GLOBAL VOLATILITY SUMMIT 2014

FEBRUARY 2015 NEWSLETTER

Dear Investor,

The Global Volatility Summit brings together volatility and tail hedge managers, institutional investors, thought provoking speakers, and other industry experts to discuss the volatility markets and the roles volatility can play in institutional investors' portfolios. The 6th Annual Global Volatility Summit is less than six weeks away on Wednesday, March 11th, 2015 in New York City.

Registration for the 2015 event is filling up quickly! We encourage you to register soon as space is limited: www.globalvolatilitysummit.com. An agenda is also available on the website.

Parallax Volatility Advisers has shared the latest report in our newsletter series with the GVS community, titled 'Cost of Systematic SPX Option Hedging', in which they provide insightful analysis and findings.

Cheers,

Global Volatility Summit

2015 EVENT UPDATE

The Sixth annual Global Volatility Summit ("GVS") will take place March 11th, 2015 at Pier Sixty at Chelsea Piers in New York City

The following managers will be participating in the 2015 event:

BlueMountain Capital
Capstone Investment Advisors
Capula Investment Management
Dominicé & Co. – Asset Management
Fortress Investment Group
Ionic Capital Management
JD Capital Management
Parallax Volatility Advisors
Pine River Capital Management
Saiers Capital

Questions? Please contact info@globalvolatilitysummit.com

Website: www.globalvolatilitysummit.com

Global Volatility Summit Special Report: Cost of Systematic SPX Option Hedging

DISCLOSURE

This research article is not investment advice or a recommendation to purchase or sell any security. Securities transactions, especially the option trades described in this summary, are risky and are not suitable for all investors. Before making an investment decision or building an option strategy, you should consider, with or without the help of a professional adviser, whether the investment or strategy is appropriate in your circumstances.

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The returns and investments described herein are not actual accounts or actual investments. These hypothetical returns were calculated by retroactively assuming certain purchase and sale transactions could have been effected at market prices at the times indicated, and by assuming hypothetical transaction costs. These assumptions may not be accurate for all sizes and types of accounts.

Past performance is not a guaranty of future results. Options trading, including puts on an index, is especially risky. Any gain or loss from the sale or exercise of an option is reduced or increased, respectively, by the amount of the premium paid. The expenses of option investing include commissions payable on the purchase and on the exercise or sale of an option.

Even a well-conceived put transaction may be unsuccessful to some degree because of market behavior. When options are used for hedging, there may be less than expected correlation between price movements in the option market and in the index being hedged. A lack of correlation could result in a loss on both the hedged position and the hedging vehicle.

Parallax is an investment adviser and it causes its clients to have long or short positions in the securities and derivatives (including options) mentioned in this summary. Parallax frequently increases or decreases those positions, and Parallax has no obligation to update this article.

In this research note we examine the 16-year historical cost of hedging with a systematically-determined long position in SPX put options, using a variety of scenarios for selecting the hedge.

