Using NDX Option Strategies to Improve Risk-Adjusted Returns

Abstract

Today's investors are fully aware of the perils of downside stock market risk. There is also a concern for their need to have enough money to retire which has led to advisory discussions on ways to participate in market gains while mitigating principal drawdowns. In the past 20 years there have been a number of studies demonstrating that simple buy-write and put-write index options strategies can be effective in achieving these goals. These same options strategies may also improve Sharpe ratios markedly in volatile markets. The growing availability of exchange-traded funds (ETFs), notes and managed products have enabled advisors and investors to take advantage of these findings. These products have been most commonly associated with the S&P 500 Index.

This study demonstrates that risk-adjusted returns of such strategies have potential to achieve higher returns and better Sharpe ratios using NDX options based on the Nasdaq-100 Index rather than SPX options based on the S&P 500 Index. We demonstrate how and why buy-write can be expected to improve risk-adjusted returns in normal market-slope environments. We further explain and evidence why the improvement has the potential to be even greater using NDX options.

Financial advisors want to be aware of a number of considerations before applying such strategies to help their clients. The reason buy-write strategies tend to deliver better risk-adjusted returns with lower drawdowns than long-only index strategies is the index options premium which demonstrates the volatility implied by index options tends to be consistently greater than actualized volatility. There is a growing awareness that this is true of SPX options. We show that it tends to be even truer of NDX options. Coupled with the fact that the NDX returns have exceeded S&P 500 returns in most multi-year time periods since inception, the potential exists to provide portfolios with superior

returns and significantly more income while lowering price volatility and limiting drawdowns.

Advisors are all too aware that stock market timing strategies utilizing knowledge of historical trends can be beneficial if the timing works out, but it can also result in underperformance. What is less well-known but has been the subject of some academic research is that conservative timing strategies on when to write more covered or fewer covered index calls have been shown to improve returns per unit of volatility. Again, both goals are better expected risk-adjusted returns and lower volatilities.

The strategies we will demonstrate have the potential to provide even better such ratios by using Nasdaq-100 stocks and NDX options with timing rules. Since the Nasdaq-100 has more exposure to technology stocks and the sector has shown particularly pronounced sensitivity to price momentum trends, we will demonstrate a strategy using this information to further increase expected benefits. All of this will be explained within the context that no strategies work in all market conditions so advisors need to be aware what environments are most and least beneficial to implementing these strategies. We also expand our explanation of the strategies to ensure that liquidity considerations are fully addressed.

Using Options for Risk Mitigation

Major media articles lead many investors to believe that options are always riskier investments than stocks however this is not true. In the context of an investment portfolio, it is only true if options are purchased or sold for speculation. Taking a “naked bet” with a belief that a stock or an index will be going up and down within a few weeks would be an example of speculation.

When used properly options can in many ways reduce overall portfolio risk. An example of this is a buy-write strategy, a conservative management strategy that has been used in bank trust departments for decades. Buy-write strategies generally reduce an equity portfolio’s net exposure to the market by exchanging some of the portfolio’s upside for income by selling covered calls. The writing (or selling) of the call option provides extra income for an investor who is willing to forgo some upside potential. While the buy-write does not prevent portfolio drawdowns, the money collected from selling calls provides income to mitigate losses. From a risk measurement perspective, a buy-write portfolio tends to reduce the portfolio’s Beta, its exposure to market movements. Therefore, buy-write portfolios are more conservative than their long-only strategy counterparts.

Some options-based portfolio managers have explained at client seminars that a long-term goal of the buy-write strategy is to achieve "stock-like" returns and lower "bond-like" volatility. In fact, some managers compare buy-write strategies to asset allocation strategies that allocate 60% to a stock index and 40% in a bond index.

Another way to limit portfolio drawdowns is to buy put options. Put options grant their owners the right to sell shares of stock at the strike price. Although puts do not necessarily provide 100 percent protection, they can reduce loss. It's similar to buying an insurance policy with a deductible. Unlike shorting stocks, where losses can be unlimited, with puts the most you can lose is what you paid for it. This conservative strategy can be especially useful in taxable portfolios for stocks that are especially vulnerable in the near-term environment, but the manager does not want to sell the stock and realize a capital gain. Accordingly, protective puts are often described as a form of insurance. The downside is that single-stock puts can be overvalued in risk-

averse market environments. Even skilled options traders can fall into this trap. Protective puts are generally more used in the tax-sensitive situation rather than being used to hedge the risk of the entire portfolio.

