

HEDGING VS. DIVERSIFICATION

COMPARING THE COSTS OF HEDGING TO THE “COSTS” OF DIVERSIFICATION

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INTRODUCTION

This paper is a quantitative study of a basic protective put strategy within a portfolio framework compared to a traditional 60/40 stock/bond mix. The study will analyze holding a 1 year 15 delta protective put option on the S&P 500 index, rebalanced on a quarterly basis and compare the performance to a 60/40 stock bond mix rebalanced quarterly. Different time periods will be analyzed to show when the two approaches underperformed or outperformed.

Traditional financial models are built on the premise that a portfolio that has a set of assets which move in different directions over the same period can deliver the product of the variance and the sum of the weighted returns. If the correlation coefficient of the combined assets is less than one, the product of the variance will be less the sum of the weighted returns thus bending the risk/return relations. In other words, receiving superior returns for less risk. This **diversifying correlation** (the relationship of how assets move over the same period) was developed in 1952 by Dr Harry Markowitz. History has shown as markets crash, correlations converge towards one which has been a primary criticism of modern portfolio theory.

This paper doesn't dispute Dr. Markowitz's seminal award-winning work but helps to identify if hedging with a negatively carrying asset with dependable correlation is a viable alternative or addition to a tradition 60/40 mix. It is a core belief in the financial community that the expected returns of a tail hedging strategy over long periods of time are negative so hedging with options is not a viable strategy. As Benn Eifert of QVR [points out in a series of tweets on the topic](#), "what this argument is missing is the portfolio effect. Tail risk hedges are inversely correlated with the performance of risk assets and produce outsized returns during times of crisis... the outsized performance of a tail hedge during large market drawdowns allows a **regularly rebalanced** portfolio to have more dollar exposure to risky assets in the periods immediately following those large market drawdowns."

This study will examine if a portfolio allocated 97.5% to the S&P 500 and 2.5% to a protective put strategy has historically been competitive with a 60/40 stock bond mix going back to 2007. The study will also focus on the period from 2017 to present, looking at the basic protective put strategy and how it compares to a 60/40 stock /bond mix. The rebalance approach will be outlined in depth to determine a simple yet effective way to think about rebalancing within this portfolio framework.

60/40 Stock Bond Mix: A Historical Perspective

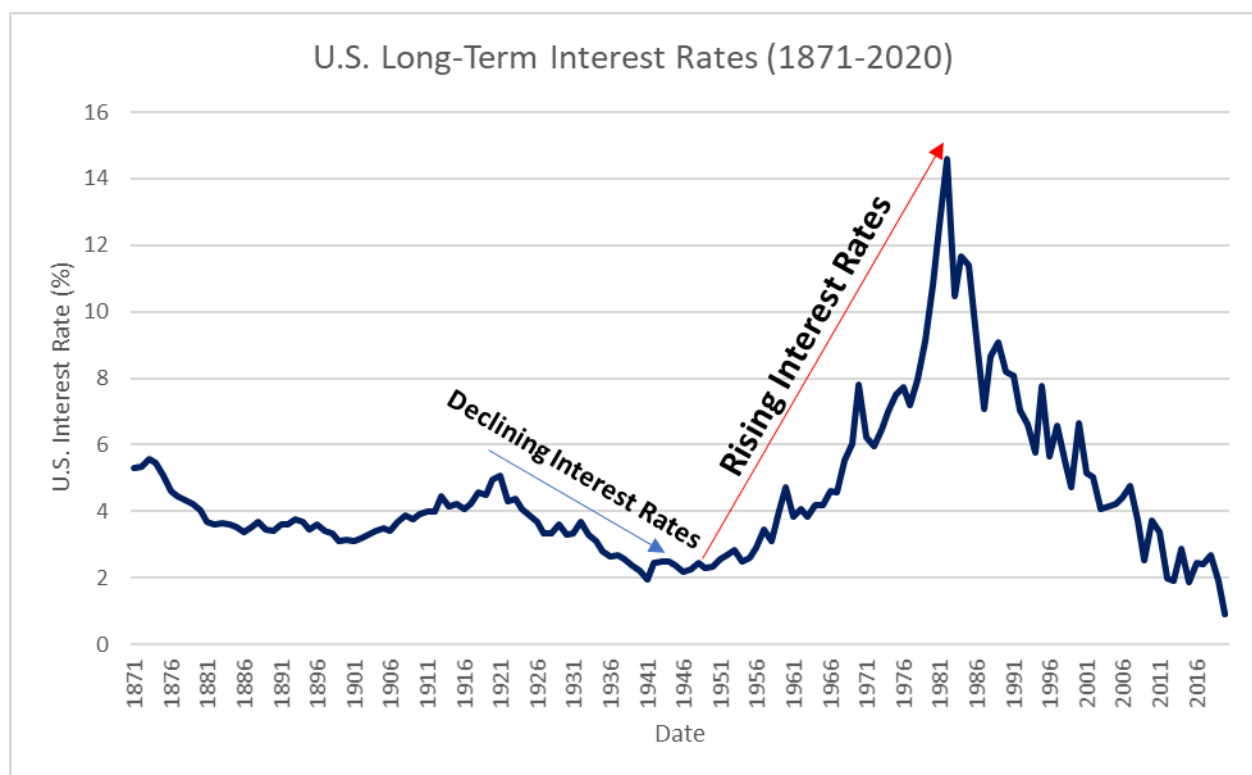
The 60/40 stock bond mix has been a staple in portfolio allocation for decades. An analysis of the origins of this popular allocation can give us an interesting perspective.

Dr. Harry Markowitz wrote "Portfolio Selection," published in 1952. The Nobel winning work of Dr. Markowitz was to examine the variance and co-variance of the historical data

between debt and equity. Dr. Markowitz looked at the effect of allocating percentages of a portfolio between bonds and equities. The mean-variance result was an efficient-frontier that is based on historical data prior to 1952, showed a blend of 40% bonds to 60% equity allocation that produced a higher return at a roughly comparable risk level to a 100% bond portfolio.

When Markowitz ran his mean-variance analysis in 1952 of a 60%/40% stock/bonds mix, interest rates were on the decline since 1920 and had bottomed near 2% by 1949. Interest rates started climbing in the early 50's and by 1982 interest rates had risen to over 15%.