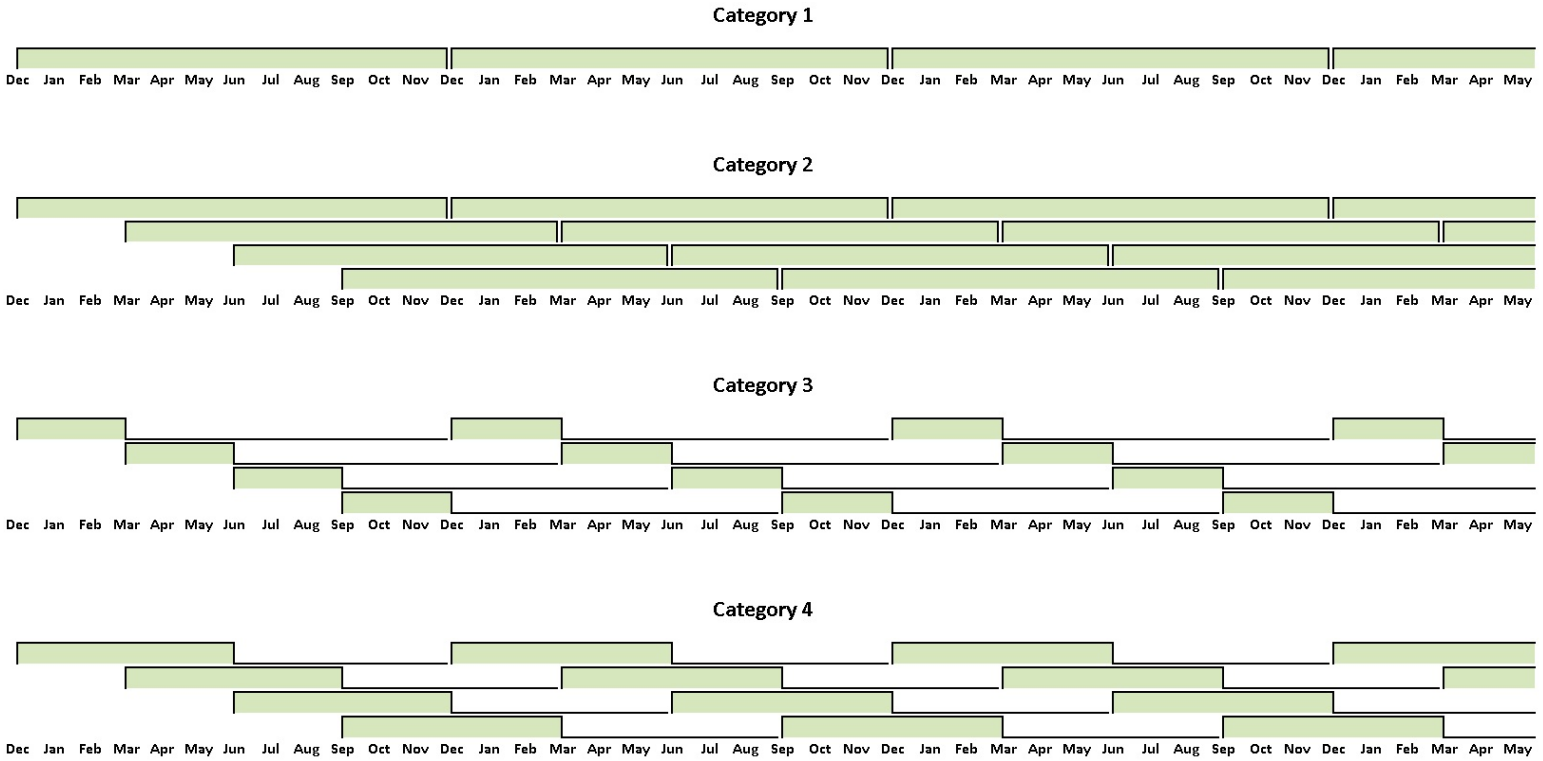
Option Hedging Strategy Design and Specification

Option Hedge Categories

The entry and exit schedule for a systematic option hedge must fall into one of the following four categories (ordered by increasing complexity):

	Non-Overlapping Holding Periods	Overlapping Holding Periods
Options Held until Expiration	1	2
Options Sold before Expiration	3	4

The following diagram illustrates an example holding schedule in each category, where option positions are entered 12 months before expiration. The green bar represents the holding period for each option, with the horizontal black line showing the lifetime of each option. In the example for Category 1, all the options expire in December. The four rows in each of the examples for Categories 2 through 4 represent options expiring in Dec, Mar, Jun, and Sep, respectively.



Option Hedge Parameters

Aside from the category above (1 through 4), the parameters that specify the hedge are:

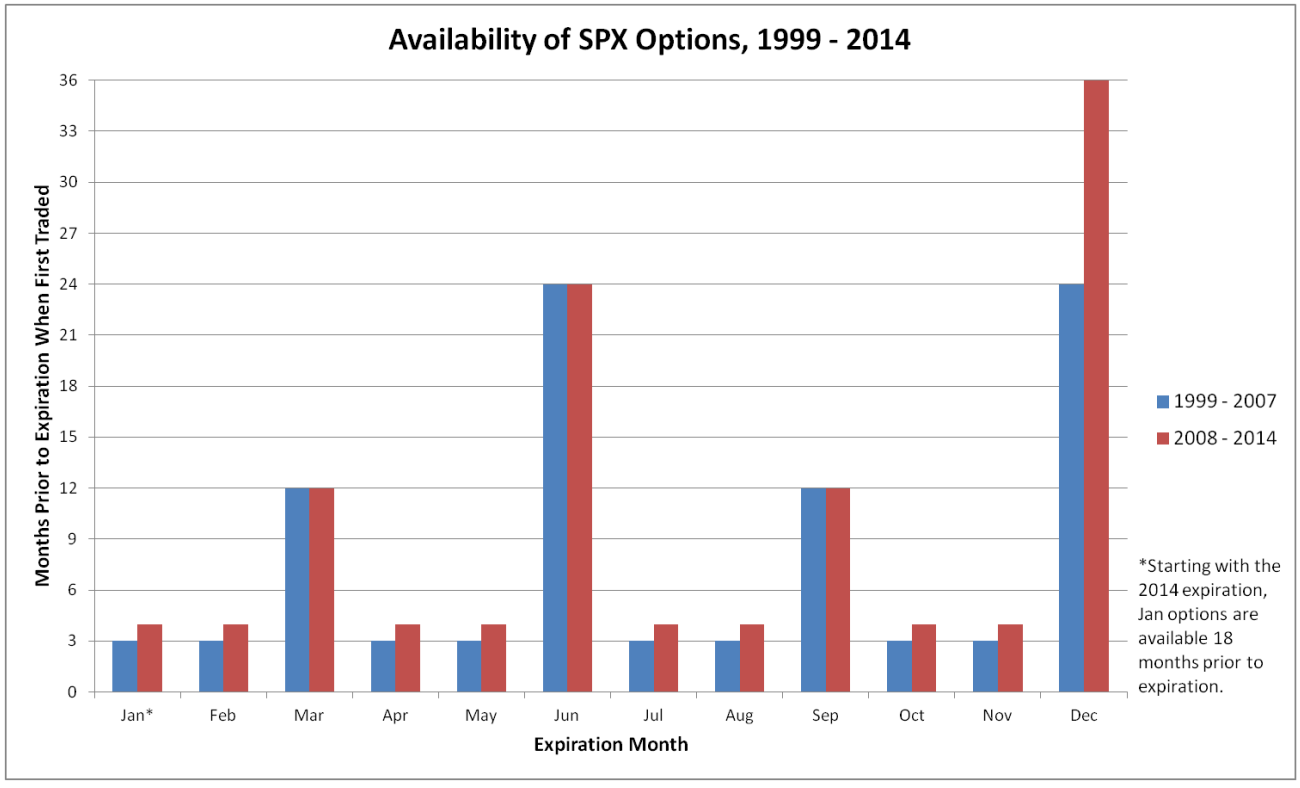
- Maturity (at the time the option position is entered)
- Holding Period (same as Maturity for categories 1 and 2)
- Roll Interval (same as Holding Period for categories 1 and 3)
    - Concurrent Positions (must be an integer) = Holding Period / Roll Interval
- Strike (as percentage of spot at the time the option position is entered)

