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Using Barbells to Lift Risk-Adjusted Return

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ABSTRACT

This study demonstrates how a barbell strategy invested primarily in fixed income assets coupled with in-the-money long-term call options on various equity asset classes can achieve a significant percentage of upside appreciation and significantly reduce downside risk. An examination of exchange-traded funds (ETFs) covering S&P 500, NASDAQ 100, mid-cap, small-cap, developed international, emerging, and real estate equities shows a barbell strategy of 88-percent bonds and 12-percent long-term call options captures 70–124 percent of the geometric annual return of the underlying ETFs for December 2002–November 2019.

During steadily rising markets, bond/option barbell portfolios generally will underperform. Compared to a 100-percent position in the underlying ETF, the return sacrifice during upward markets is compensated for by reducing the standard deviation by more than half and cutting maximum loss by 74 percent. The out-of-sample 2020 "corona crash" reaffirms the results with an average return of -11.34 percent for the barbell strategies compared with -35.60 percent for the underlying ETFs during February 20–March 23, 2020. A barbell investment strategy should be attractive to risk-averse investors, those approaching or in retirement, and any investor unable to ride out extreme market losses. As of 2020, upside participation relative to long-only ETFs may be somewhat reduced due to the extremely low interest-rate environment.

MITIGATING DOWNSIDE RISK

The COVID-19 crisis of 2020 represents the twenty-first century's third "once in a century" financial event. Along with the 2000–2002 tech crash and the 2008–2009 Global Financial Crisis, these events serve as a reminder of the importance of downside-risk mitigation. Investors have every right to be nervous about the COVID-19 market correction and should be given options (no pun intended) for what can be done to mitigate the impact of this crisis and the next.

The investment industry is not oblivious to this fact, and several investment ideas for mitigating downside risk have been transformed into investment vehicles, including low-volatility and option-based funds. The appetite for risk-reducing equity-like products is large given demographic trends, especially an aging population that cannot withstand a market downturn. Low-volatility equity products and option-based portfolio insurance type ETFs (Leland and Rubinstein 1976) have recently been introduced to the market, garnering billions in assets.[1]

A barbell investment strategy should be attractive to risk-averse investors, those approaching or in retirement, and any investor unable to ride out extreme market losses.

However, the option-based funds are focused primarily on the S&P 500 or individual large-cap stocks. This study explores whether downside risk in varying asset classes can be mitigated by applying a barbell strategy to various equity asset classes. A barbell strategy is implemented by placing most of the wealth in relatively safe fixed income securities and a small percentage in long-dated call options referred to as long-term equity anticipation securities (LEAPs). In-the-money call options are chosen to reduce losses from the option position during flat to low single-digit return years of an asset class.

The barbell strategy is not new and is discussed as far back as Bodie (2001), though little empirical evidence is available regarding its implementation. Barbell strategies come in different flavors, but across the board they rely upon asset classes that are vastly different in risk characteristics. The best-known proponent of these strategies, Taleb (2007, 205) proposes a portfolio with 85–90 percent in very safe investments and the remainder in highly speculative investments. Similarly, Scott and Watson (2013) recommend that investors near retirement invest 85 percent of their assets in Treasury securities with the remaining 15 percent invested in 3x leveraged ETFs. They find

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this type of barbell portfolio is superior to a traditional portfolio for providing a sustainable withdrawal rate in retirement.

The barbell strategy examined in this study has characteristics comparable to the constant proportional portfolio insurance (CPPI) of Black and Jones (1987). With CPPI, a floor is set and positions in equities and a risk-free asset are adjusted so the floor is not breached. This requires equities to be sold as the market declines, converging to a risk-free position as the portfolio value approaches the floor. Most studies find CPPI is superior to typical option-based downside-risk protection strategies such as using protective puts (Annaert et al. 2009; Pezier and Scheller 2013; Zieling et al. 2014).

The barbell strategy has similar insurance-type characteristics as a CPPI with the percentage in Treasury securities acting as a floor while the percentage in call options, and thus exposure to equities, increases and decreases with the market. Unlike a CPPI, a barbell does not require as much rebalancing, nor is it exposed between rebalancing; whereas the floor value in a CPPI strategy may theoretically be breached with a large enough decline in the market. George and Trainor (2017) find monthly rebalancing is mostly adequate for a CPPI strategy although equity deviation rules generally outperform.[2]

It also should be pointed out that a barbell strategy is not a protective put strategy. To see this, note that put-call parity can be written as

$$X(e)^{-rt} + C = S + P \quad (1)$$

where $X(e)^{-rt}$ is the present value of the strike price, C is the call price, S is the stock price, and P is the put price. On the surface, the barbell strategy appears to be the left-hand side of equation (1), which is equal to $S + P$ (a protective put strategy). However, the barbell strategy as implemented in this study has critical differences. First, 7–10-year Treasury notes are used for Treasury securities, and the amount is set at a fixed percentage (88 percent in this study) instead of the present value of the strike price. This creates the situation where $S + P$ may not be equal to $X(e)^{-rt} + C$. The barbell effectively creates an 88/32 leveraged bond/equity type strategy based on historical return dynamics. Trainor et al. (2019) show how a protective put strategy vastly underperforms a barbell strategy by demonstrating they are not equivalent.