Index options, on stock market indexes such as the S&P 500, were introduced in the early 1980s. Since then, options have been created on many US indexes. Studies have shown that implied index volatility tends to consistently overestimate realized index volatility over time. Additionally, index options tend to be vastly more liquid than individual stock options allowing managers to minimize frictional costs in strategy execution.

The same studies also clearly show that during multi-year periods that provides income and offsets drawdowns to an extent but also can provide superior returns. The table below provides two 10-year periods of comparison between investing long-only in the S&P 500 Index and investing in the most widely used buy-write index, the Cboe S&P 500 BuyWrite Index (BXM). The BXM holds the same portfolio but hedges risk and generates income by writing monthly covered calls. The top half of this table illustrates the benefits of a buy-write strategy during a 10-year period with cyclical behavior punctuated by two large downturns, specifically January 1, 1999 and December 31, 2008. The hedged strategy worked very well, providing higher absolute returns for the period with much lower volatility. The Sharpe ratio provides a measure of risk-adjusted returns – the higher the ratio, the better the risk-adjusted return. In this case, the Sharpe ratio for the hedged portfolio was not only higher than the Sharpe ratio for the long-only S&P 500 but it was positive for the former and negative for the latter.

In the following 10-year period, the S&P 500 Index endured no major corrections. During this period the amount of upside on the stock portfolio given up by selling the call options was greater than the income received. So during this bull market period, the trade-off of stock market exposure for income still lowered volatility but the compensation for accepting less participation in the upside was inadequate as measured by the Sharpe ratio. The bottom half of the table shows the same comparison for January 1, 2009 through December 31, 2018.

	S& P 500 TR	BXM
	1999-2008	1999-2008
Annualized Return	-1.38%	2.20%
Standard Deviation	15.04	11.61
Sharpe Ratio	-0.09	0.19
	2009-2018	**2009-2018**
Annualized Return	13.12%	7.96%
Standard Deviation	13.61	9.42
Sharpe Ratio	0.96	0.85

Advance knowledge of market volatility and direction would be very helpful in knowing whether to hedge equity portfolio exposure at all, and if so, how much of it to hedge. There are timing strategies we will examine that experts have studied that attempt to provide signals on the best times to hedge or remove the hedge and go long-only. First, however, we address the question of the best index instruments to use for strategy implementation.

Inside the Nasdaq-100 Index

The S&P 500 is one of many stock market indexes used for US stock market exposure. Many stock market indexes serve as the underlying portfolio composition for investible products such as index options and ETFs. Two of the more popular alternatives are the Nasdaq-100 Index and the Russell 2000 Index. It is important to understand the differences between the indexes themselves to gain insights as to how these enhancement strategies work.