For this research note, we will present results for hedges in categories 1 and 2 only. We will also restrict the hedges to consider:

- SPX put options only
- Regular (monthly) expirations only
- Rolling on monthly expiration Fridays (except where noted)

SPX Option Availability

When developing an option holding schedule for trading or backtesting, it is important to note the current and historical availability of regular (monthly) SPX options for trading, as shown here:



Results of Backtesting for Jan 1999 – Dec 2014

The following results are for the 16-year period from January 1, 1999 through December 31, 2014. It is assumed that trades are executed at the closing bid-ask midpoint price, subject to the specified transaction cost (if any).

1) Options Held until Expiration, Non-Overlapping Holding Periods

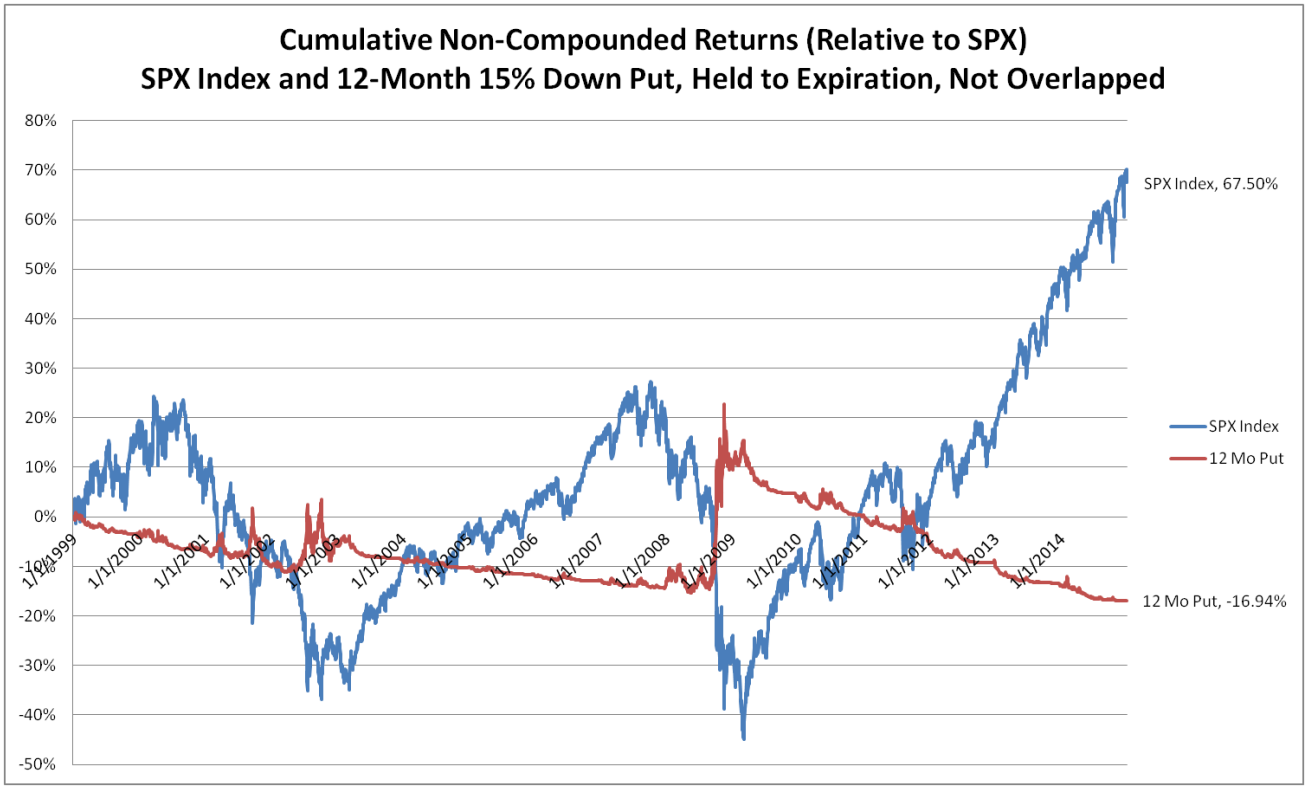
Hedges in this category are the most reliable for providing protection against specified drops in SPX price over fixed time periods, but they are also the most sensitive to the specific choice of these time periods, and may not provide the desired payoffs for drops in SPX price over other time periods.