This study extends the research of barbell strategies by examining asset classes beyond the standard S&P 500 to include the NASDAQ 100, mid-cap, small-cap, developed international, emerging, and real estate investment trusts (REITs). The range of participation varies across asset classes but, on average, 92 percent of an underlying asset's geometric annual return for December 2002–November 2019 is achieved with less than half the standard deviation and only 26 percent of the maximum loss for any annual period. Figure 1 shows the cumulative value of $1 for the S&P 500 and its associated 88/12 barbell counterpart through July 31, 2020 (the time in this figure is extended to include the out-of-sample period).

Figure 1
S&P 500 VS. BARBELL, CUMULATIVE VALUE OF $1

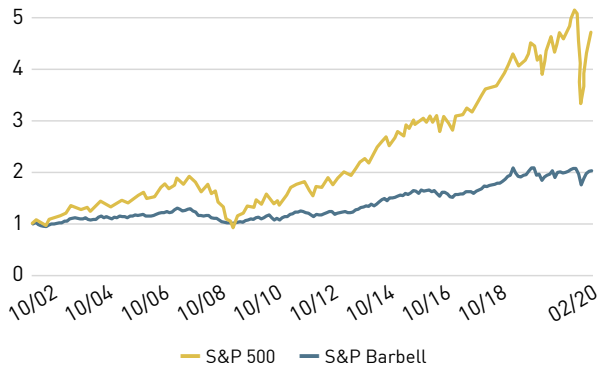

Figure 1 shows the cumulative value of $1 from November 1, 2002 through July 31, 2020, for the S&P 500 and an 88/12 barbell portfolio consisting of 7–10-year Treasury notes and long-term call options.

When the underlying long securities do well, the barbells tend to underperform. A barbell's value becomes clear during both the 2008–2009 Global Financial Crisis and the 2020 corona crash. By avoiding large losses and an investor's need to recover from them, cumulative returns often can match or exceed a 100-percent investment in the underlying asset even over long periods of time.

Figure 1 shows a case in point where after the first thirteen-plus years (November 1, 2002 through February 29, 2016), the barbell's returns are equivalent to a 100-percent investment in the S&P 500 by effectively avoiding the 2008–2009 financial crisis. It is only since March 2016 that a 100-percent investment in the S&P 500 begins to outperform after suffering the effects of the 2008–2009 financial crisis. However, this outperformance ended with the March 2020 corona crash because the cumulative value from a barbell strategy outperforms a buy-and-hold strategy even over the past eighteen years. The sudden rebound has the S&P 500 slightly ahead on performance once again, but avoiding declines of 30 percent and more while maintaining substantial upward participation is attractive.

The one potential downside to the barbell strategy is the reliance on Treasury securities. Recall that 88 percent of the barbell strategy is in 7–10-year Treasury notes. Although Treasury securities tend to do well during times of market stress and the flight to safety, reliance on these or similar fixed income assets could lead to more-muted returns when rates remain low for long periods of time or when interest rates are continuously rising. A barbell strategy can be used in conjunction with standard buy-and-hold strategies to maintain participation

in upward moving markets while reducing exposure to downside losses during times of extreme market stress.

DATA AND METHODOLOGY

In this study, a barbell strategy is composed of 7–10-year Treasury notes (proxied by IEF, the iShares 7–10-year Treasury Bond ETF) and 0.7 delta (in-the-money) long-term call options in a variety of asset classes with at least one-year maturity purchased at the end of every February, May, August, and November from December 2002–November 2019. Call options are sold before maturity, reducing some of the time premium loss (theta decay), which is most pronounced in the months before maturity. Additional calculations showing what occurs during the March 2020 corona crash are included as an out-of-sample test.

