

# Collar Strategy for Fund Managers

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Collaring the Cube:  
Protection Options for a  
QQQ ETF Portfolio

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The Options Industry Council (OIC) was created as an industry cooperative to increase the awareness, knowledge and responsible use of exchange-listed options among retail investors, their financial advisors and institutional investors. Options are a versatile but complex product, and that is why OIC hosts options seminars, webcasts and podcasts, distributes software and literature, and maintains a web site and Help Desk - all focused on options education.

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PowerShares QQQ™ (Symbol: QQQQ) is the most actively traded equity security in the world<sup>1</sup>. It seeks to replicate the NASDAQ-100 Index®, which includes 100 of the largest, most innovative non-financial companies that trade on the NASDAQ Stock Market®.

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PowerShares QQQ™ is rebalanced quarterly and reconstituted annually. As of Dec. 31, 2007, the fund's average market capitalization was about \$87 billion.

<sup>1</sup> As of 12.31.06, as measured by the average daily share trading volume.

A Summary of

# Collaring the Cube: Protection Options for a QQQ ETF Portfolio

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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 study of the performance of a collar strategy on the Powershares QQQ<sup>TM</sup> exchange-traded fund (ETF). The study was conducted by The Isenberg School of Management's Center for International Securities and Derivatives Markets (CISDM) at the University of Massachusetts. CISDM is a non-profit research and education center and is considered one of the leading academic centers in the area of alternative investment research. Research support for this study was provided by OIC. Research results, however, represent those of the authors and do not necessarily represent the views of OIC.

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Evaluating nine years of data on the Powershares QQQ exchange traded fund (Ticker: QQQQ), a study by Szado and Kazemi of the University of Massachusetts, found that a protective collar strategy using a six month put purchase and consecutive one month call writes provided far superior returns compared with buying and holding the NASDAQ-100 Index<sup>®</sup> ETF with about one-third of the index volatility. Over the 108 month study period, this collar strategy returned more than 150% cumulatively, while the cube portfolio lost over 12%. The study assessed the effectiveness of this passive collar strategy from March 1999 to March 2008. The analysis considered a number of strategy implementations with varied moneyness of the puts and calls as well as

the time to maturity. In addition, the collar's performance was analyzed over two sub-periods; one favorable and the other unfavorable.

The protective collar significantly outperformed the QQQ in the overall period, as well as in the favorable period. While the collar under performed the QQQ in the unfavorable period, all of the implementations in all time periods exhibited lower risk than the buy and hold QQQ strategy. In fact, Szado and Kazemi found the magnitude of the risk reduction of the collar quite impressive. The study indicated that the collar iteration utilizing six month put purchases outperformed the one month and three month put strategies on almost all measures and all time segments. The slower decay of the longer maturity six month put was a