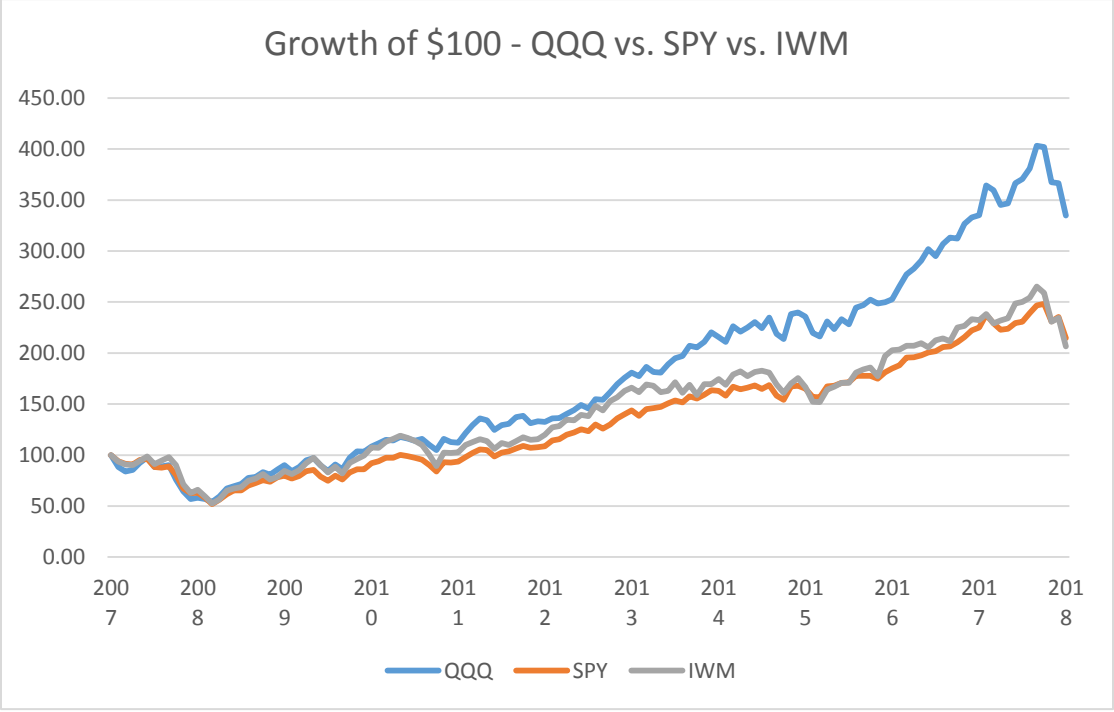
The Nasdaq-100 Index includes 100 of the largest non-financial companies listed on The Nasdaq stock exchange, based on market capitalization. It does not contain securities of financial companies including investment companies. The index is rules-based. There is no selection committee that makes recommendations and decisions based upon potential candidates unlike the S&P 500 Index.

The Russell 2000 Index is a rules-based measure of the small-cap segment of the US stock market. At a specified selection date, it ranks the top 3,000 US stocks by market capitalization, and then excludes the top 1,000. As a result, the index includes stocks ranked from 1,001 to 3,000 which the providers define as the US Small Cap universe.

The differences in construction methodologies lead directly to differences in sector and industry exposures. The Nasdaq-100 is more heavily allocated towards three industries: Technology, Consumer Services, and Health Care than the other two indexes. The growth of companies in these industries has been well above average in recent years. Unsurprisingly, the Nasdaq-100 has provided superior returns as compared with the S&P 500 and Russell 2000. Both the S&P 500 and Russell 2000 include sectors such as Banks, Transportation and Utilities which have been lagging in the past 11 years.

Today most financial advisors increasingly garner equity exposures through ETFs. In order to best reflect realizable performance, we use the largest corresponding ETFs rather than the indexes themselves as follows:

QQQ for the Nasdaq-100; SPY for the S&P 500; IWM for the Russell 2000.



An initial $100 investment on December 31, 2007 in QQQ grew to $334.76 for the period. The corresponding dollar values for SPY and IWM were $214.71 and $206.49, respectively.

The following table shows the cumulative results for the period on a risk adjusted basis. It is readily seen that for QQQ, the annualized return (also known as Compound Annual Growth Rate) for the 11-year period was more than double that of the other two ETFs.

	QQQ	SPY	IWM
Annualized Return	11.61%	7.19%	6.81%
Standard Deviation	17.91	14.99	19.60
Sharpe Ratio	0.65	0.48	0.35
Correlation to QQQ	1.000	0.915	0.815

Although QQQ experienced somewhat more price volatility than SPY, the Sharpe Ratio metric of risk-adjusted returns clearly shows the compensation was more than adequate with a Sharpe Ratio of 0.65 as compared with 0.48. On the other hand, the slight bump in return IWM had in comparison with SPY was not justified by its much larger standard deviation as demonstrated by its Sharpe Ratio of just 0.35.

