comparison of annual HY index returns versus CDX-HY in the chart below shows that the hedge gain drops from close to 100% on the positive corporate bond index return side to significantly lower when the HY index returns are negative. This generates significant hedge mismatch against the underlying portfolio.

FIGURE 5. ANNUAL RETURNS OF THE BARCLAYS US CORP HIGH YIELD INDEX (X-AXIS) AND ANNUAL HEDGE TOTAL RETURNS FROM BUYING CREDIT PROTECTION VIA CDX-HY INDEX SWAP (Y-AXIS). DOTTED LINE IS 50% BETA VS INDEX, 2000 - 2019



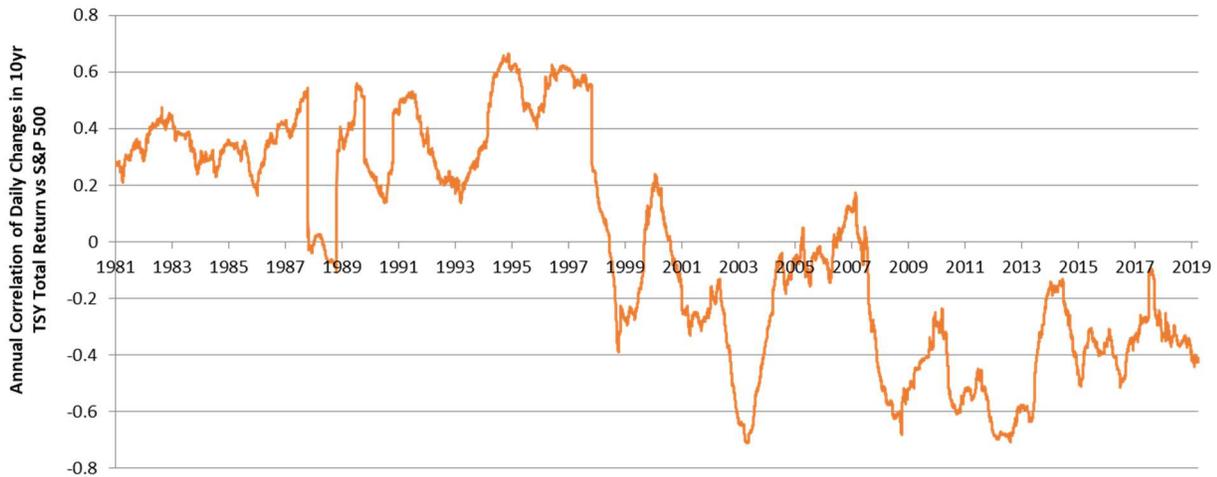
Sources: Barclays, Bloomberg, Advocate

The standard deviation of the hedge mismatching between CDX HY and the Bloomberg Barclays High Yield Index is 1.9% on a monthly basis and 9.0% on an annual basis. That is a larger “basis risk” than our option-based hedging example. Most of the hedge mismatch occurs during periods of large positive and negative returns, which might argue for a two-regime model of credit default swap versus the bond index: a 100% beta regime when returns are $\pm 10\%$, but a lower beta regime when returns are beyond $\pm 10\%$. Such performance non-linearity highlights the significant basis risk of using credit default swap indexes to hedge a bond portfolio.

III. Bonds as Equity Hedge

What about buying bonds as a hedge against equities? Equities and bonds as asset classes were positively correlated (both went up or both went down) for decades. However, post-2000 the correlation between Treasury and equity returns turned negative and remained generally negative for the last 19 years.