Treasury notes are used as the alternative asset with the objective of providing a lower correlation to equities and a flight to safety when markets significantly decline. Because equity markets tend to move together, this flight to safety is relevant for international markets as well. Using one-year rolling correlations, the correlation between the S&P 500 and international developed markets relative to the IEF average −0.31 and −0.21, respectively. More importantly, during 2008, this correlation fell below −0.70 even for international returns. The drop of 10-year Treasury-note yields to less than 1 percent during the corona crash reaffirms this flight-to-safety rationale.

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Another positive attribute of the fixed income component of the portfolio is the yield received. Under most circumstances, a bond yield effectively replaces the equity indexes' dividend. An aggregate bond fund also could be utilized instead of Treasury exposure in this methodology, although the flight-to-safety effect would be somewhat reduced due to the aggregate bond's lower credit quality.[3]

The asset classes and ETFs used as proxies are the S&P 500 (SPY), NASDAQ 100 (QQQ), mid-cap (MDY), small-cap (IWM), international developed (EFA), emerging markets (EEM), and real estate investment trusts (IYR). Returns for all ETFs include reinvested dividends. For the barbell, 7–10-year Treasury notes are proxied by IEF for the 88 percent in bonds, but individual Treasury notes easily could be purchased instead. The options are all on the underlying ETFs except for SPY, where options on the SPX are used because they have an earlier start date. IYR and EEM options do not begin until December 2004 and September 2006, respectively.

Following the methodology of Trainor et al. (2019), an 88/12 bond/option position is created for each underlying ETF.[4] Greater or lesser allocations in the call options could be applied easily depending on investors' risk aversion. Significantly more in options increases the probability of loss because the options could expire worthless, which is counter to the idea of mitigating loss. On the other side, reducing the amount in options reduces the upside participation. Thus an 88/12 mix is chosen but, depending on risk aversion, an 84/16 or a 92/8 mix could be more appealing.[5]

The barbell is rebalanced at the end of each February, May, August, and November but only for the options purchased in the same month in the previous year; e.g., in May, only the options purchased the previous May are rebalanced to 3 percent of the portfolio, with the percentage in Treasury notes adjusted accordingly. The options purchased in other months are not adjusted. This allows option gains to be taxed at the more favorable long-term capital gains rate because the options are held for at least one year and a day.[6]

Although the barbell strategy seems safe, with 88 percent exposed to fixed income it does face the risk of rising interest rates. Participation rates are examined separately during rising-interest environments to estimate the impact of Treasury-note losses. Furthermore, with Treasury yields in 2020 falling well below 1 percent, additional analysis of what may be expected in the future is performed.

Option prices are obtained from DeltaNeutral. To be conservative, options are purchased at the ask. The average of the bid-ask is used for intermediate monthly return calculations, and options are sold when rebalanced at the bid. ETF returns including dividends are obtained from the Center for Research in Security Prices (CRSP). Call options are selected based on a delta of 0.7 (which is approximately 9-percent in the money but varies with the option's implied volatility) to reduce the time value (as a percentage of the total price) paid for the option. Results for various deltas are examined, but only results for the 0.7 delta options are reported.[7] Options in this study average 429–533 days in length, although six-month options are used for MDY, EFA, EEM, and IYR until June 2004, December 2006, December 2006, and June 2007, respectively, because long-term options are not available before these dates.[8]

EMPIRICAL RESULTS

Table 1 summarizes annual return results ending the last day of November 2003 to November 2019. Panel A shows the returns for the underlying index, and panel B shows the 88/12 barbell returns. The barbell strategies attain 70 percent (QQQ) to 124 percent (EFA) of the annual geometric return of the

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Table 1

RETURN STATISTICS FOR ETFS (PANEL A) AND 88/12 BARBELLS (PANEL B), 2003–2019

Average returns and risk statistics for various asset classes from December 2002–November 2019.
Panel A is the underlying ETFs and Panel B is the 88/12 barbell strategy.