Strategies to Improve Risk Adjusted Returns and Income Streams Using Nasdaq-100 Portfolio Products and NDX options

Given the superiority of returns, the obvious next step is to examine a buy-write strategy using the Nasdaq-100 ETF in conjunction with NDX index options. Many American investors seeking to implement such a strategy may find an advantage to using index options over ETF options and stock options. Stock and ETF option trading profits are taxed at normal short-term rates. However, index options have preferential tax treatment under Section 1256 of the tax code (i.e., 60% of trading profits are taxed at the lower long-term capital gains rate, and 40% are taxed at the short-term rate). Since situations may differ please consult your tax advisor for more information.

NDX options are often compared with the most-traded index option which is the SPX based upon the S&P 500 Index. Structurally, they are identical other than representing

different underlying indexes. Both NDX and SPX are European-style and cash-settled options that expire the third Friday of the expiration month.

From a trading perspective, however, these differences may be considerable. Many traders regularly sell index options to capture the systematic tendency for implied volatility to exceed realized volatility which is often referred to as the index options premium. The greater the difference between the implied and realized volatilities, the greater the profit. This factor leads to increased potential for gain in favoring NDX options in such strategies over SPX options. The Nasdaq-100 Index has more price volatility than the S&P 500. The greater the volatility, the greater the expected index options premium.

Most investors will find that NDX options have ample liquidity to meet their needs. During the 11-year period measured in this study, the 2% out-of-the-money call options traded very efficiently every month. Of the total number of options during the 11-year period that needed to be rolled, more than 80% were executed within 1% of the midpoint between the bid and the ask. The remaining (23 options during the 11-year period) were all traded within 2% of the midpoint. Trades made within three days of execution had similar results with nearly 85% being made within 1.5% of the midpoint between bid and ask. We conclude that execution of the buy-write strategy using 2% out of the money NDX options do not incur significant slippage costs.

Now let us examine a strategy holding the Nasdaq-100 ETF and writing 2% out-of-the-money NDX calls against the long portfolio. The comparison will be holding the SPY ETF and writing 2% out-of-the-money SPX options. In both cases, the strategies will automatically roll on the next market day following the options expiration Friday every month during the same 11-year period. The buy-write strategy for the NDX strategy covered 50% of the value of the portfolio with call contracts that were approximately 2%-out-of-the-money. The selection criteria also took into account the liquidity of contracts offered on the next market day after expiry. Geometric averaging techniques were employed to calculate monthly and annualized returns to be consistent with investment performance calculations used by the industry.

The table showing the annualized returns, standard deviations and Sharpe ratios provides interesting insights. In a predominantly bull market period, both buy-write strategies produced somewhat lower annualized returns. On the plus side, they also produced lower standard deviations. In fact on a risk-adjusted basis as measured by Sharpe ratios, the Buy-Write Strategy using the NDX options actually scored highest at 0.69 as compared with 0.65. The SPX-enhanced strategy did not fare as well with its Sharpe ratio of 0.46 just a tad lower than 0.48 for SPY.

	QQQ	NDX-2% OTM	SPY	SPX-2% OTM
Annualized Return	11.61%	10.45%	7.19%	6.04%
Standard Deviation	17.91	15.06	14.99	13.03
Sharpe Ratio	0.65	0.69	0.48	0.46

The year-by-year total return chart below gives a clearer picture as to what is actually going on. In 5 of the 11 years, the 2% out-of-the-money hedge improved total returns. In the other 6 years, there was a net cost to the hedge. This is especially true of the six-year unbroken bull market in technology from 2012 through 2017. As a rule during the period, however, it was better to stay unhedged in double-digit return years.

Year-By-Year Total Returns

Year	QQQ	NDX-2% OTM	SPY	SPX 2% OTM
2008	-41.73%	-35.37%	-36.81%	-31.23%
2009	54.68%	52.71%	26.36%	32.07%
2010	20.14%	13.10%	15.06%	9.82%
2011	3.47%	-0.11%	1.89%	7.20%
2012	18.12%	15.19%	15.99%	10.24%
2013	36.63%	29.05%	32.31%	20.79%
2014	19.18%	17.19%	13.46%	5.49%
2015	9.45%	8.55%	1.25%	2.78%
2016	7.10%	7.33%	12.00%	8.41%
2017	32.66%	27.19%	21.70%	19.48%
2018	-0.12%	3.69%	-4.56%	-4.72%

Focusing solely on the two out-of-the-money strategies, one can see that the combination of the superior returns of the Nasdaq-100 index and the higher index

volatility premium for NDX options provides better returns for the Nasdaq-100 Buy-Write strategy in 8 of 11 years, including 6 of the most recent 7 years.

