# Risk Mitigating Collar Strategy

## Loosening Your Collar: Alternative Implementations of QQQ Collars

OIC The Options Industry Council

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PowerShares QQQ™, formerly known as "QQQ" or the "NASDAQ- 100 Index Tracking Stock®", is an exchange-traded fund based on the Nasdaq-100 Index®. The Fund will, under most circumstances, consist of all of stocks in the Index. The Index includes 100 of the largest domestic and international nonfinancial companies listed on the Nasdaq Stock Market based on market capitalization. The portfolio is rebalanced quarterly and reconstituted annually.

January 2011

A Summary and Data Update of

# Loosening Your Collar: Alternative Implementations of QQQ Collars

By Edward Szado and Thomas Schneeweis[1]

Fall 2010

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The Options Industry Council (OIC), as part of its mission to provide education and research to institutional investors, helped sponsor a paper on the performance of a collar strategy on the PowerShares QQQ™ ("QQQQ") exchange-traded fund (ETF). The study was conducted by Edward Szado and Thomas Schneeweis from the Isenberg School of Management at the University of Massachusetts. Research support for this study was provided by OIC, a service of OCC. Research results, however, represent those of the authors and do not necessarily represent the views of OIC. The following pages contain a summary of the study as well as an explanation of the collar strategy.

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This summary updates the analysis in the original paper by Szado and Schneeweis (2010)[2], which covered the ten year period from March 1999 through May 2009. The update now covers the 11½ year performance of the modified collar strategies ending in September 2010 and highlights the three year sub-period beginning with the onset of the financial crisis in September 2007. The authors found that a long protective collar strategy using six month put purchases and consecutive one month call writes earned far superior returns compared to a simple buy-and-hold strategy while reducing risk by over 60%.

The authors also extended the analysis to a more active implementation of the strategy. While the passive collar used a constant set of fixed rules, the active collar used rules that adapt the collar to changing macroeconomic variables and market conditions. The active collar implementation generated higher returns than the passive implementation, while volatility was only slightly higher. Over the 138-month study period, the passive collar returned over 185% (9.6% annually), while the long QQQQ position experienced a "lost

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[1] Szado, Edward and Thomas Schneeweis, "Loosening Your Collar – Alternative Implementations of QQQ Collars," *Journal of Trading,* Spring 2010, Vol. 5, No. 2, pp. 35-56

[2] Some minor changes in methodology were made from the Spring 2010 paper. The current methodology picks the closest strike price to the desired strike price from those options with full data over the life of the option. The previous study chose the closest strike to the ATM whereas the current methodology picks the closest strike to the current market whether it is ITM or OTM. In addition, minor changes in the return streams may have resulted from subsequent data cleaning/updating by OptionMetrics.

Exhibit 1.

Results of QQQQ, (Passive and Active Collar Strategies), April 1999 to September 2010*

| Monthly Data: April 1, 1999 to September 30, 2010 | QQQQ TR | QQQQ TR PASSIVE COLLAR | QQQQ TR ACTIVE COLLAR |
|---|---|---|---|
| Annualized Return | -0.29% | 9.56% | 12.52% |
| Annualized Standard Deviation | 29.55% | 10.66% | 11.34% |
| Sharpe Ratio | -0.10 | 0.64 | 0.87 |
| Maximum Drawdown | -81.08% | -17.58% | -21.50% |
| Correlation with QQQQ | 1.00 | 0.38 | 0.44 |
| Min Monthly Return | -26.21% | -9.75% | -10.21% |
| Max Monthly Return | 23.48% | 15.06% | 16.38% |
| Number of Months | 138 | 138 | 138 |
| % Up Months | 54% | 64% | 67% |
| % Down Months | 46% | 36% | 33% |

* QQQQ TR FUND ONLY - No Options; QQQQ TR PASSIVE COLLAR - 2% OTM 1 Mo Call & 2% OTM 6 Mo Put; QQQQ TR Short ACTIVE COLLAR - 1 Mo Call & 6 Mo Put.

decade", losing 3% over the same period. The active collar out-performed both strategies and returned almost 290% (12.5% annually). Both collar implementations earned their superior returns with about one-third of the risk as measured by the standard deviation (10.7% for the passive collar; 11.3% for the active collar versus 29.6% for the QQQQ). During the three year financial crisis sub-period the passive modified collar earned a cumulative return of 12%; the active implementation gained over 16% while the QQQQ lost over 3%.