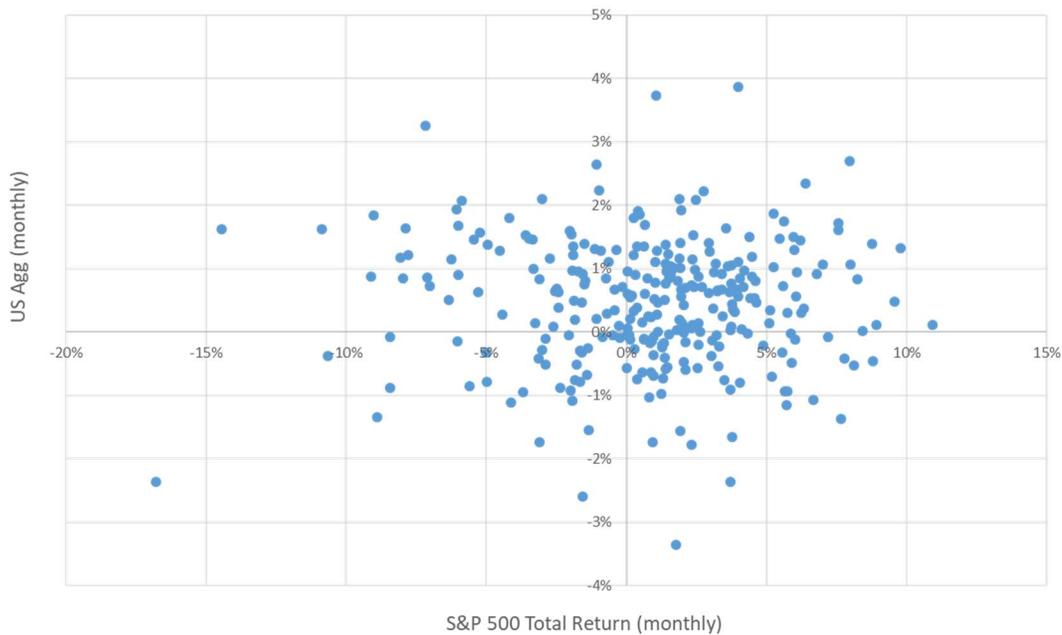
FIGURE 6. ROLLING ANNUAL CORRELATION OF DAILY RETURNS BETWEEN S&P 500 AND 10-YEAR TREASURY RETURNS, 2000 - 2019



Sources: Treasury Department, S&P, Bloomberg, Advocate

Given the generally negative correlation between equities and bonds since 2001, buying bonds to hedge equity risk should produce a good hedging outcome. Historical total return data shows that, on a month-by-month basis, such a claim is difficult to uphold.

FIGURE 6. MONTHLY TOTAL RETURN OF S&P 500 INDEX (X-AXIS) AND THE U.S. AGGREGATE BOND INDEX (Y-AXIS)