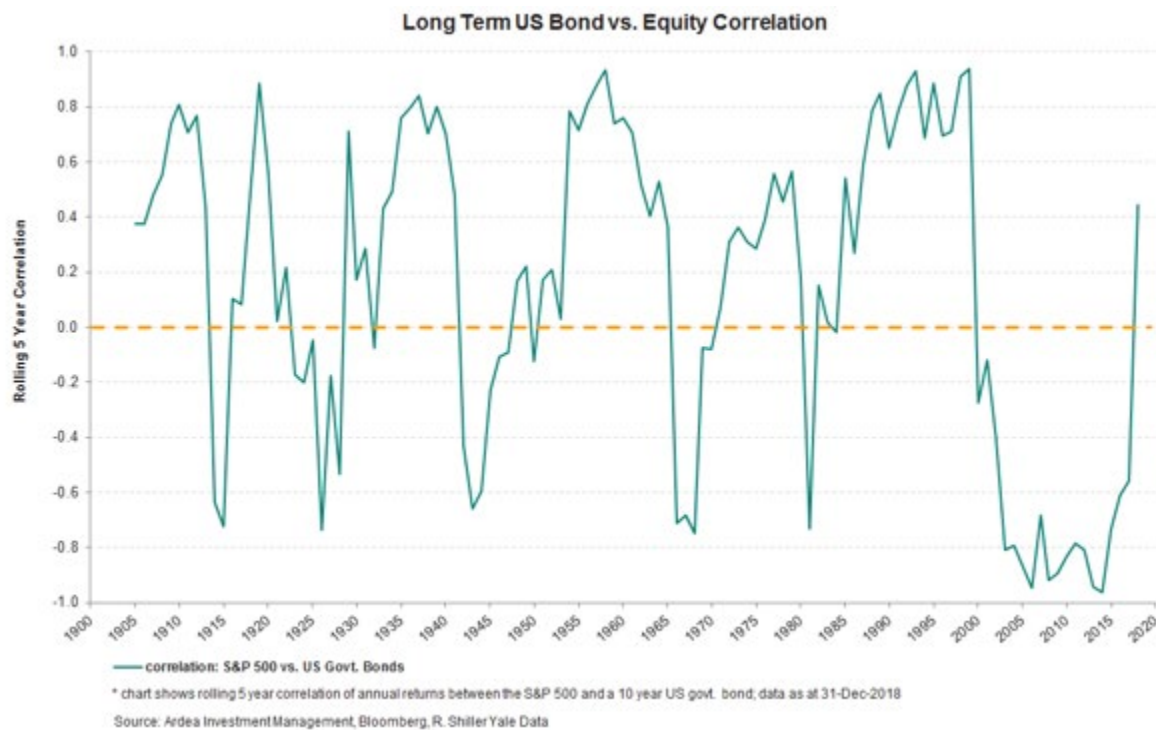
Figure 1-A Long-Term View of Interest Rates in the U.S.



Source: Robert Shiller Yale Data

Through the rising interest rate environment of the early 1950's to the early 1980's, the correlation between the return of stocks and bonds had mostly been positive save a short time period in the mid 1960's. As the below chart illustrates, the relationship between equity returns and bond returns has been quite volatile.

Figure 2-5-Year Rolling Bond/Equity Return Correlation



Source: Ardea Investment Management

This positive correlation was detrimental to the 60/40 portfolio as equities exhibited high volatility and sub-par returns from the mid 1960's to the early 1980's and bonds performed poorly compared to history given the backdrop of rising interest rates. One would have to wonder if Dr. Markowitz had written his paper in 1982 instead of looking at portfolio selection before 1952 what conclusions he might have surmised.

The 2008 Credit Crisis

The yield on a U.S. 10-year treasury bond peaked at 5.30% in mid-2007 before dropping as low as 2.05% by the end of 2008. This drop of 3.25%, combined with accommodative Federal Reserve policy, helped bonds to appreciate nicely through the credit crisis. When examining the returns of the 60/40 portfolio throughout this time period, the negative correlation between equity and bonds provided substantial benefit to the traditionally diversified portfolio.

Figure 3-The 60/40 Portfolio During the Global Financial Crisis

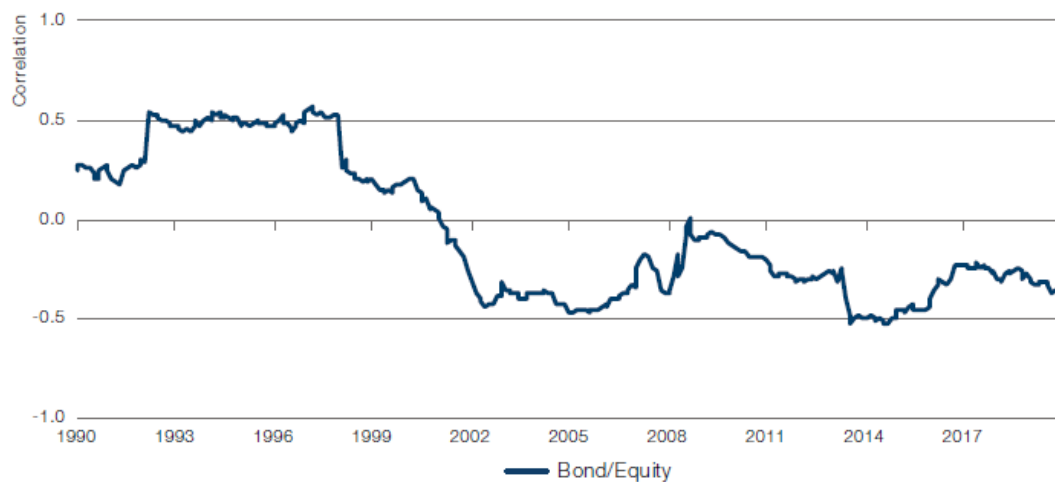


The SPX represents the price return of the S&P 500 index during the time period. The 60/40 portfolio uses the S&P 500 index return to represent the 60% equity allocation and the Bloomberg Barclays US Aggregate Bond Index (Total Return) is used to represent the 40% bond allocation. The portfolio is rebalanced back to the targeted 60/40 weighting on the last trading day of each quarter.

Source: Bloomberg LP Data, IPS calculations

The strong performance of bonds during the credit crisis helped the 60/40 portfolio to have a maximum drawdown of only -36.3% compared to a -56.8% maximum drawdown in the S&P 500 index. One could conclude that if the correlation between stock and bonds is reliably negative, as it was throughout most of the 2000's, that the mean-variance framework outlined by Markowitz is an optimal approach to portfolio management.

Figure 4-Bond/Equity Correlation since the 1990s



Source: Bloomberg; as of 30 June 2020.

Source: The Bond Problem - Man Group (<https://www.man.com/maninstitute/the-bond-problem>)

Over the last 3 decades, as interest rates have dropped, the total return of Treasury notes returns have been impressive. The question is, in the current environment will the future be as impressive?

Figure 5-Return for 10-Year Bonds by Decade

DECADE	RETURN
1990-1999	115.6%
2000-2009	91.8%
2010-2019	47.8%
2020-2029	?