There are a variety of options strategies that can provide capital protection for equity-based portfolios. The most obvious choice is the use of protective puts. But this choice tends to be relatively expensive especially in periods of high volatility. Another options-based approach is the buy-write or covered call strategy. The covered call strategy typically entails the writing of call options against a long underlying position at a one-to-one ratio. Several empirical studies have suggested that covered call writing can enhance returns as well as mitigate losses from market downturns. However, covered call writing still leaves an investor exposed to large down moves. The collar strategy essentially adds a long protective put to a covered call strategy. This addition provides significant downside protection which the covered call lacks. The purchase of the long put is financed by the sale of the call. In essence, the collar trades upside participation for downside protection. A tight collar provides less upside participation and more downside protection than a loose collar. At one extreme, the tightest collar utilizing at-the-money (ATM) puts and calls effectively immunizes the portfolio from market movements. At the other extreme, a loose collar utilizes very far out-of-the-money (OTM) puts and calls. Between these far OTM strike prices the collar is essentially equivalent to a long underlying position.

The financial crisis has rekindled interest in collars and protective strategies in general. In 2008/2009, the QQQQ experienced a drawdown of roughly 50% from peak to trough. Many other asset classes that are generally considered effective equity diversifiers also faced significant losses. During the market decline, correlations of most asset classes with broad equity indices

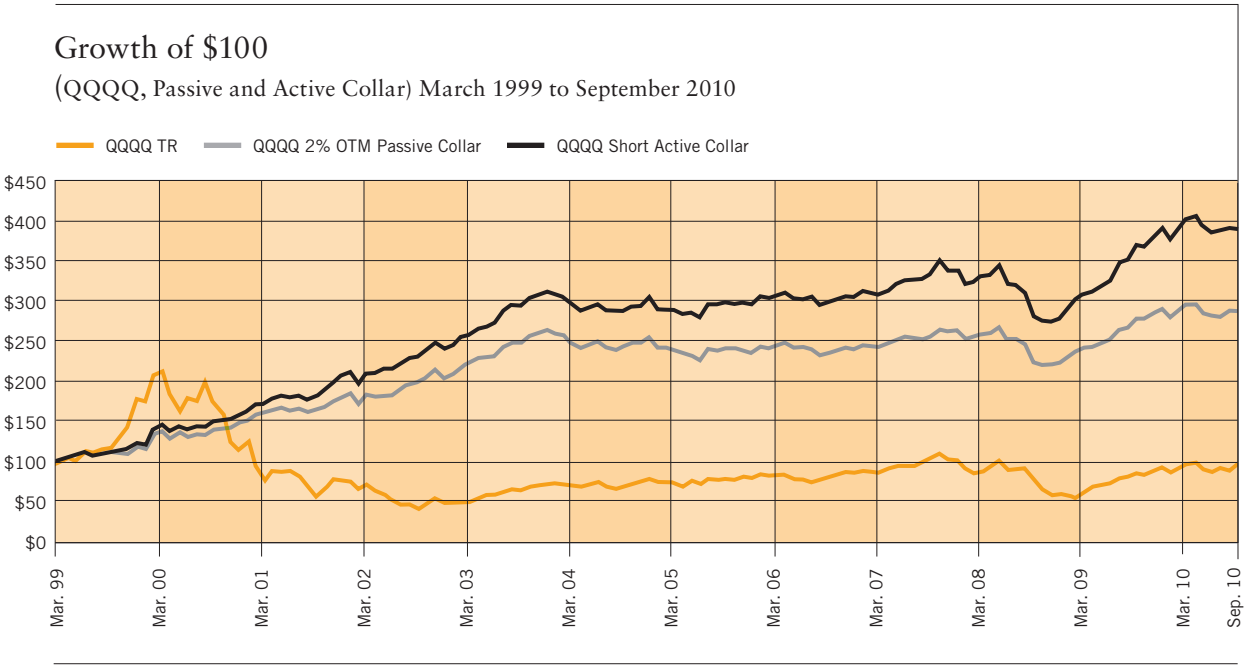


Figure 1.