## Growth of the QQQ

6-Month ATM Puts and 1-Month ATM Calls

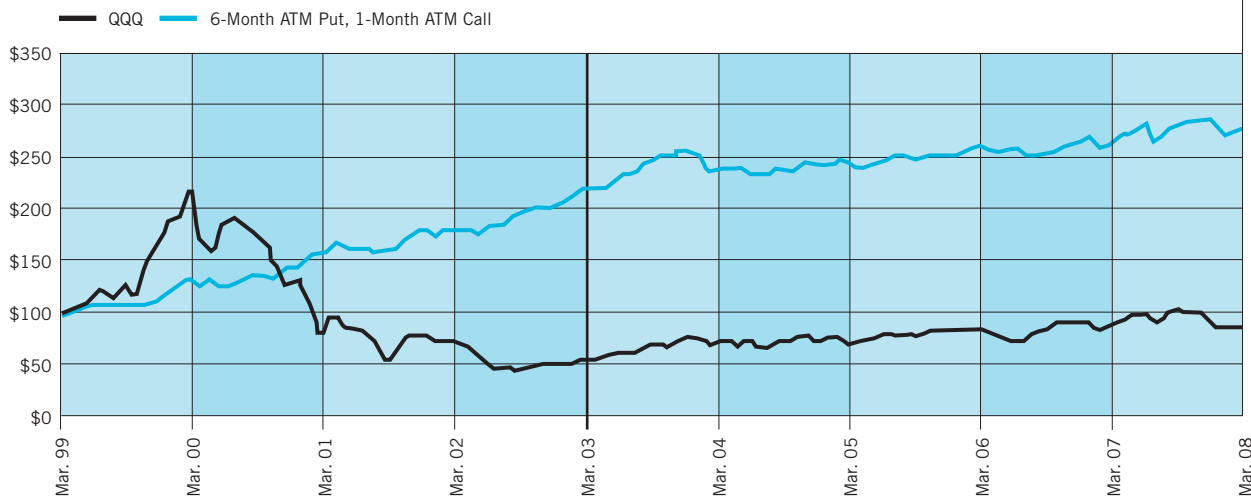


Figure 1.

great benefit to this collar strategy. Therefore, the summary will focus on only the six month put strategy. Comparative analysis including all time segments can be found in the complete study.

Downside market protection is a central focus of a myriad of trading strategies. In addition to collar strategies, investors may implement protective strategies by utilizing equity indexed annuities, applying methodologies like portfolio insurance, and investing in vehicles with limited market exposure such as hedge funds or short bias/bear ETFs. There are several reasons to choose a collar strategy from the wide range of protective strategies available, not the least of which are the strategy's transparency, flexibility, near elimination of counterparty risk and the ease of marking to market the collar's highly liquid and exchange-traded positions.

From a return perspective, the ideal situation for this collar is for the underlying to gradually increase over the life of the call, ending at the short call's strike price at expiration. However, when compared to the returns of a long position in the underlying index, the collar strategy has

the highest relative advantage when the market experiences a strong downward trend and has the highest relative disadvantage during sustained strong upward trends. Ultimately, the relative risk of the collar strategy (as opposed to holding the underlying) is opportunity cost. This is a fundamental risk of hedging. The risk is that the underlying performs extremely well and some of the potential returns are lost on the short call position (which is written to fund the purchase of the put's downside protection). Likewise, the ultimate relative benefit is the protection provided by any typical insurance contract or hedge. That is, in the case of a sharp downward move, losses are largely eliminated by the put.

As illustrated in Figure 1, the two time periods had considerably different market dynamics. The first period, from March 1999 to March 2003, exhibited extremely high volatility of 40.99%, while the second period, April 2003 to March 2008, exhibited a more moderate but still relatively high 16.51% volatility. The early period had favorable market conditions from a relative return perspective. The period beginning April 2003 was the