Panel A	S&P 500	Nasdaq	Mid–cap	Small–cap	International	Emerging	REITs	
Average	11.00%	15.71%	12.58%	12.13%	9.82%	7.75%	11.50%	
Geo. Avg.	9.51%	13.43%	10.49%	9.95%	6.88%	3.15%	7.99%	
St. Dev.	14.50%	19.23%	16.97%	17.61%	20.27%	31.85%	23.22%	
Minimum*	-43.42%	-43.06%	-42.23%	-42.30%	-50.05%	-54.31%	-58.08%	
Maximum*	53.24%	63.48%	65.47%	64.85%	58.08%	86.41%	104.33%	
VaR[1]	-20.94%	-15.29%	-19.32%	-21.02%	-24.45%	-25.20%	-33.93%	
Sharpe	0.56	0.63	0.54	0.49	0.27	0.07	0.28	
Sortino	0.17	0.21	0.17	0.14	0.11	0.15	0.15	
Panel B	**BB SPY**	**BB QQQ**	**BB MDY**	**BB IWM**	**BB EFA**	**BB EEM**	**BB IYR**	**T–bonds**
Average	9.01%	9.68%	8.17%	8.83%	10.15%	4.38%	7.23%	4.91%
Geo. Avg.	8.62%	9.34%	7.66%	8.18%	8.53%	3.86%	6.57%	4.70%
St. Dev.	6.85%	7.64%	5.96%	8.17%	13.29%	10.94%	10.78%	4.59%
Minimum*	-12.68%	-13.45%	-10.52%	-9.71%	-14.00%	-14.35%	-11.61%	-6.60%
Maximum*	24.36%	27.37%	26.97%	48.85%	65.27%	25.30%	36.09%	17.87%
VaR[1]	-3.13%**	-2.35%**	-3.70%**	-3.32%**	-6.88%**	-8.04%**	-6.95%**	-3.83%
Sharpe	1.06**	1.04**	1.06**	0.84**	0.54**	0.26**	0.48**	0.73
Sortino	0.31	0.31	0.28	0.25	0.26	0.15	0.18	0.26
Participation %	90.67%	69.50%	73.04%	82.20%	123.97%	122.78%	82.24%	N/A

**Minimum, maximum, and value-at-risk (VaR) are based on monthly rolling annual returns to show best and worst one-year holding periods.*
***Significantly better than corresponding ETF at the 5-percent level. Annaert et al. (2009) and Opdyke (2007) are followed to determine significant differences between ETF vs. barbell VaRs and Sharpe ratios, respectively.*

individual underlying ETF's total return including dividends. This is shown in the panel B row labeled "Participation %." Note that, due to relatively poor returns in emerging markets, an investor was better off not buying EEM or options on EEM; 7–10-year Treasury notes outperform this asset class, 4.70 percent to 3.15 percent annualized.

On a risk-adjusted basis, the barbell strategies are very attractive, with less than half the standard deviation and, on average, only 26 percent of the maximum loss based on rolling monthly annual returns relative to the underlying ETFs. Barbell return minimums range from -9.71 percent (BB IWM) to -14.35 percent (BB EEM), and the underlying ETF return minimums range from -42.23 percent to -58.08 percent. This results in superior Sharpe and Sortino ratios for the barbells along with lower value-at-risk (VaR). Only 5 percent of the observations are below the VaR.

OPTION CONTRIBUTION

With only a small percentage of the barbell invested in 0.7 delta long-term call options, it is important to understand the magnitude and probability of success with these options, because approximately 20 percent of all options and up to 80 percent held to expiration expire worthless in any given year.[9] Mathematically, the 0.7 delta option's price should move by approximately 70 percent of the underlying ETF's price change.

Figure 2

INITIAL 0.7 DELTA OPTION RETURN AS FUNCTION OF ETF RETURN

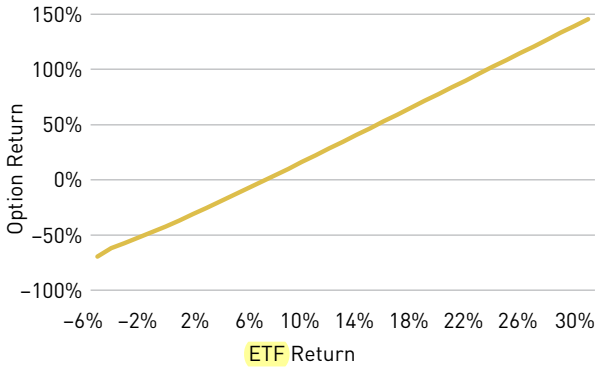

Figure 2 shows how the average LEAP option return is affected by underlying ETF returns. The average in-the-money strike price is 9.44 percent, meaning the 0.7 delta option has an average strike price 9.44 percent below the index value at purchase. The option prices themselves are on average 16.6 percent of the underlying ETF's value. Figure 2 shows that, if the underlying ETF declines 6 percent over the year, the option return is -70 percent. Alternatively, an increase in the underlying ETF of 10 percent results in a 22-percent option return. With 12 percent in options, this results in 2.64 percent of additional return added to the return attained from the 88 percent in bonds. Higher ETF returns leverage the option

Table 2

OPTION CONTRIBUTION TO BARBELL RETURNS 2002–2019

	BB SPY	BB QQQ	BB MDY	BB IWM	BB EFA	BB EEM	BB IYR
Average	4.61%	5.33%	3.76%	4.31%	5.54%	–0.09%	2.81%
Geometric Average	4.24%	5.03%	3.31%	3.67%	4.05%	–0.60%	2.37%
Total Participation (Table 1)	90.67%	69.50%	73.04%	82.20%	123.97%	122.78%	82.24%
Option Contribution	44.58%	37.44%	31.59%	36.87%	58.80%	–18.94%	29.65%

Table 2 shows the 2002-2019 average returns generated from only the 12 percent in options and the contribution to their returns generated in table 1.