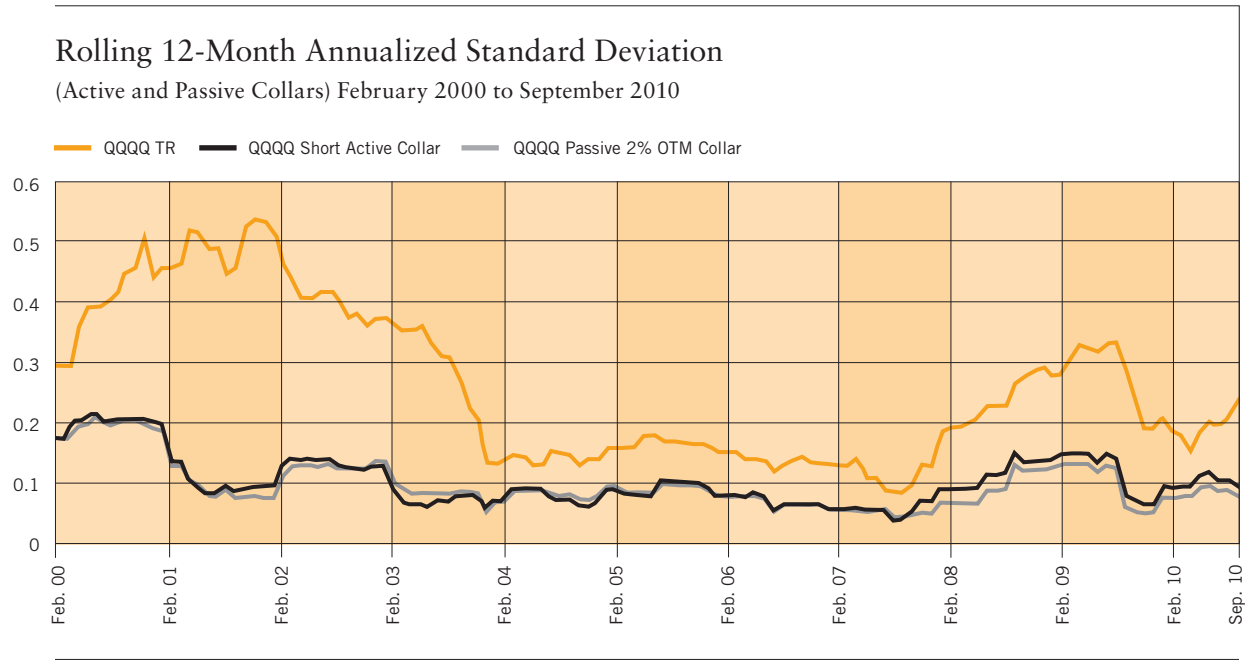


Figure 2.

tended to be significantly higher than in previous years, negating much of the expected benefits of diversification. This type of contagion across asset classes suggests that in times of major systemic stress, direct hedges through protective options strategies provide equity portfolios with more benefits than standard diversification programs.

The research assessed the effectiveness of the passive and active variations of the collar strategy from March 1999 to September 2010. The analysis considered a number of implementations of long collar strategies with varied moneyness of the puts and calls as well as times to expiration. In addition, the collars' performances were analyzed with the time period segmented into three sub-periods. These sub-periods feature different market environments reflecting conditions generally favorable and unfavorable to a collar strategy. The protective collars significantly outperformed the QQQQ in the overall period, as well as in the two favorable periods (one covers the technology bubble and one covers the financial crisis). While the collar variations underperformed the QQQQ in the unfavorable interim period, the authors found that in all of the implementations in all time periods, both collars significantly reduced risk compared to the buy-and-hold strategy. The study further indicated that the collar variations utilizing six month put purchases outperformed the one month and three month put strategies in almost all measures. The slower time decay of the longer maturity six month puts was a significant benefit to this collar implementation.