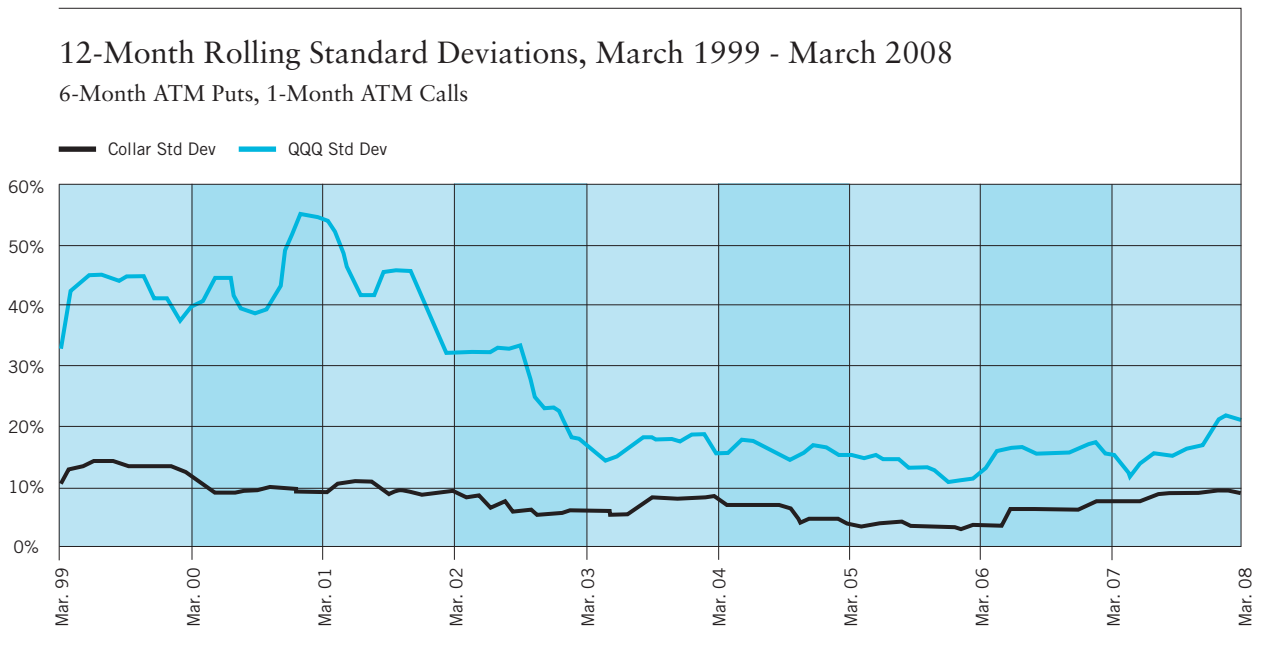


Figure 2.

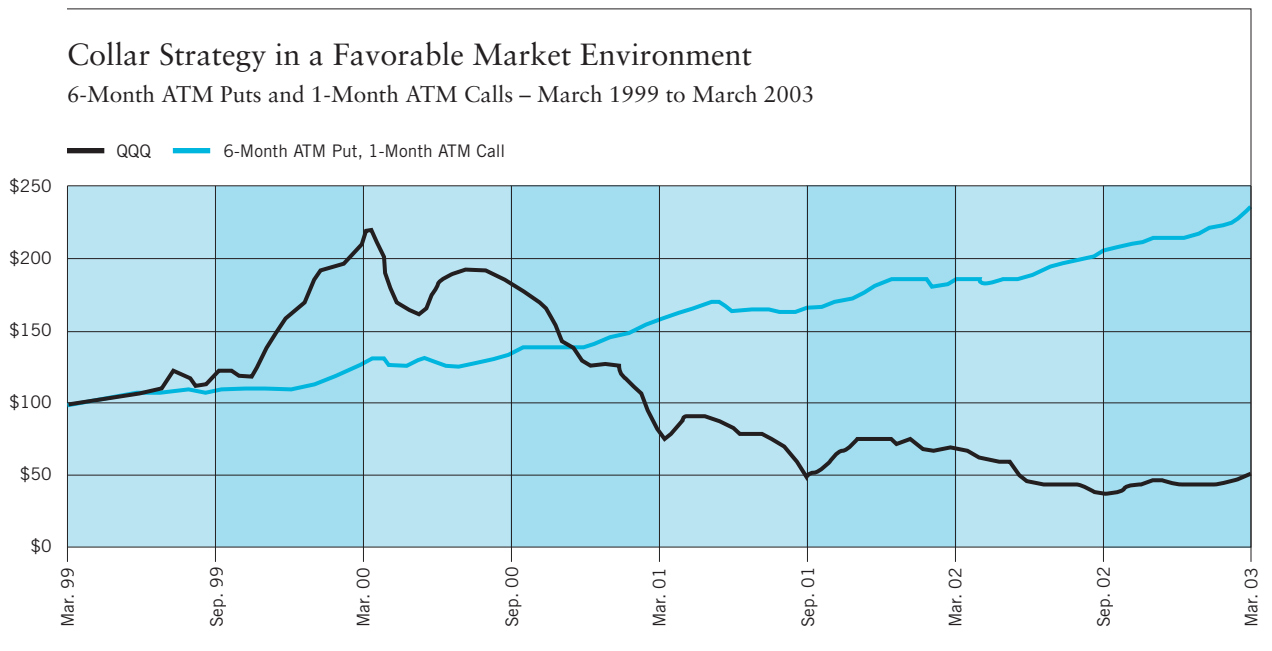


Figure 3.

least favorable market characterized by comparatively stable, upward trending price movements.