Figure 3

PARTICIPATION CONTRIBUTION RELATIVE TO UNDERLYING ETFs FROM OPTIONS AND TREASURIES

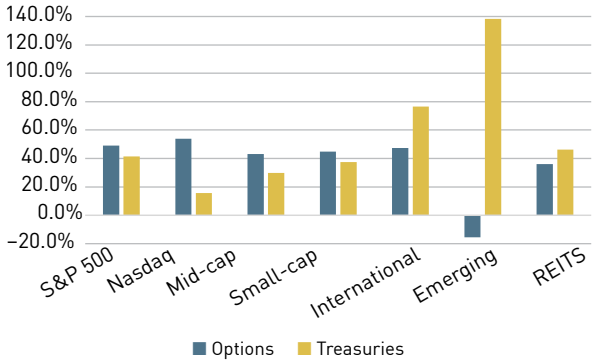

Figure 3 shows the respective contribution to the participation rate from Treasury notes and options for each asset class.

Table 3

RETURN STATISTICS FOR A PORTFOLIO OF ETFs VS PORTFOLIO COMPOSED ENTIRELY OF BARBELLS, DECEMBER 2002–NOVEMBER 2019

ETFs (40 percent in S&P 500 with 10 percent in QQQ, MDY, IWM, EFA, EEM, and IYR) versus a corresponding portfolio of 88/12 barbells used for each asset class.

	ETF Portfolio	Barbell Portfolio
Average	12.25%	9.87%
Geometric Average	10.09%	9.11%
Standard Deviation	16.91%	6.72%
Minimum	-42.40%	-3.14%
Maximum	36.72%	20.30%
VaR	-7.77%	-0.75%
Sharpe	0.52	1.15
Sortino	0.17	0.37

value to increasingly large returns, reaching more than 100 percent on average with a 23-percent ETF return.

Table 2 shows how much of the 70–124-percent participation rate comes from the options when the return on Treasury securities is set to zero for 2002–2019. The contribution from the options ranges from –18.94 percent (EEM) to 58.80 percent (EFA) as measured by the geometric return from the barbell divided by the geometric return of the index.

Note that EEM performs worse than Treasury notes during this time period, so it is expected the options would provide little if any additional contribution. Excluding EEM, options contribute roughly 40 percentage points to the participation rates of long-only ETFs calculated in table 1. This participation rate is confirmed using bootstrapping analysis, which allows the use of longer historical index returns dating to 1926 coupled with all historical implied volatilities experienced during 2002–2019.[10] These results also have implications for the abnormally low interest-rate environment where future participation rates may rely more on the options than on the Treasury securities. Figure 3 summarizes the respective contribution from Treasury notes and the options for each underlying asset class.

THE PORTFOLIO BARBELL

In a portfolio setting, it is entirely possible to fully or partially replace an investor's equity asset classes with a barbell strategy. As an example, a portfolio with 40 percent in the S&P 500 and 10 percent in each of the asset categories examined in this study results in a 10.09-percent geometric annual mean using the underlying ETFs. Using 88/12 barbells for each asset class results in a 9.11-percent geometric annual mean.[11] Table 3 shows the descriptive statistics and figure 4 shows the annual returns December 2002 through November 2019.

In twelve of the seventeen years, the 88/12 barbell strategy has lower returns than the traditional portfolio. These results are qualitatively similar for each individual asset class as well. This is not unexpected because the barbell strategy employed in this study generally will underperform in rising markets. When the equity asset classes do very well, the barbell strategy will not attain 100-percent upside participation as seen in 2009, 2013, and 2017. However, the value of using barbells is apparent when the market moves in the other direction. During the 2008 financial crash when the equity portfolio falls 42.4 percent, the barbell is down only 3.1 percent. The real upside to a barbell strategy is avoiding the psychological trauma of seeing a third or more of one's wealth disappear and still participating in the gains of the underlying securities. Avoiding these large losses feeds directly into the success of the geometric annualized returns for a barbell strategy relative to investing in the underlying ETFs directly.