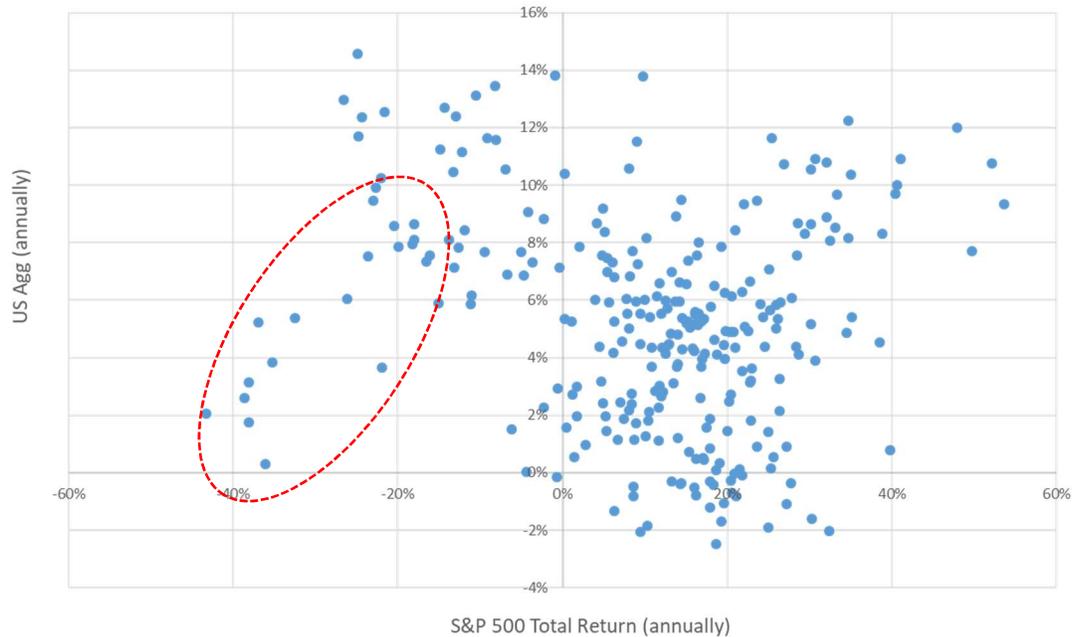


Sources: Federal Reserve, ECB, BOJ, BoE, Credit Suisse

The monthly total return correlation of the Bloomberg Barclays U.S. Aggregate index to the S&P 500 index is -0.014 with a beta of -0.001. We refrained from adding a beta line to the chart.

What about over longer time horizons? The rolling 1-year total returns of S&P versus the Aggregate index is shown below.

FIGURE 6. ROLLING ANNUAL TOTAL RETURN OF S&P 500 INDEX (X-AXIS) AND U.S. AGGREGATE BOND INDEX (Y-AXIS), 2000 - 2019

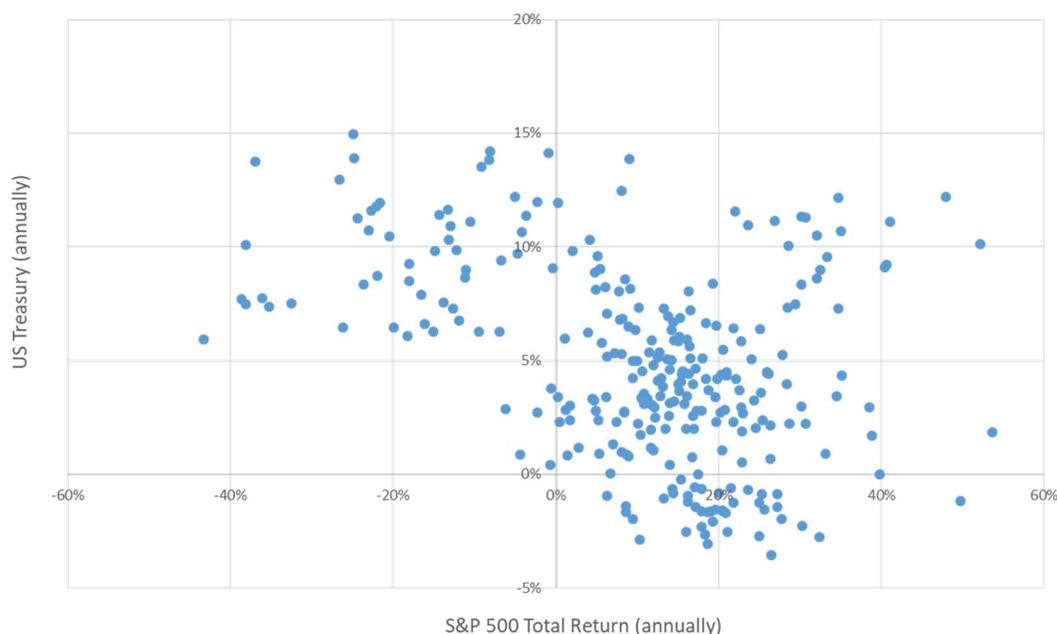


Sources: Federal Reserve, ECB, BOJ, BoE, Credit Suisse

The annual correlation between S&P and the US Aggregate Bond Index is -0.16, modestly better than the monthly correlation, but the Aggregate bond index beta to S&P is very modest at -0.007. The US Aggregate Bond Index managed to generate mostly positive returns when S&P was negative, but also did so when S&P was positive. Bond returns were actually poorer than usual during some of the worst-performing periods for the S&P (red oval).