Exhibit 1 displays the unequivocal effectiveness of the collar as a protection strategy. Over the 108 months, the underlying QQQ showed a loss of more than 10% for a negative annualized return of 1.69% with 29.93% volatility as measured by the annualized standard deviation of returns. In contrast, the annualized returns of the six month put collar strategy showed a gain of more than 12% at less than one-third of the QQQ volatility.

Figure 2 illustrates the dramatic volatility reduction of the six month at-the-money put/one month at-the-money call collar by comparing the 12-month rolling annualized standard deviations of the collar to that of the QQQ. The ability to drastically reduce return volatility is perhaps the most remarkable characteristic of this collar.

The impressive downside protection of the collar was clearly evident in the risk and return statistics provided in Figure 3 and sub-period beginning in March 1999 in Exhibit 2. The annualized returns of the collar strategies were a positive 23.01%, while the QQQ returned an annualized loss of more than 14.66%. Not only did implementing a collar greatly improve the returns, the statistical measures also clearly indicate the collar broadly reduced the risk of the underlying security. QQQ volatility was 40.99%, while the collar strategy cut volatility by 75% to below 10%. Similarly, the lowest monthly return for the QQQ was -25.45%, while the collar showed only a 5% loss. As in the full period, the difference in the maximum drawdown of the QQQ and the collar was particularly striking. The QQQ's maximum drawdown showed a loss of 80.44% while the drawdown of the collar was only one-tenth of this loss. The collar was able to reduce a potential 80% loss of capital to a mere 5% loss.

In the later period, the annualized return of the QQQ was 10.09%, exceeding the returns of all the collar implementations, which ranged between 4 and 5.3%. However, the collar strategy exhibited much lower risk. The annualized standard deviation for the QQQ was 16.51%, while for

the collar implementations it was more than 50% lower at 6.9%. The QQQ's lowest monthly return was a -12.45% while the collar minimum return was considerably better at -5.81%. Similarly, the drawdown of the QQQ was -17.71%, while the collar drawdowns were 50% lower at -8.42%. Even in the unfavorable period where the collar exhibited lower returns than the long QQQ, it did so at a much lower risk level.

The most notable component of the return was the long QQQ position. However, the collar benefited both from the put protection and from the short call position. In fact, when considering the entire period, the short call position earned a greater return on average than the put position. The generally positive returns of the short call position suggest that the collar strategies should typically outperform a simple protective put strategy in this market environment. The variance reduction of the collar benefited from both the call write and put purchase, reducing the impact of large moves on the underlying. The study also showed that transaction costs had limited impact on the performance of the strategies particularly for the six month put iteration which required a put purchase only twice a year.

## Conclusion

The results of this analysis confirm the effectiveness of the collar as a protective strategy. From a return or risk-adjusted return perspective, performance in the overall period and the favorable period was far better than holding the underlying alone. Not surprisingly, in the unfavorable period, the collar under performed the underlying. However, it did so at a significantly lower risk level. The results of the return decomposition suggest that the collar performed far better than a pure protective put strategy and suggest that transaction costs were not an overly significant consideration in the implementation of the six month put strategy. As a final note, while this study focuses on strictly passive implementations of collars, a recent article in *Futures and Options Trader* suggests additional risk-adjusted gains are possible through active management of collars.

Exhibit 1.