The rolling standard deviations in Figure 2 clearly show the risk-reduction benefits of the collar strategy. The collar strategies exhibited lower standard deviations throughout the entire period, with the differences ranging from 5 to 45 percentage points. It is also worth noting that the risk reduction benefits of the active collar strategy over the passive collar tended to be relatively subtle, particularly when compared to the difference between the collars and the QQQQ.

## Passive Collar

This summary focuses on the passive strategy using the 2% OTM six month put and 2% OTM one month call. This variation generally exhibited the best performance and represents a middle ground between ATM and far OTM. The study explored comparative analyses of maturities and strike prices. However, these aspects are not covered in this summary.

The effectiveness of the collar strategy in the April 1999 to September 2002 sub-period is clearly evident in Exhibit 2. During this period, the QQQQ was extremely volatile and lost more than three-quarters of its value from peak to trough. Specifically, the QQQQ had an annualized loss of 23.3% with a staggering 42% volatility. In contrast, the passive collar strategy generated an annualized positive return of 21.6% at a volatility of only 13.6%. The collar was able to turn a very sizeable loss into a significant gain while at the same time reducing risk by more than two-thirds. The capital protection ability of the collar strategy truly shines in this case. The collar could have earned investors a very impressive 21.6% per year over the sub-period with a maximum loss of capital of 7.5%, regardless of how poorly investors timed their entry into the strategy. The collar was an effective way of capturing a significant return from the bubble run-up without facing the tremendous losses that came with the collapse.

In the sub-period between October 2002 and September 2007, steady positive returns, low volatility and few sharp down moves of the index explain why the collar strategy was expected to perform relatively poorly. The annualized return of the QQQQ over this sub-period was an

impressive 20.4% at a relatively moderate volatility of 17.5%. The collar only provided a 5.2% annualized return over this period. It did, however, do so at a far lower volatility. Nevertheless this underperformance was not nearly as significant as the QQQQ's under-performance in the earlier sub-period.

While most asset classes became more correlated and collapsed during the financial crisis period from October 2007 to September 2010, the collar again provided significant capital protection. The annualized loss of 1% in the QQQQ was converted to a gain of 3.8%, while the standard deviation was cut from 26.6% to 10.2%. Exhibit 2 and Figure 3 illustrate the protective qualities of the collar during this period of extreme market stress.

## Active Collar

The active implementation of the collar strategy used three different sets of signals: momentum[3], volatility[4] and a macroeconomic indicator[5]. Please refer to the full study for a complete discussion of the active market signals. Various time horizons were reviewed in the full study. Since results based on the shorter-term signals were superior to alternative combinations, they are summarized below.

Changes in the signals are incorporated into the strategies only on roll dates. Since puts tend to be more expensive than calls for a given level of moneyness, the active strategies begin with puts further OTM than calls. This allows for the initial construction of the option component of the strategy to be close to zero cost. The initial

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[3] The momentum signal is a simple moving average cross-over (SMACO) of the NASDAQ-100 Index® (NDX®). A SMACO compares a short-term moving average (SMA) and a long-term moving average (LMA) to determine whether an upward or downward trend exists. This summary highlights the shorter 1/50 day moving average cross-over on each roll date (vs. 5/150 day moving average for medium-term and 1/200 day moving average for long-term) to determine whether to widen the collar (increase the upside participations with a corresponding reduction in downside protection) or tighten the collar in response to a sell signal (increasing downside protection while reducing upside participation).

[4] The volatility signal uses 50-day moving average (MA) of the daily VIX® close as an indicator of implied volatility levels (versus 150-day MA for medium-term and 250-day moving average for longer-term variations). The CBOE Volatility Index® (VIX) is a market estimate of expected volatility of the S&P 500® Index calculated by using bid/ask quotes of near-term and next-term out-of-the money SPX™ options with at least eight days left to expiration, weighted to yield a constant, 30-day measure of the expected volatility. The strategy writes 0.75 calls to each long index position when the markets short-term anxiety level is high (as indicated by a situation in which the VIX is above the 50-day, one standard deviation Bollinger band around its current 50-day moving average level), and writes 1.25 calls per index position when the anxiety level is low (when VIX is below the 50-day, one standard deviation Bollinger band around the 50-day average level). When the one month implied volatility level is within the one standard deviation, the strategy follows a standard 1:1 ratio buy-write. The goal in varying the quantity of written calls is to have a longer exposure to the market in times of high anxiety and shorter exposure in times of complacency.