THE CORONA CRASH

The March 2020 corona crash lends itself to the ideal out-of-sample test. Data in table 4 show the returns for the underlying

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ETFs and their associated barbells for December 1, 2019–February 19, 2020, when the S&P 500 reached its high; February 20, 2020–March 23, 2020, when the S&P 500 reached its low; and the March 24, 2020–July 31, 2020, recovery period.

The results before, during, and after the corona crash corroborate the results of this study. For the S&P 500, the barbell captures 91 percent of the upward move for December 1, 2019–February 19, 2020, which is also the average for all the categories and basically equal to the result for December 2002–November 2019. By February 19, 2020, the option percentage in the S&P 500 barbell reaches 20 percent of the portfolio. Even with this greater exposure, the barbell falls only 13.31 percent relative to the 33.70-percent decline in the S&P 500. However, this large decline leaves just 1.9 percent of the barbell portfolio in options. The flight to safety where IEF gained more than 6.5 percent over this period also reaffirms the theory behind the barbell strategy.

The drawback of the barbell strategy during a market crash is the small percentage left in options. With such a quick rebound, only the May options are rebalanced, and this led to a smaller capture rate of 41 percent during the rebound. As of July 31, 2020, the option percentage increased to 15.2 percent of the barbell portfolio. For the entire period, December 1, 2019–July 31, 2020, the S&P 500 and its barbell returned 13.91 percent and 15.09 percent, respectively. The other asset classes have similar stories. Only QQQ and EEM outperform their respective barbells for December 1, 2019–July 31, 2020.

GOING FORWARD UNDER LOW INTEREST RATES

Recall that table 2 shows that the option returns from the 88/12 barbells provide approximately 40 percent of the underlying geometric index return. However, the 7–10-year Treasury notes from 2002–2019 have a 4.9-percent average return, and after combining the two, participation rates are 70–124 percent. As of July 2020, the 10-year Treasury note yields less than 1 percent, which begs the question: What can be expected going forward?

Historically, for 2002–2019, the 7–10-year Treasury notes proxied by IEF lost money only for years ending November 2013 (–4.98 percent) and November 2018 (–1.59 percent). In 2013, the average participation rate for the barbells fell to 40.05 percent for asset classes that experienced a 10-percent or more gain (SPX, QQQ, MDY, IWM, and EFA). In 2018, only QQQ had a return of 10 percent or more, and the capture rate for the QQQ barbell was 48.4 percent of QQQ's return.

Although payoffs for options, even with a known index return, cannot be calculated in the future with remaining time to maturity and an unknown implied volatility, an estimate can be made by assuming the implied volatility will equal its average. To estimate option prices, Merton's (1973) model is used

Figure 4

ANNUAL RETURNS, DECEMBER 2002–NOVEMBER 2019

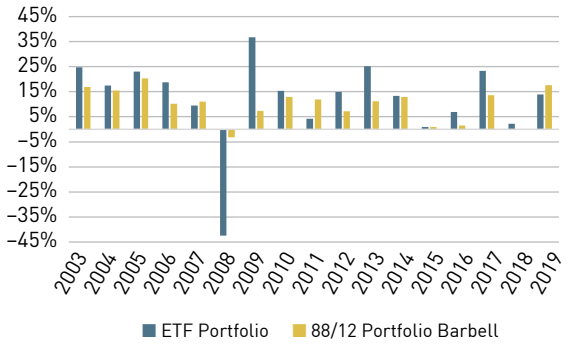


Figure 4 shows annual returns by year for a portfolio of ETFs and a corresponding 88/12 portfolio barbell.

Table 4

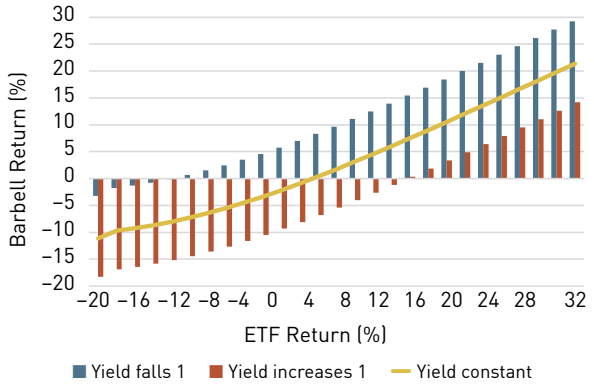
THE CORONA CRASH

Returns for underlying ETFs and the corresponding 88/12 barbell strategies before, during, and after the corona crash.