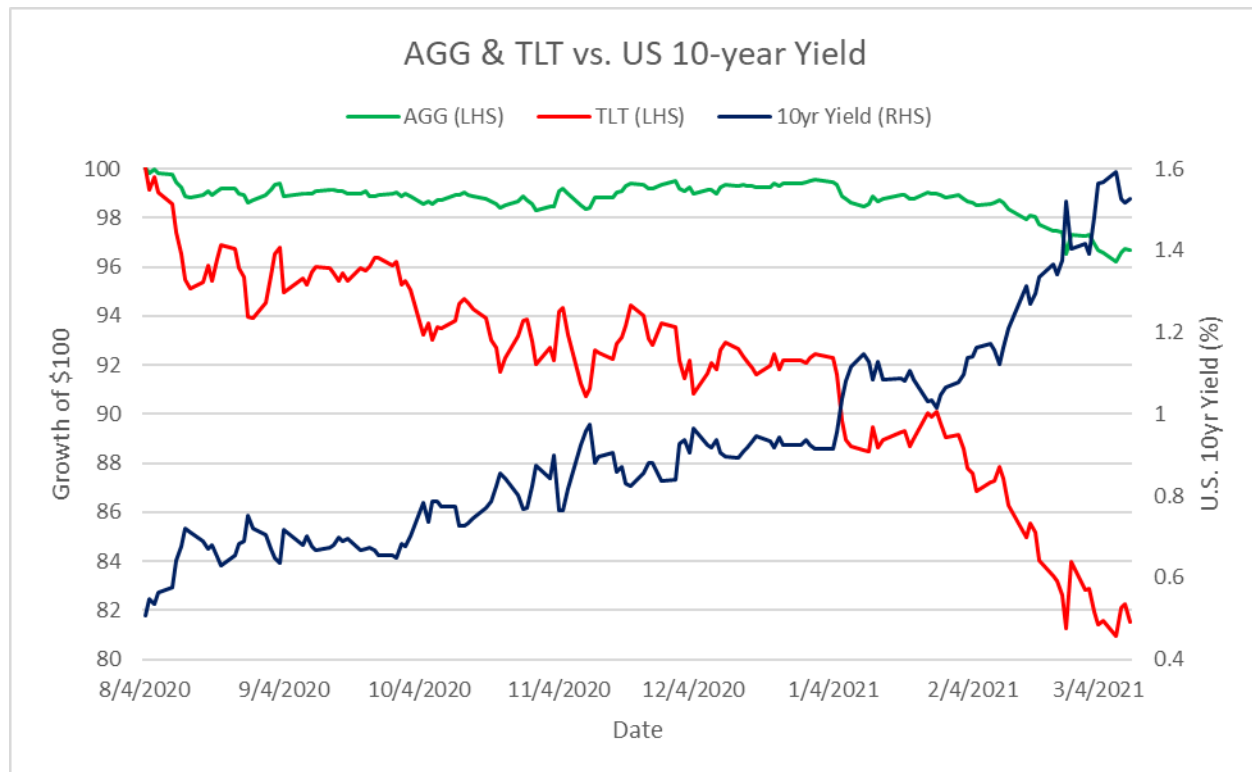
Source: Bloomberg; as of end-2019.

Total returns based on portfolio of Treasury notes with average maturity of 10 years.

Source: The Bond Problem - Man Group (<https://www.man.com/maninstitute/the-bond-problem>)

In the past year, U.S. 10-year interest rates have risen from a low of 0.50% to over 1.50% as fears surrounding inflation have gripped bond markets. During this time period performance of popular bond ETFs has faltered.

Figure 6-Performance of Fixed-Income in 2020/2021 as Interest Rates Rise

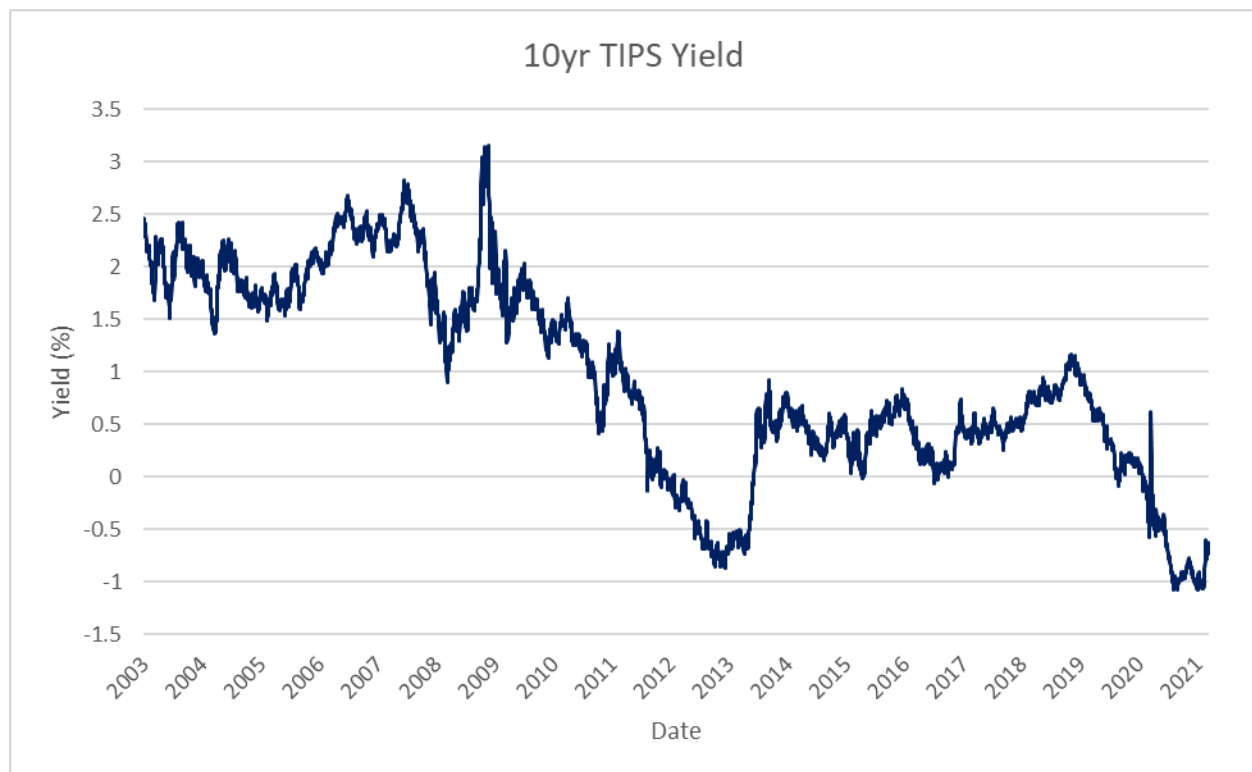


The AGG represents the growth of \$100 invested into the iShares Core U.S. Aggregate Bond ETF assuming reinvestment of dividends. The TLT represents the growth of \$100 invested into the iShares 20+ Year Treasury Bond ETF assuming reinvestment of dividends. The U.S. 10-year yield is represented by the price of the USGG10YR Index from Bloomberg LP®.

Source: Bloomberg LP Data, IPS Calculations

With real returns on U.S. treasury bonds still solidly negative, investors continue to rely on historically unstable correlations between equity and bonds to protect their portfolios from equity market volatility. With interest rates still near historical all-time lows, investors are relying on a continued decline in rates to maintain the benefits of traditional portfolio diversification.

Figure 7-Yield on 10-Year U.S. TIPS Since 2003



The 10-year TIPS yield represents the price of the 10-Year Treasury Inflation-Indexed Security, Constant Maturity

Source: FRED

This paper examines whether an alternative approach to traditional asset allocation is viable through the use of direct portfolio hedging. The paper demonstrates that investors who are concerned with the prospect of bonds going forward could potentially look towards hedged equity-based strategies to achieve their investment goals.

PORTFOLIO REBALANCING

Rebalancing is the core of portfolio risk management and must be addressed in any analysis of tail risk hedging. To determine a “best case scenario” for this approach, the paper examines how a portfolio allocated 97.5% to the S&P 500 and 2.5% to S&P 500 put options would have performed through the credit crisis assuming the hedges were rolled at the “perfect” time. This performance is compared to the performance of the portfolio 100% allocated to the S&P 500 index as well as a 60/40 portfolio that is rebalanced on a quarterly basis.