[5] The macroeconomic signal is based on the trend of initial unemployment claims and the state of the economy with respect to the business cycle as pronounced by the National Bureau of Economic Research. These announcements are generally considered the authority on the current state of the business cycle. Since there is often a significant delay in announcement dates, the authors base the signals on announcement dates to avoid hindsight biases. During expansionary periods stocks rise, counter-intuitively, on bad unemployment news, while the opposite relationship holds in contractionary periods. One might expect rising unemployment to negatively affect stock prices regardless of the business cycle, but the authors relied on the existing literature which suggested that rising unemployment in expansionary economies causes expected future interest rates to decline, increasing the value of equities, while rising unemployment in contractions indicates slower future earnings growth rates, reducing the value of equities. This summary highlights the results of the shorter SMACO unemployment signal using 1/10 weeks (vs. 1/30 week for medium-term and 1/40 week long-term). Since rising unemployment claims in an expansionary economy is a bullish stock market price and volatility signal and if the SMA is greater than the LMA, the authors shift the collar towards the ATM put and OTM call (increasing both strike prices). In contractionary economies, rising unemployment claims would cause a shift of the strike prices in the opposite direction.

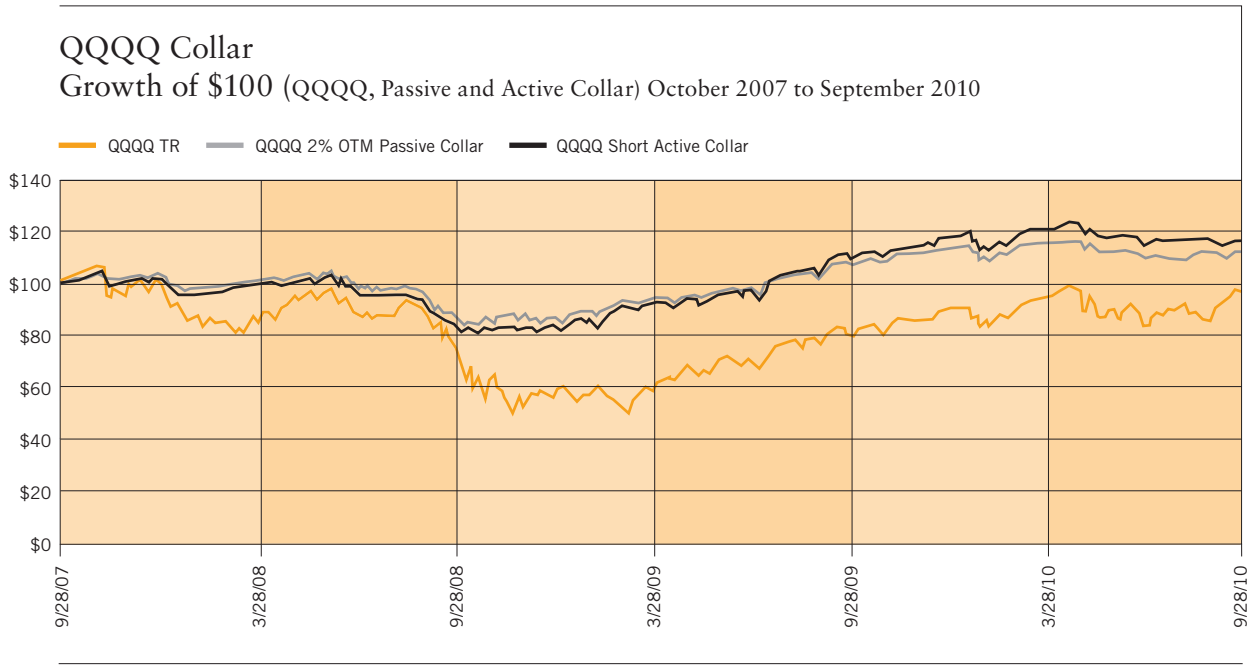



Figure 3.