	SPY	Nasdaq	Mid-cap	Small-cap	International	Emerge	Real Estate
December 1, 2019-February 19, 2020							
ETF	8.17%	15.79%	4.72%	4.48%	2.32%	6.18%	7.21%
88/12 Barbell	7.46%	12.34%	4.39%	4.29%	2.38%	4.38%	7.59%
February 20, 2020-March 23, 2020							
ETF	-33.70%	-27.92%	-41.98%	-40.68%	-32.60%	-30.79%	-41.55%
88/12 Barbell	-13.31%	-12.69%	-12.64%	-11.99%	-10.73%	-6.19%	-11.86%
March 24, 2020-July 31, 2020							
ETF	47.10%	56.19%	54.31%	48.56%	35.33%	42.25%	44.11%
88/12 Barbell	19.41%	28.19%	12.64%	9.74%	8.15%	10.09%	7.76%
Entire period: December 1, 2019-July 31, 2020							
ETF	13.91%	42.92%	0.57%	0.43%	0.66%	10.64%	-8.31%
88/12 Barbell	15.09%	30.71%	6.27%	4.30%	3.03%	8.35%	0.86%

Figure 5

ESTIMATED BARBELL RETURN RELATIVE TO MARKET RETURN AND YIELD CHANGES



assuming a 2-percent continuous dividend yield. In addition, it is assumed the average remaining time to maturity when the option is sold is 125 days with an implied volatility of 25 percent based on the option averages in this study.

Figure 5 shows various outcomes for ETF returns ranging from −20 percent to +32 percent during the next year along with ten-year yield changes from −1 percent to +1 percent assuming an initial 1-percent interest rate. The worst-case scenario, albeit unlikely given investors' flight-to-safety tendencies, is a market crash and rapidly rising interest rates. A barbell could experience an 18-percent loss under those conditions, as shown by the red bars. This could be described best as a market crisis possibly due to rampant inflation caused by some supply shock. The typical average scenario with steady rates and a 10-percent market increase is likely to be associated with a 4.6-percent return resulting in only a 46-percent participation rate. This rate reaffirms the empirical results found between 2013 and 2018. With such low yields, even a 20-percent ETF return likely will result in only a 60-percent participation rate. Thus, the current historically low interest rates will mute performance of the barbell strategy for the time being. However, the low interest rates will similarly mute performance of asset-allocated portfolios that might have (say) 30 percent in fixed-income in a 70/30 portfolio. In other words, the fixed income component of any balanced type portfolio will be muted.

CONCLUSION AND IMPLICATIONS FOR INVESTORS

This study finds an 88/12 fixed income/option barbell strategy historically captures 70–124 percent of the annual geometric return of the underlying equity asset classes. The Sharpe and Sortino ratios over time tend to be much greater than long-only equity index investing due to the limited downside of the barbell strategy that has less than half the standard deviation and only 26 percent of the annual downside exposure relative to the asset classes themselves.

For those investors in long-only funds, this study finds evidence for potentially enhancing risk-adjusted returns by incorporating a core portion of capital into a barbell-type approach. This strategy, simple in its construction but powerful in its application, holds most of the capital in flight-to-safety fixed income assets and a much smaller allocation in LEAP call options on underlying ETFs based upon well-established equity indexes. The methodology may be appropriate for many investor types and may provide additional easy-to-understand planning opportunities that historically have required a more complex set of investment tools. We recommend utilizing tax-advantaged accounts for the option portion of the portfolio to minimize the impact of taxes on option gains.

A barbell strategy as outlined here may provide significant value to investors who are either in, or approaching, the withdrawal phase of their portfolios. This is the phase where portfolios are most impacted by significant market downturns, and this strategy, which participates in the upside but provides significant downside protection, may be useful.

In addition, this strategy may be especially appropriate for risk-averse investors who do not want to experience a severe market crash. This relatively simple and easy-to-implement strategy is not a market-timing strategy, and thus it can be implemented as a permanent, core portion of the portfolio. An out-of-sample examination of how the barbell strategy performed during the corona crash (as of July 31, 2020) reaffirms results with an average drawdown of 11.34 percent compared to 35.60 percent for the underlying ETFs.

Although the barbell strategy appears to be robust—the results remain qualitatively similar as option deltas, option maturity, rebalancing, and the percentage in options are all allowed to vary—it does have limitations. These limitations are mainly associated with risks of rising interest rates, which may hamper fixed-income returns. The current low interest-rate environment suggests participation rates may be only half what they have been until a more normal interest-rate environment is achieved.

Additionally, timing risks are associated with option purchases throughout the year, especially during times of high volatility when option prices are more expensive than usual. Despite these limitations, utilizing the barbell approach may indeed allow investors to capture the majority of the upside in upward trending markets and avoid significant losses during market crashes.