Figure 8-Backtest of SPX, 60/40, and Protective Puts during GFC



The SPX is represented by the growth of \$10mm invested in the S&P 500 index using price returns (no dividend reinvestment). The 60/40 is represented by a portfolio that invests 60% into the S&P 500 index and 40% in the Bloomberg Barclays U.S. Aggregate Bond Index (Total Return), LBUSTRUU Index in Bloomberg, rebalancing on the last trading day of each quarter. Both are unmanaged and un-investable indexes and therefore do not account for any management fees/expense ratios. The Long Put hedge targets S&P 500 put options on the SPX with a maturity date of approximately 1 year and a delta of -0.15. The 97.5% SPX/2.5% Long Puts portfolio is rebalanced using a methodology that provided “optimal” rolls through the time period.

Source: Bloomberg LP Data, ORATS Data, IPS Calculations

The perfectly monetized protective put hedge is not realistic; however, the point being made here is not that debt doesn’t provide a cushion during market turmoil. The point being made is, with a rules-based put strategy, can the portfolio manager compete with a 60/40 mix when the mean-variance was in a very optimal period of falling interest rates and negative stock/bond correlation?

A REALISTIC REBALANCING APPROACH

There is a great deal of path dependency associated with when a portfolio manager decides to roll or monetize their long-put option hedges. Throughout the remainder of the paper, all the portfolios are rebalanced back to their target weightings on a systematic rebalancing schedule. The long put hedged equity portfolio is rebalanced back to the desired equity/hedge weightings

on the quarterly option expiration dates. These quarterly option expiration dates (commonly referred to as “quadruple witching” dates) occur on the third Friday of March, June, September, and December.

Take for example a portfolio allocated 97.5% to SPX and 2.5% to a long-put hedge that has grown to 98.5% SPX and 1.5% long put hedge by the third Friday of March. This portfolio would be rebalanced back to the 97.5% SPX/2.5% long put hedge target weighting on this date. The back tested data assumes that the long-put option is rolled back to its target maturity and delta at this time, sized to appropriately reflect the original weighting targets. In the above example, this means the portfolio would be selling shares of SPX to increase the size of the long-put option hedge.

In a traditional portfolio framework, portfolio managers may rebalance their portfolios based on specified time periods (e.g. at the end of the month or end of quarter) or risk-based tolerances (e.g. if a 60/40 portfolio has grown to 65/35). One of the goals of the paper is identify a systematic, rules-based rebalancing methodology that is simplistic yet effective. While a time-based rebalancing strategy may seem naïve due to a lack of consideration for the profitability of both the SPX and long put hedge portion of the portfolio, there is a surprising dynamic that occurs on these quarterly option expiration dates.

OPTION EXPIRATION SEASONALITY

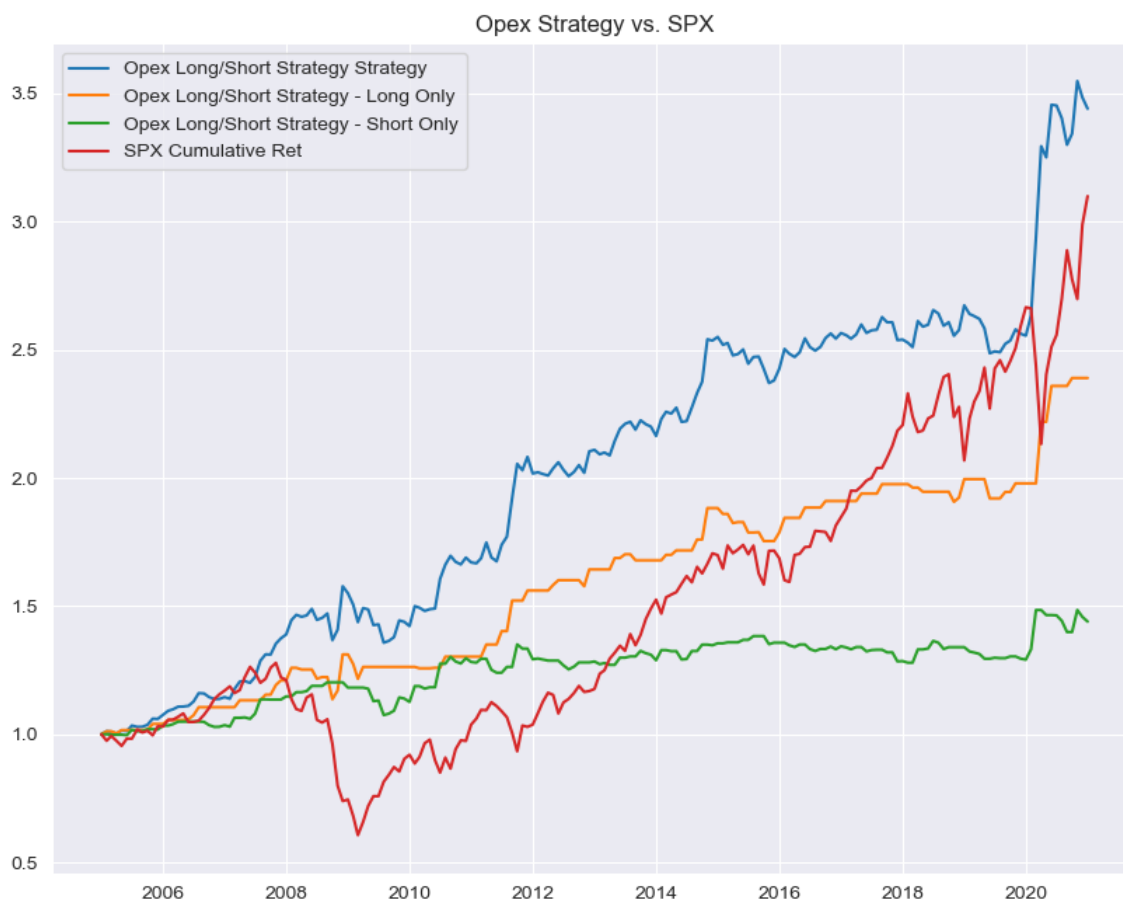
The importance of options expiration has long been known by practitioners in the space. The most significant of these option expirations occurs on the third Friday of March, June, September, and December when stock index futures, stock index options, single stock options, and single stock futures all expire. These dates tend to exhibit heavy trading volume in individual equities, ETFs, futures, and options on both stock indexes and equities.

Another important dynamic at play on quadruple witching date is the cleansing of positioning as millions of options and futures contracts roll off market makers trading books. Market makers in options markets partake in an activity referred to as “delta hedging” which is simply defined as the process of buying or selling the underlying asset to remain hedged against the price fluctuations in the underlying. Options expiring in the quarterly option expiration cycle (March, June, September, and December) tend to have the highest open interest of any option expirations. This is in part caused by the length of time these option contracts are available to trade. In the S&P 500 options markets some of these options are listed 3 years prior to their expiration date which allows large amounts of open interest to accumulate in the options. Once these positions have rolled off market makers trading books, the need for the market makers to delta hedge these positions is no longer necessary.