Exhibit 2.

QQQQ Collar – Sub-Period Results of QQQQ, Passive and Active Collar Strategies*

| | 4/1999 to 9/2002 | | |
|---|---|---|---|
| | QQQQ TR | QQQQ TR PASSIVE COLLAR | QQQQ TR ACTIVE COLLAR |
| Annualized Return | -23.31% | 21.59% | 26.88% |
| Annualized Standard Deviation | 42.44% | 13.63% | 14.05% |
| Sharpe Ratio | -0.65 | 1.28 | 1.62 |
| Maximum Drawdown | -81.08% | -7.54% | -7.48% |
| Correlation with QQQQ | 1.00 | 0.26 | 0.35 |
| Min Monthly Return | -26.21% | -7.54% | -7.48% |
| Max Monthly Return | 23.48% | 15.06% | 16.38% |
| Number of Months | 42 | 42 | 42 |
| % Up Months | 40% | 74% | 74% |
| % Down Months | 60% | 26% | 26% |

* QQQQ TR FUND ONLY - No Options; QQQQ TR PASSIVE COLLAR - 2% OTM 1 Mo Call & 2% OTM 6 Mo Put; QQQQ TR Short ACTIVE COLLAR - 1 Mo Call & 6 Mo Put.

moneyness of the puts and calls is set to 3% OTM and 2% OTM, respectively. From this initial point, the momentum signal will widen or tighten the collar by increasing or decreasing the OTM amount. The macroeconomic signal will shift the collar up by increasing the OTM amount of the calls and decreasing the OTM amount of the puts, or shift the collar down by moving the strike prices in the opposite direction. The volatility signal will determine whether the ratio of the call write will be neutral, overwritten or underwritten.

Exhibit 1 provides statistics covering the overall period. The active collar outperformed both the QQQQ and the passive collar. While the volatility was slightly higher for the active collar than for the passive collar, annual returns of the active exceeded those of the passive by almost three percentage points. On the other hand, maximum drawdown and minimum monthly returns were slightly higher for the active collar.

Results for the three sub-periods are shown in Exhibit 2. In the first sub-period covering the technology bubble, the active collar significantly outperformed the passive collar generating almost one quarter higher annualized return with very similar standard deviations. In the second sub-period, the active collar mitigated the underperformance of the passive strategy. Annualized returns improved from 5.2% to 7.7%, while volatility was slightly reduced. While the improvements of the active strategy were certainly appealing in the favorable period, they were even more appealing in this sub-period in which both collars underperformed the QQQQ. During the financial crisis sub-period the active strategy again outperformed the passive strategy and significantly outperformed the QQQQ. Annualized returns of the active strategy versus passive collars were increased from 3.8% to 5.2% with standard deviations only somewhat higher. Again the active collar still provided protection from the annualized 1% QQQQ loss.

| 10/2002 to 9/2007 | | | 10/2007 to 9/2010 | | |
|---|---|---|---|---|---|
| QQQQ TR | QQQQ TR PASSIVE COLLAR | QQQQ TR ACTIVE COLLAR | QQQQ TR | QQQQ TR PASSIVE COLLAR | QQQQ TR ACTIVE COLLAR |
| 20.37% | 5.19% | 7.71% | -1.03% | 3.84% | 5.19% |
| 17.54% | 7.93% | 7.73% | 26.56% | 10.21% | 12.20% |
| 1.00 | 0.30 | 0.63 | -0.07 | 0.30 | 0.36 |
| -12.36% | -14.02% | -10.49% | -49.74% | -17.58% | -21.50% |
| 1.00 | 0.67 | 0.69 | 1.00 | 0.63 | 0.67 |
| -12.09% | -5.49% | -5.57% | -15.58% | -9.75% | -10.21% |
| 18.48% | 5.60% | 6.19% | 13.17% | 4.90% | 6.28% |
| 60 | 60 | 60 | 36 | 36 | 36 |
| 62% | 57% | 63% | 58% | 67% | 64% |
| 38% | 43% | 37% | 42% | 33% | 36% |

Exhibit 3.