Year	NDX-2% OTM	SPX 2% OTM	Difference
2008	-35.37%	-31.23%	-4.14%
2009	52.71%	32.07%	**20.64%**
2010	13.10%	9.82%	**3.28%**
2011	-0.11%	7.20%	-7.31%
2012	15.19%	10.24%	**4.95%**
2013	29.05%	20.79%	**8.26%**
2014	17.19%	5.49%	**11.70%**
2015	8.55%	2.78%	**5.77%**
2016	7.33%	8.41%	-1.08%
2017	27.19%	19.48%	**7.72%**
2018	3.69%	-4.72%	**8.41%**

A Simple Timing Strategy

There is a strategy that traders may use to attempt to ascertain when it is beneficial to forego the hedge. One of the most studied technical strategies in literature is called the Golden Cross. It has been used by options and stock traders for years with varying degrees of success to determine whether the stock market is bullish or bearish. There are also many ways option traders use this right down to 15-second ticks. The most common application we found was testing when an index's 50-day geometric moving average exceeded its 200-day moving average. Some strategies also waited a period for a confirmation signal to avoid being whipsawed.

We took what we considered the simplest and most conservative approach using the ETF tracking the Nasdaq-100, QQQ and the portfolio strategy that hedged the ETF by writing 2% out-of-the-money NDX calls. A further simplification for testing purposes and in keeping of using the most conservative strategies was modifying the crossing algorithm to use monthly returns. We used two months to represent 50 trading days and eight months for the 200 trading-day proxy. The default position was the conservative portfolio strategy writing 2% out-of-the-money index calls as seen before. The difference is that we would now remove that hedge when the 2-month geometric

moving average was higher than the 8-month geometric moving average and two more confirming conditions were satisfied: 1) the 2-month geometric moving average was positive, and 2) the bullish signal was repeated after a second month.

Applying this timing strategy resulted in the following results:

	QQQ	QQQ-2% OTM	Golden Cross Timing Strategy
Annualized Return	11.61%	10.45%	11.12%
Standard Deviation	17.91%	15.06%	15.96%
Sharpe Ratio	0.65	0.69	**0.70**

Again, the statistics all related to employing these strategies to the 11-year period from December 31, 2007 through December 31, 2018. The "Golden Cross" timing strategy increased annualized return over the buy-write strategy by 67 basis points. Although the standard deviation was higher, the improved Sharpe ratio showed that the additional market exposure paid for itself on a risk-adjusted basis.

The line graph showing the growth of $100 for the period provides visual insights to the differences between the strategies. The growth of QQQ grew to $334.76 still ranks first for the period albeit with the greatest volatility. The Golden Cross finished just $12.85 shy at $318.91 but with less volatility. The 2% out-of-the-money QQQ/NDX strategy grew to $298.46, $20.55 less than the growth achieved with the timing strategy. The corresponding dollar values for SPY and the hedged SPY strategy selling SPX options grew to $214.71 and $190.32 respectively.