Given the explosive growth of options in the past decade, the magnitude of these delta hedging flows has grown accordingly. It is not uncommon to see option expiration mark significant turning points in the trend of both the price of the S&P 500 as well as realized and implied volatility. While it is impossible to attribute the cause of these turning points to this dynamic there is a reliable correlation that the paper will explore.

Take for example a simple strategy that goes long or short the S&P 500 index based on the returns of the index from the previous option expiration date to the current option expiration date which is subsequently referred to as Opex return. The Opex long/short strategy will go long the S&P 500 index at the closing value on option expiration if the Opex returns are negative and short the S&P 500 index at the closing value on option expiration if the Opex returns are positive. The positions for the Opex long/short strategy are held from the date close of trading on Opex to the end of the month thus only being invested for one to two weeks per month. The results of this hypothetical backtest from 2005-2020 are shown below.

Figure 9-Backtest of “Opex Strategy” Compared to S&P 500



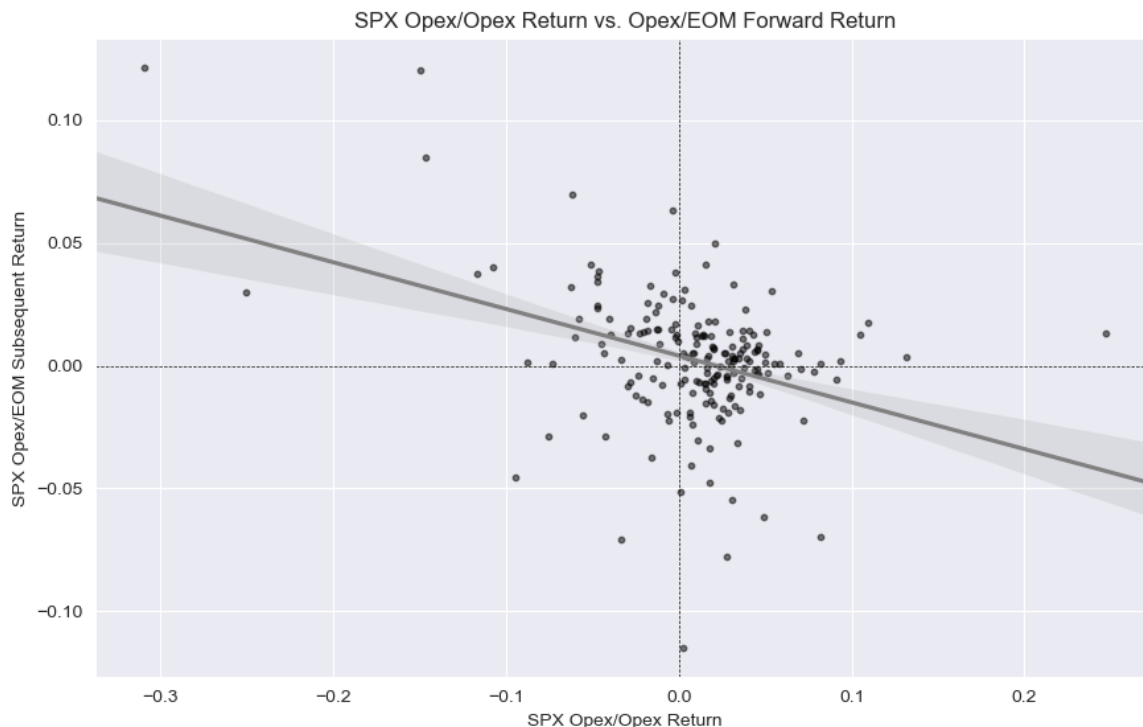
The SPX is represented by the returns of the S&P 500 index using price returns (no dividend reinvestment)

Source: Bloomberg LP Data, IPS Calculations

The results of the backtest are quite surprising since the Opex long/short strategy outperforms the S&P 500 index over the backtesting period while only being invested for the portion of the month between Opex and the end of the month (EOM).

The scatter plot below shows the performance of the S&P 500 from the previous months Opex to the current months Opex on the x-axis compared to the subsequent returns of the S&P 500 index from Opex to EOM.

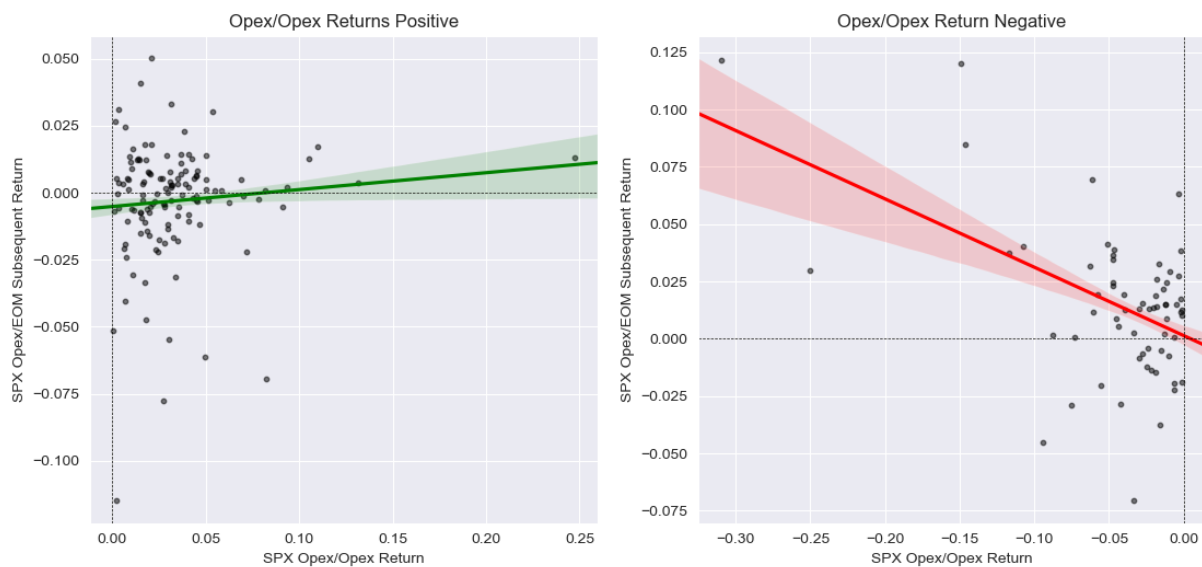
Figure 10-Scatterplot of Opex Returns vs. Subsequent Opex/EOM Returns



Source: Bloomberg LP Data, IPS Calculations

The correlation of these return series is -0.19 showing a relationship between the performance of the S&P 500 from Opex to Opex compared to the subsequent performance of the S&P 500 from Opex to EOM. Looking further into the data, when separating the data series into only positive Opex returns vs. only negative Opex returns, the tendency for the S&P 500 to rally after a negative Opex return cycle is much higher than the tendency for the S&P 500 to fall following a positive Opex return cycle.

Figure 11-Comparison of Opex Returns to Opex/EOM Returns When Opex Return is Positive/Negative



Source: Bloomberg LP Data, IPS Calculations

The following table breaks down statistical information on the returns of the S&P 500 from Opex to Opex, Opex to EOM, and filtered returns of Opex to EOM when Opex returns are positive and negative.