Results of QQQQ (Passive and Active Collar Strategies), June 2009 to September 2010

| Monthly Data: June 1, 2009 to September 30, 2010 | QQQQ TR | QQQQ TR PASSIVE COLLAR | QQQQ TR ACTIVE COLLAR |
|---|---|---|---|
| Annualized Return | 28.70% | 11.38% | 16.08% |
| Annualized Standard Deviation | 21.51% | 8.64% | 10.34% |
| Sharpe Ratio | 1.33 | 1.30 | 1.54 |
| Maximum Drawdown | -13.09% | -5.18% | -5.50% |
| Correlation with QQQQ | 1.00 | 0.60 | 0.68 |
| Min Monthly Return | -7.39% | -3.81% | -4.05% |
| Max Monthly Return | 13.17% | 4.90% | 6.28% |
| Number of Months | 16 | 16 | 16 |
| % Up Months | 69% | 63% | 69% |
| % Down Months | 31% | 38% | 31% |

* QQQQ TR FUND ONLY - No Options; QQQQ TR PASSIVE COLLAR - 2% OTM 1 Mo Call & 2% OTM 6 Mo Put; QQQQ TR Short ACTIVE COLLAR - 1 Mo Call & 6 Mo Put.

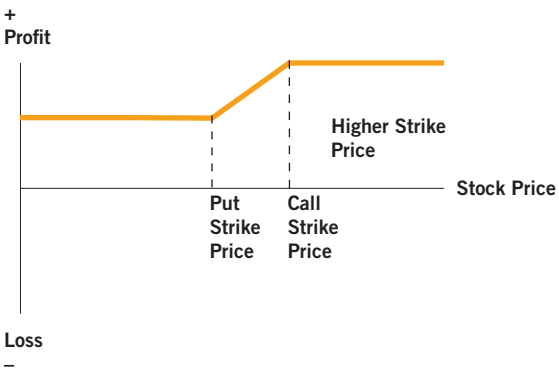
## Conclusion

The study analyzed the performance of various passive and active implementations of the collar strategy on the QQQQ ETF. The eleven-year time horizon since the introduction of the QQQQ options provided a variety of market conditions in which to test the performance characteristics of collar strategies. The collar underperformed the QQQQ in the strong market climb of October 2002 to September 2007. In the period from June 2009 through the end of September 2010 the collar was expected to perform poorly relative to the surging recovery for the NASDAQ 100. If one could accurately pick the market bottom during the financial crisis, the data shows that a naked long QQQQ position would have yielded a return of 28.7% versus an annualized return of 11.4% for the passive collar. However, the collar carried less than half the risk (8.6% standard deviation for the passive collar versus 21.5% for the QQQQ). The return of the active collar implementation was almost 2/3 of the return of the long QQQQ portfolio, gaining 16% annually but with less than 1/2 the risk (10.3% standard deviation for the active collar versus 21.5% for the QQQQ). However, over the entire 138-month period and in the sub-periods around the technology bubble and financial crisis, the collar strategies significantly outperformed a buy-and-hold strategy and provided much needed capital protection.

# Collar Strategy

A collar can be established by holding shares of an underlying security, purchasing a protective put and writing a covered call on that security. The underlying security may be a stock, an exchange-traded fund, a basket of stocks or an index. For the purpose of this example, the underlying will be referred to as stock. Generally, the put and the call are both out-of-the-money when this combination is established, and have the same expiration month. But collars can also be implemented with puts and calls of varied intrinsic value and time to maturity. Both the buy and the sell sides of this combination are opening transactions, and are normally the same number of contracts. In other words, one collar equals one long put and one written call along with owning 100 shares of the underlying stock. The primary concern in employing a collar is protection of profits accrued from underlying shares rather than increasing returns on the upside.

Collar




Graph assumes accrued stock profit when establishing combination

## Market Opinion

Neutral, following a period of appreciation.

## When to Use

An investor will employ this strategy after accruing unrealized profits from the underlying shares, and wants to protect these gains with the purchase of a protective put. At the same time, the investor is willing to sell his stock at a price higher than the current market price so an out-of-the money call contract is written, covered in this case by the underlying stock.