Full Period (3/1999 to 3/2008)

6-Month Puts, 1-Month Calls	QQQ	ATM Calls		
		5% OTM Puts	2% OTM Puts	ATM Puts
Annualized Return	-1.69%	12.80%	12.14%	12.11%
Annual Standard Deviation	29.93%	8.89%	8.71%	8.63%
Mean Monthly Return	0.24%	1.04%	0.99%	0.99%
Median Monthly Return	0.30%	1.37%	1.30%	1.32%
Monthly Standard Deviation	8.64%	2.57%	2.51%	2.49%
Skewness	-0.308	-0.688	-0.626	-0.602
Excess Kurtosis	1.542	0.237	0.270	0.251
Minimum Monthly Return	-25.45%	-5.95%	-5.81%	-5.81%
Maximum Monthly Return	26.57%	6.02%	6.02%	6.02%
Maximum Drawdown	-80.44%	-8.59%	-8.42%	-8.42%
Annual Sharpe Ratio	-0.180	1.025	0.970	0.976
Monthly Stulzer Index	0.028	0.280	0.268	0.269
CAPM Beta	1.000	0.092	0.062	0.052
Leland Beta	1.000	0.091	0.062	0.052
Monthly Leland Alpha	0.00%	0.74%	0.69%	0.69%
Jarque-Bera Statistic	12.416	8.765	7.373	6.817
Probability Normal	0.20%	1.25%	2.51%	3.31%

Exhibit 2.

6-Month Put, 1-Month Call Statistics – Full and Sub-Periods

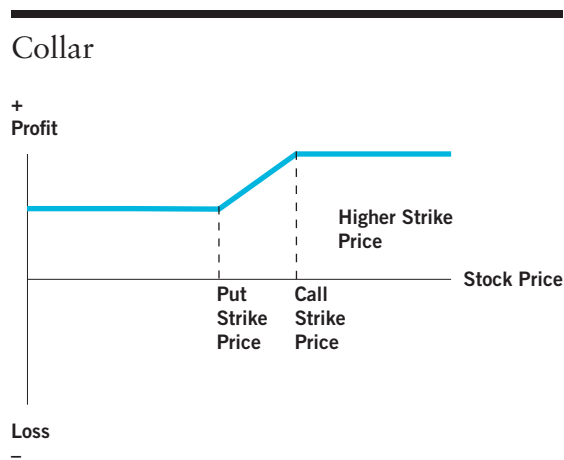
6-Month Puts, 1-Month Calls	Full Period 3/99 to 3/2008		3/1999 to 3/2003		4/2003 to 3/2008	
	ATM Calls		ATM Calls		ATM Calls	
	QQQ	ATM Puts	QQQ	ATM Puts	QQQ	ATM Puts
Annualized Return	-1.69%	12.11%	-14.66%	23.01%	10.09%	4.10%
Annual Standard Deviation	29.93%	8.63%	40.99%	9.79%	16.51%	6.90%
Mean Monthly Return	0.24%	0.99%	-0.61%	1.78%	0.92%	0.35%
Median Monthly Return	0.30%	1.32%	-0.65%	2.35%	0.57%	0.91%
Monthly Standard Deviation	8.64%	2.49%	11.83%	2.83%	4.77%	1.99%
Skewness	-0.308	-0.602	-0.080	-0.906	-0.151	-1.135
Excess Kurtosis	1.542	0.251	-0.154	0.138	-0.042	1.356
Minimum Monthly Return	-25.45%	-5.81%	-25.45%	-5.00%	-12.45%	-5.81%
Maximum Monthly Return	26.57%	8.02%	26.57%	6.02%	10.94%	4.25%
Maximum Drawdown	-80.44%	-8.42%	-80.44%	-5.00%	-17.71%	-8.42%
Annual Sharpe Ratio	-0.180	0.976	-0.458	1.927	0.409	0.110
Monthly Stulzer Index	0.028	0.269	-0.081	0.472	0.135	0.040
CAPM Beta	1.000	0.052	1.000	0.030	1.000	0.207
Leland Beta	1.000	0.052	1.000	0.031	1.000	0.226
Monthly Leland Alpha	0.00%	0.69%	0.00%	1.47%	0.00%	-0.06%

# Collar Strategy

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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.

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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

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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 1-888-OPTIONS or visit [www.optionseducation.org/institutional](http://www.optionseducation.org/institutional).

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