Figure 12-Descriptive Statistics of Opex Returns and Opex/EOM Returns

Return Period	Average	Median	Min	25th %-tile	75th %-tile	Max	StDev
Opex to Opex Returns (All)	0.8%	1.5%	-30.9%	-1.2%	3.3%	24.7%	5.4%
Opex to EOM Returns (All)	0.3%	0.3%	-11.5%	-0.7%	1.3%	12.1%	2.7%
Opex to EOM Returns (Opex Ret <i>Negative</i>)	1.4%	1.3%	-7.1%	-0.4%	2.8%	12.1%	3.2%
Opex to EOM Returns (Opex Ret <i>Positive</i>)	-0.3%	0.0%	-11.5%	-0.8%	0.7%	5.0%	2.2%

Return Period	Correlation to Opex Return
Opex to EOM Returns (All)	-0.19
Opex to EOM Returns (Opex Ret <i>Negative</i>)	-0.30
Opex to EOM Returns (Opex Ret <i>Positive</i>)	+0.06

Opex to Opex returns represent the returns of the S&P 500 Index from the date of the previous months option expiration to the current month's options expiration date, both generally occurring on the 3rd Friday of the month. The Opex to EOM returns represent the returns of the

S&P 500 Index from the date of the current months Opex to the end of the current month. These returns are subsequent to Opex date and thus used to test the predictability of the Opex to Opex returns.

Source: Bloomberg LP Data, IPS Calculations

Given this observed dynamic around Opex, the rolling methodology used in this paper is to roll the long put option hedges and rebalance the portfolio back to the target weightings every three months on the date of Opex occurring in March, June, September, and December. There is always a degree of rebalancing timing luck when a portfolio manager decides to rebalance their portfolio and the paper aims to exploit this observed Opex dynamic to increase the odds that rebalance timing luck works in the portfolio managers favor.

Another interesting piece of research that is outside of the scope of this paper but certainly worth analyzing further is the dynamic of quarter-end rebalancing. Please see the linked article in the appendix by Vincent Deluard titled [*Swimming with the Target Date Whale*](#) that looks at seasonality around the end of the quarter rebalancing tendency of target-date funds.

USING OPEX TO REBALANCE PROTECTIVE PUTS

Let us now examine how the 97.5% SPX/2.5% Long Put strategy would have performed using the opex-based rebalancing methodology discussed above from 2007-2020. The data is compared to the S&P 500 index as well as a 60/40 portfolio rebalanced quarterly.

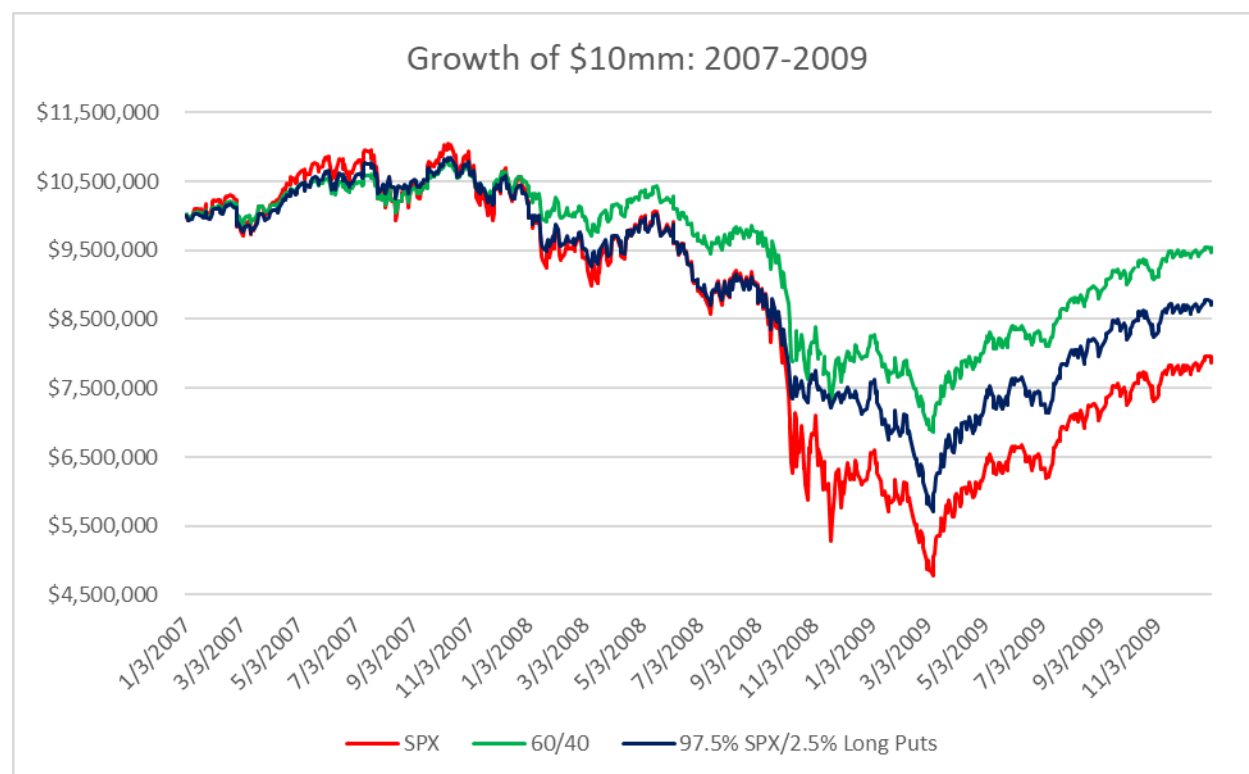
Figure 13-Portfolio Risk/Return Statistics of SPX, 60/40, and Protective Puts (2007-2020)

	SPX	60/40	97.5% SPX/2.5% Long Puts
Cumulative Return	157.4%	138.0%	138.8%
Annualized Return	7.1%	6.4%	6.5%
Volatility	15.6%	9.4%	12.0%
Sharpe	0.45	0.68	0.54
Sortino	1.36	2.13	1.80
Max DD	-56.8%	-36.3%	-47.4%

Source: Bloomberg LP Data, ORATS, IPS Calculations

The 97.5% SPX/2.5% Long Put strategy showed a maximum drawdown of 47.4% during the 2008 credit crisis compared to a drawdown of only 36.3% for a 60/40 portfolio. Despite the relative underperformance of the Long Put strategy during this period the hedged strategy was able to produce returns comparable to a 60/40 portfolio over the entire time period, returning 6.5% annually compared to a 6.4% annualized return for the 60/40 portfolio. The protective put strategy did improve the risk adjusted returns of a long only equity portfolio lowering volatility and improving Sharpe and Sortino ratios. This demonstrates that the protective put was able to deliver edge when implemented in a portfolio rebalancing framework despite losing money over the entire time period.