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ENDNOTES

1. There are now more than twenty low-volatility equity ETFs with assets under management of more than $74 billion (https://www.etf.com/channels/low-volatility-etfs) and seventy option-based ETFs with more than $6 billion (https://money.usnews.com/funds/etfs/rankings/options-based). Relative to employing a barbell type strategy, Aptus's Defined Risk and Amplify's BlackSwan Growth & Treasury Core are the most similar with more than $1 billion in assets between them.
2. An equity deviation rule requires rebalancing when the percentage of the portfolio in equity varies by a set amount such as ±2.5 percent, for example.
3. In general, aggregate bond funds tend to provide slightly less return and less of a hedge during market crashes with the increased credit risk. However, they do have less duration risk than 10-year Treasury notes. The BND ETF was tested with the results qualitatively similar to IEF although with slightly lower returns and greater maximum losses. A more aggressive albeit riskier stance could include 20+-year Treasury securities. The TLT ETF would be one such alternative.
4. Strictly speaking, Trainor et al. (2019) analyze 85/15, 90/10, and 95/5 barbell strategies using only the S&P 500.
5. A higher weight in options is associated with greater return, but also an increase in risk and a decrease in both the Sharpe and Sortino ratios. For example, the 84/16 barbell has a 98-percent average participation rate compared to 92 percent for the 88/12, but 16 percent of the barbell is now exposed to a significant loss for moderately declining markets. In the other direction, downside risk can be improved but with increasing sacrifice of return. A 92/8 barbell is associated with only an 84-percent upward participation rate. Thus, there is no single, optimal percentage in options for all investors and only the 88/12 is reported, which is roughly in line with previous studies.
6. Not all options are treated at long-term capital gains rates at 365+1 day held. SPX options automatically split gains at 60-percent long term, 40-percent short term irrespective of time held. In addition, the percentage in options will vary throughout the year as only one option each three months is reset to 3 percent of the portfolio. Semi-annual purchases are investigated with similar results. Theoretically, options could be purchased just once a year. However, the fewer rebalances, the greater the volatility of the effective percentage in options.
7. Option deltas from 0.4 through 0.9 delta call options are examined. In general, return declines with deltas below 0.5 with increasing risk. This is due to the increased probability the option loses most of its value or expires worthless. Deltas 0.8 and above also show rapidly declining average returns although they are associated with lower risk. Deltas in the 0.6–0.7 range appear to be in the sweet spot in terms of risk/return depending on risk aversion. On a year-to-year basis, returns to the 0.6 and 0.7 deltas are quite mixed for all the asset classes except for mid-caps and emerging markets where 0.7 deltas result in higher returns for fifteen of seventeen and nine of thirteen years, respectively. Thus, the exact option delta chosen is not critical within a reasonable range.
8. Ignoring tax effects, using only six-month options also is examined, which improves average return and significantly increases risk. As an example, the maximum loss using six-month SPX options increases from 12.68 percent to 21.08 percent and the value-at-risk triples. For the more aggressive investor, rolling six-month options within a barbell strategy are also effective and suggest results are not unique to long-term options only.
9. A common misconception is 80 percent of options expire worthless, not the other way around. This is due to only examining options held to expiration and not examining those closed before expiration (Wolfinger 2019). The strategy in this study is a prime example because the options are sold before maturity.
10. Twenty thousand bootstrapped simulations are employed. For each simulation, an implied volatility is sampled from monthly 2002–2019 LEAP option data. A single year from the historical return index data is sampled and the option price one year later is recalculated based on a separately sampled implied volatility. Expected values are attained for all the asset classes using historical returns for each asset class. Nasdaq Index data starts in 1973; both the S&P Mid Cap 400 and Russell 2000 Small Cap data start in 1926 using CRSP's deciles 5–7 and 2–4, respectively, to proxy for mid- and small-cap stocks. MSCI EAFE and MSCI Emerging Market indexes start in 1988, and Dow Jones Global U.S. Real Estate starts in 2001. Based on the 88/12 barbell, the average participation rate from only the option returns relative to the underlying index ranges from 26.73 percent to 37.21 percent with an overall average of 31.86 percent. This number likely will understate the barbell's empirical values because the option percentage in the barbell will increase well above 12 percent during rising markets.
11. As an example, for the 40 percent in the S&P, 0.40 × 0.88 = 35.2 percent in Treasury securities and 4.8 percent is in S&P 500 options. The other six asset classes add 8.8 percent in Treasury securities and 1.2 percent in options for each corresponding ETF barbell.

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