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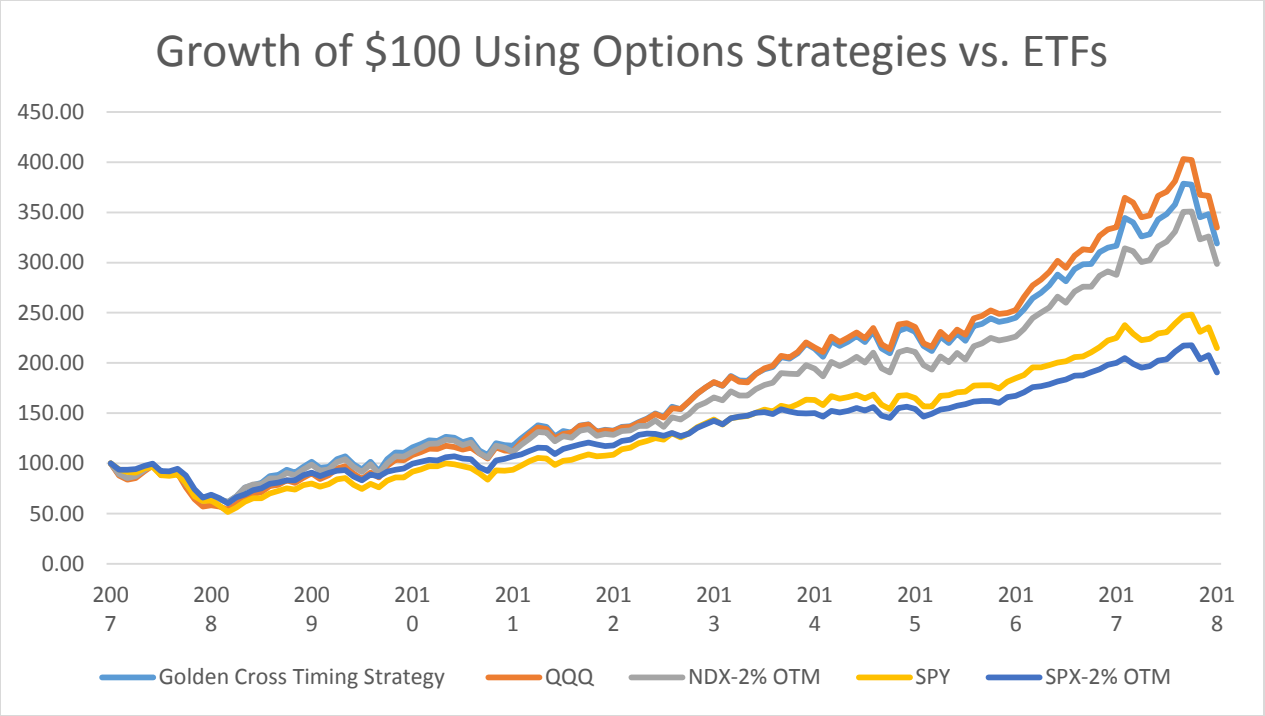

Implications for Investors

The usual disclaimers apply concerning about past performance, time-period selection and market cyclicality. For example, some future market time intervals may see leadership shift away from tech and innovation and back to old economy energy and financials temporarily. For the present and expected future, the evidence shows that these three strategies merit consideration for controlling downside risk while achieving performance goals:

1. Substituting QQQ for SPY,
2. Substituting NDX for SPX in buy-write strategies, and
3. Using a modified “Golden Cross” timing strategy.

Advisors also should take note that in most years in the study, the income yield of the strategy was greater than 9%. Although this paper focused on total return and the returns illustrated could only be achieved with 100% dividend reinvestment, advisors using the strategy for clients more concerned with income than capital appreciation may wish to modify the strategy accordingly.

Summary

Contrary to media-driven perceptions that derivatives are inherently risky, options can be used in systematic strategies to reduce overall portfolio risk while adding current income. We have shown that properly implemented covered call or buy-write strategies can improve risk-adjusted returns for conservative investors. One major factor of significance is the performance engine itself. The Nasdaq-100, more representative of modern technologies and innovation, provided better performance during the past 11 years than the broader-based S&P 500 benchmark index. The latter contains many "old-economy" stocks in order to represent 500 of the largest companies in the US market but many of those stocks have been laggards in performance. Two other factors covered by this study also apply. One is to take only the risks you need to take and to hedge away the others as demonstrated by the NDX-2%OTM strategy. And the other factor is that timing can mean everything when it comes to stock market investing. This was demonstrated by the "Golden Cross" timing strategy where it added significant value. We concluded that a strategy using NDX call options as a hedge in owning a portfolio based on the Nasdaq-100 Index allows conservative investors to participate in market gains while mitigating principal drawdowns.

By Herbert Blank and Richard Greene, November 2019.

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