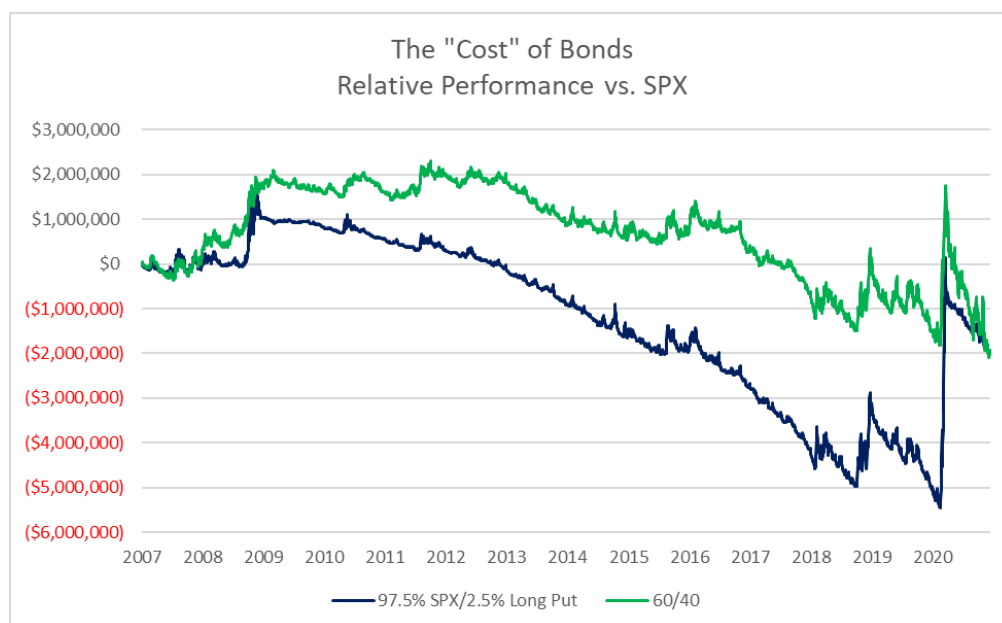
Figure 14-Backtested Performance of SPX, 60/40, and Protective Puts during GFC



Source: Bloomberg LP Data, ORATS, IPS Calculations

The strong performance of the 60/40 throughout the credit crisis, mainly attributable to the fall in interest rates, clearly showed that the 60/40 portfolio was superior to a protective put strategy. However, as we broaden our scope to the entire backtest period, we see that the “cost” of bonds ended up being comparable to the cost of hedging with put options. The below chart illustrates the performance of the 60/40 and the 97.5% SPX/2.5% Long Put strategy relative to the SPX. From 2007-2020, the “cost” of these strategies was effectively the same.

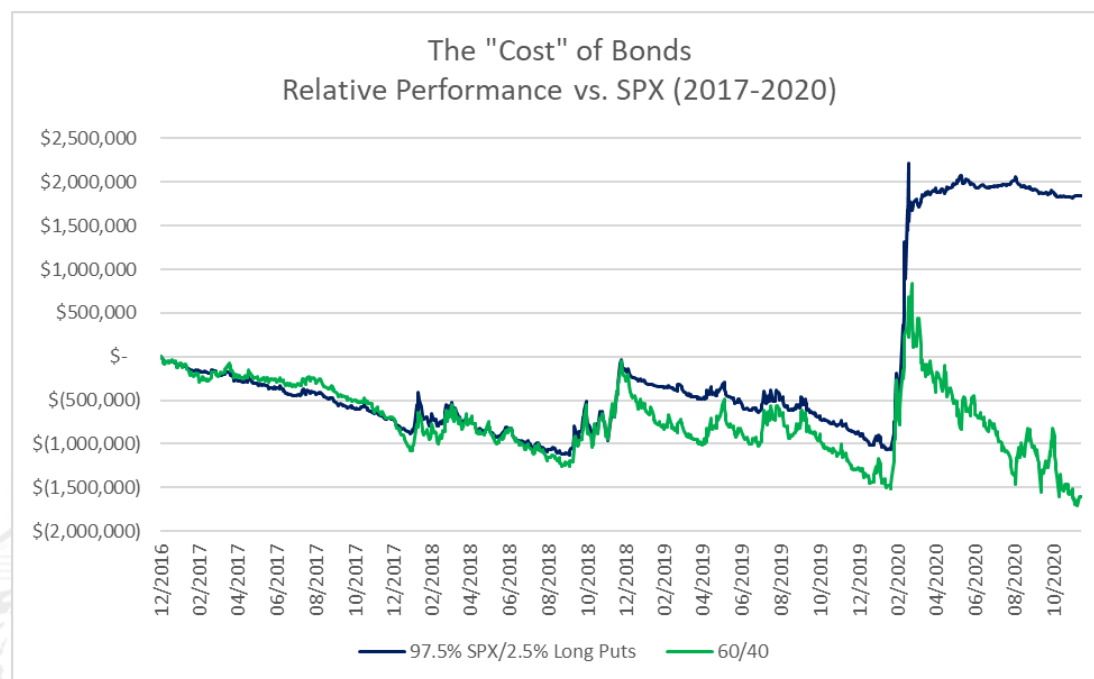
Figure 15-The “Cost” of Bonds compared to the Cost of Hedging (2007-2020)



Source: Bloomberg LP Data, ORATS, IPS Calculations

It is our belief that viewing an allocation to bonds as a “cost” to the portfolio is an appropriate way to approaching asset allocation decisions, especially as interest rates rise off historical lows and the outlook on bonds for many portfolio managers is negative.

Figure16-The “Cost” of Bonds compared to the Cost of Hedging (2017-2020)



The above chart shows that the cost of hedging using protective puts was higher than the “cost” of bonds up until the end of 2017. Since 2017, financial markets have exhibited subpar bond returns combined with above average equity returns with heightened volatility. This type of environment has proved to be a sweet spot for hedged equity strategies as they are far better equipped to take advantage of the violent sell offs and subsequent V-shaped recoveries than a traditional diversified portfolio. Investors who believe that the current liquidity dynamics are here to stay should consider using hedged equity strategies as an alternative to riskier bond allocations within their portfolios.

THE NEW NORMAL

In September of 2019, IPS Strategic Capital published a paper titled [“Is Selling Options Still Worth the Risk?”](#) The article focuses on the rise of volatility selling strategies that resulted in “net selling of option premium that has far exceeded option buying ... most likely due to the popularity of option selling strategies in both retail and institutional communities starting in 2013.” The conclusion of the paper is that the cost of holding long options (carry cost) has become much more competitive while large scale option and volatility selling programs have drastically reduced the cost of being long optionality.

If we look at the protective put strategy discussed above since 2017, we can see the 97.5% SPX/2.5% Long Put strategy has shown to be much more efficient when compared to a 60/40 portfolio. The paradigm shift through this period is explosive upside in equities combined with systematically cheap option premium. It is important to note that much of the outperformance during this time period is attributable to the market sell off surrounding COVID-19 fears.