What about hedging equities with Treasuries rather than the aggregate bond index? The correlation of annual returns between the US Treasury index and S&P 500 is significantly better at -0.41, but the beta is still quite low at -0.03.

FIGURE 6. ROLLING MONTHLY TOTAL RETURN OF S&P 500 INDEX (X-AXIS) AND THE U.S. TREASURY BOND INDEX (Y-AXIS), 2000 - 2019



Sources: Federal Reserve, ECB, BOJ, BoE, Credit Suisse

Summary

The historical hedge mismatches between put options, credit default swap, and Aggregate Bond and Treasury bond portfolio hedges against various underlying portfolios (S&P 500 or High Yield Index) are summarized in the table below.

FIGURE 6. MONTHLY AND ROLLING ANNUAL PERFORMANCE OF VARIOUS HEDGES AGAINST DELTA OF THE UNDERLYING PORTFOLIO INDEX: CORRELATION TO INDEX, DELTA VS INDEX AND STANDARD DEVIATION OF PERFORMANCE VS DELTA, 2000 - 2019

HEDGE vs Portfolio	Monthly			Rolling Annual		
	Correlation	Hedge Delta	1 σ Hedge Mismatch vs Delta	Correlation	Hedge Delta	1 σ Hedge Mismatch vs Delta
1yr 10% OTM Put vs SPX	-0.86	-50%	1.3%	-0.88	-50%	4.4%
CDX-HY vs HY Bond Index	-0.75	-100%	1.9%	-0.88	-100%	9.0%
Agg Bond Index vs S&P	-0.01	-1%	1.1%	-0.16	-3%	3.7%
Treasury Bond Index vs S&P	-0.23	-7%	1.2%	-0.41	-10%	3.9%

Sources: Bloomberg, Markit, Barclays

FIGURE 6. BASIS RISK CONTRIBUTING FACTORS FOR VARIOUS HEDGES

HEDGE vs Portfolio	Drivers of Hedge Ineffectiveness		
	Factor 1	Factor 2	Factor 3
1yr 10% OTM Put vs SPX	Strike Drift	Implied Vol	Time
CDX-HY vs HY Bond Index	Compositional Diff	Duration Diff	CDX-Bond basis
Agg Bond Index vs S&P	Shift in correlation		
Treasury Bond Index vs S&P	Shift in correlation		

Sources: Bloomberg, Markit, Barclays

After All That...

Our simple historical analysis shows that:

- Direct option hedges tend to perform like an outright beta hedge, especially over more realistic horizons such as a year.
- Direct put hedging historically produced significant hedging uncertainty over a wide range of underlying index returns.
- Hedgers who believe put options can help them achieve firm “attachment points” (fixed points at which a hedge begin generating definitive gains in response to a given shock) while also producing significant convexity may be sorely disappointed.
- Credit default swap index hedges exhibited significant basis risk and hedge deviation against the underlying asset class. Our example showed that CDX-HY hedge deviation against 100% beta of the Barclays High Yield Index is amplified when absolute annual bond index returns exceeds 10%. This feature calls into question the appropriateness of CDS indexes as tail risk hedges.
- While bond correlation to equities has been negative since 2001, historical analysis shows that hedging the S&P 500 with either the US Aggregate or the Treasury index yields poor results in terms of both responsiveness (low delta) and hedge uncertainty.

The most surprising result of our analysis is that the two most commonly considered macro hedges (equity put and CDX credit protection) yielded some of the largest hedging basis risk (hedge uncertainties) of our limited instrument sample. Hedgers considering the use of any hedging instrument should thus take into account the presence of basis risk and seek to quantify the potential hedge slippage before embarking on a hedging program.