## Benefit

This strategy offers the stock protection of a put. However, in return for accepting a limited upside profit potential on his underlying shares (to the call's strike price), the investor writes a call contract. Because the premium received from writing the call can offset the cost of the put, the investor is obtaining downside put protection at a smaller net cost than the cost of the put alone. In some cases, depending on the strike prices and the expiration month chosen, the premium received from writing the call will be more than the cost of the put. In other words, the combination can sometimes be established for a net credit; the investor receives cash for establishing the position. The investor keeps the cash credit, regardless of the price of the underlying stock when the options expire. Until the investor either exercises his put and sells the underlying stock, or is assigned an exercise notice on the written call and is obligated to sell his stock, all rights of stock ownership are retained.

## Risk vs. Reward

This example assumes an accrued profit from the investor's underlying shares at the time the call and put positions are established, and that this unrealized profit is being protected on the downside by the long put. Therefore, discussion of maximum loss does not apply. Rather, in evaluating profit and/or loss below, bear in mind the underlying stock's purchase price (or cost basis). Compare that to the net price received at expiration on the downside from exercising the put and selling the underlying shares, or the net sale price of the stock on the upside if assigned on the written call option. This example also assumes that when the combined position is established, both the written call and purchased put are out-of-the-money.

If the underlying stock price is between the strike prices of the call and put when the options expire, both options will generally expire with no value. In this case, the investor will lose the entire net premium paid, or keep the entire net cash credit received when establishing the combination. Balance either result with the underlying stock profits accrued when the combination was established.

**NET UPSIDE STOCK SALE PRICE IF ASSIGNED ON THE WRITTEN CALL**

Call's Strike Price plus Net Credit Received for Combination
or
Call's Strike Price minus Net Debit Paid for Combination

**NET DOWNSIDE STOCK SALE PRICE IF EXERCISING THE LONG PUT**

Put's Strike Price plus Net Credit Received for Combination
or
Put's Strike Price minus Net Debit Paid for Combination

Risk vs. Reward.

## Break-Even Point (BEP) at Expiration

In this example, the investor is protecting his accrued profits from the underlying stock with a sale price for the shares guaranteed at the long put's strike price. In this case, consideration of break-even point does not apply.

## Time Decay

**Passage of Time:** Positive Effect

The effect of time decay on this strategy varies with the underlying stock's price level in relation to the strike prices of the long and short options. If the stock price is midway between the strike prices, the effect can be minimal. If the stock price is closer to the lower strike price of the long put, losses generally increase at a faster rate as time passes. Alternatively, if the underlying stock price is closer to the higher strike price of the written call, profits generally increase at a faster rate as time passes.

## Alternatives Before Expiration

The combination may be closed out as a unit just as it was established as a unit. To do this, the investor enters a combination order to buy a call with the same contract terms and sell a put with the same contract terms, paying a net debit or receiving a net cash credit as determined by current option prices in the marketplace.

## Alternatives at Expiration

If the underlying stock price is between the put and call strike prices when the options expire, the options will generally expire with no value. The investor will retain ownership of the underlying shares and can either sell them or hedge them again with new option contracts. If the stock price is below the put's strike price as the options expire, the put will be in-the-money and have value. The investor can elect to either sell the put before the close of the market on the option's last trading day and receive cash, or exercise the put and sell the underlying shares at the put's strike price. Alternatively, if the stock price is above the call's strike price as the options expire, the short call will be in-the-money and the investor can expect assignment to sell the underlying shares at the strike price. Or, if retaining ownership of the shares is now desired, the investor can close out the short call position by purchasing a call with the same contract terms before the close of trading.

For more information on OIC or the collar strategy, or for a copy of the full study, contact The Options Industry Council at options@theocc.com or visit www.OptionsEducation.org

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In order to simplify the calculations used in the examples in these materials, commissions, fees, margin, interest and taxes have not been included. These costs will impact the outcome of any stock and options transactions and must be considered prior to entering into any transactions. Investors should consult their tax advisor about any potential tax consequences.

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