Figure 17-Backtested Performance of SPX, 60/40, and Protective Puts (2017-2020)



Source: Bloomberg LP Data, ORATS, IPS Calculations

Figure 18-Portfolio Risk/Return Statistics of SPX, 60/40, and Protective Puts (2017-2020)

	SPX	60/40	97.5% SPX/2.5% Long Puts
Cumulative Return	66.2%	49.3%	82.9%
Annualized Return	13.8%	10.8%	16.7%
Volatility	16.4%	9.9%	12.2%
Sharpe	0.84	1.08	1.37
Sortino	2.28	3.11	4.90
Max DD	-34.3%	-20.9%	-17.5%

Source: Bloomberg LP Data, ORATS, IPS Calculations

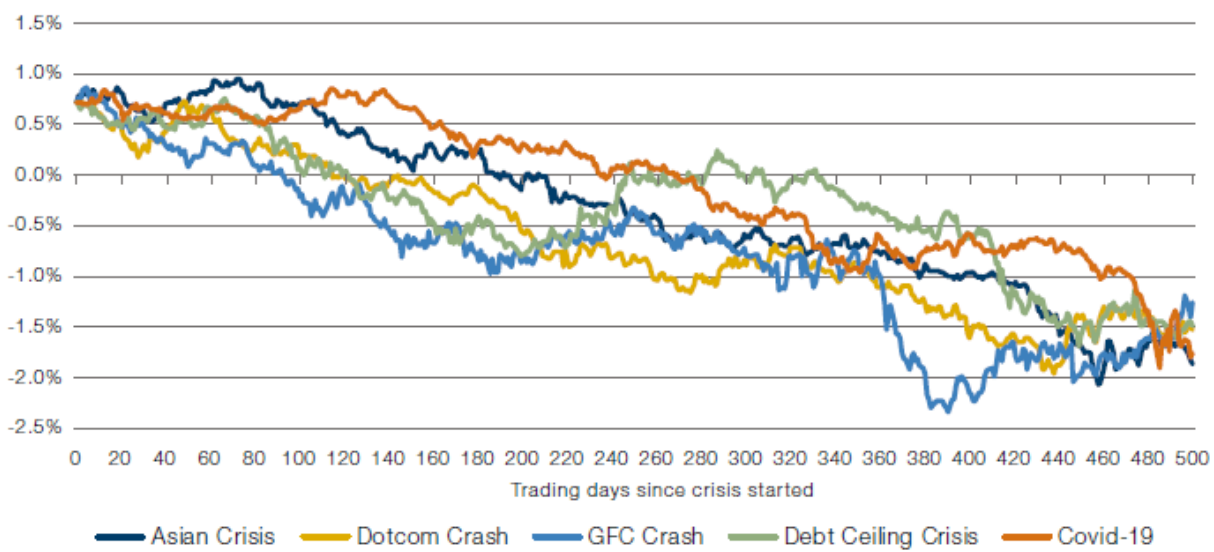
The annualized return of the protective put strategy was over 6% better than 60/40 portfolio. These results demonstrate that the cost of using explicit hedges can be comparable to the “cost” of owning debt in a low interest rate environment.

In addition to the strong outperformance on the upside, the asymmetry provided by using long put options to hedge an equity portfolio led to very favorable maximum drawdown during this period of only -17.5% compared to a maximum drawdown of almost -21% for a 60/40 portfolio. The strong performance of put options during the COVID-19 crisis led to a substantial increase in the Sortino ratio of the protective put portfolio which was 4.90 compared to only 3.11 for a 60/40 mix.

The takeaway from the last four years is that investors have been able to increase their exposure to risky assets, hedge them directly with strategies like a protective put, and obtain better risk adjusted returns than traditional asset allocation models. Given the backdrop of low interest rates and potential for higher-than-average inflation in the future, investors should consider these tradeoffs carefully in their asset allocation.

The relatively low yield through this period is worth examining further as the average yield on the 10-year U.S. treasury from 2017 to 2020 was 2.06% and the 10-year U.S. Treasury as of this writing is approximately 1.50%. It could be argued that at the current yield, the upside of holding debt within a portfolio is negligible. The Man Group recently published a study showing how much yields would need to drop to produce returns on U.S. Treasuries that have been comparable to previous crises.

Figure 19-How Bond Yields Would Have Had to Evolve to Generate Equivalent Returns



Source: The Bond Problem - Man Group (<https://www.man.com/maninstitute/the-bond-problem>)

Their analysis found that “rates would need to go decidedly negative for investors to earn the returns they did in prior events. Given Bunds and Japanese government bonds (‘JGBs’) hit lows of negative 90 basis points and negative 15 basis points, respectively, one might question if the rates below negative 1% would at all be reasonable to expect in US Treasuries.”

Across Wall Street, the consensus seems to be that rates will move higher for the first time in decades. In his most recent annual letter, Warren Buffett claimed, “bonds are not the place to be these days... Bonds are still too pricey, and still pay out insufficient coupons, for many investors.” Francesco Sandrini, senior multi-asset strategist at Amundi Asset Management said, “While bond coupons in some sectors might be appealing at a first glance, the potential capital loss from bonds in a rising yield environment means you should probably avoid them”.

CONCLUSION

This paper makes a strong argument to consider hedging in a portfolio framework especially as interest rates have approached historic lows and the cost of protective puts have been reduced due to the implementation of large-scale option and volatility selling strategies over the last few years. This study was not meant to be advancing any one strategy but showing how systematically owning protective puts rebalanced quarterly can be competitive to using bonds as a diversifier in the current environment.

One should consider the potential value that can be added by firms that specialize in managing hedging solutions as their core business to improve on the basic hedging example. Nassim Taleb, author of the seminal work *Black Swan*, pointed out in a

Bloomberg TV interview that, “a lot of people think they can call a broker, buy puts and its done, It’s much harder than that.”

As a firm that specializes in building and optimizing hedging solutions for both individual and institutional investors, we absolutely agree with Dr Taleb’s assessment. A professional hedging firm can considerably improve on using a basic protective put strategy rebalanced quarterly.

The main premise of this study shows that even the most basic protective put strategy clearly belongs within all portfolio frameworks today. As interest rates bottom and equities continue to produce above average yet highly volatile returns, the use of protective puts must be considered as a viable portfolio alternative or at the very least, an addition to an asset allocation model. As many investors saw the value of portfolio hedging during the COVID-19 crisis in 2020, we expect the trend towards using direct portfolio hedges will only continue to grow in popularity.

*Created by Dominick Paoloni CEO of IPS Strategic Capital and Patrick Hennessy the Head Trader at IPS Strategic Capital, an investment management firm dedicated to using options-based strategies that achieve uniquely superior risk mitigation and generous participation in market upside. Their education content and strategies can be explored at www.investps.com.

For anyone interested in the full results of the detailed backtests ran on the protective long put strategy used in the paper, please contact Dominick Paoloni at dominick@investps.com or Patrick Hennessy at patrick@investps.com – we are happy to share and dialogue on the full results.

APPENDIX

Bonds Don't Always Diversify Equity Risk – Ardea Investment Management

<https://www.ardea.com.au/dont-assume-bonds-always-diversify-your-equity-risk/>

Benn Eifiert – Twitter Thread

<https://twitter.com/bennpeifert/status/1362908508237090816?s=20>

The Bond Problem – The Man Group

<https://www.man.com/maninstitute/the-bond-problem>

Is Selling Options Still Worth The Risk? – IPS Strategic Capital

<https://investps.com/is-selling-options-still-worth-the-risk/>

Swimming with the Target Date Whale – Vincent Deluard

<https://blog.evergreengavekal.com/swimming-with-the-target-date-whale/>

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The backtested performance is not based on real results produced by an investor but rather obtained through an investment framework that was historically applied to past data. Trading fees, commissions, taxes, and management expenses have not been included in the backtested performance within the document.

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