The parameters to be specified in this category are:

- Maturity (same as Holding Period and Roll Interval)
- Strike

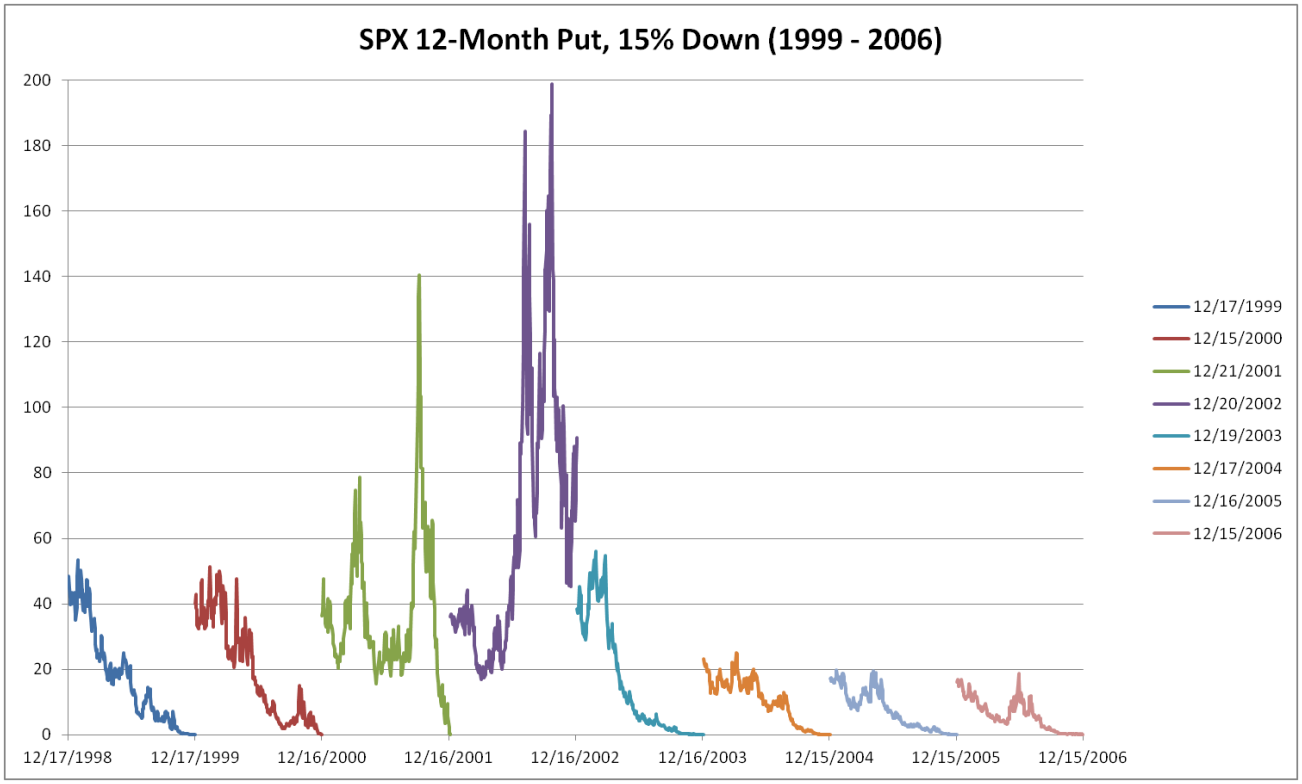
We start with the simplest and most direct way to hedge against annual losses exceeding 15% in the SPX, with a 12-month 15% down put purchased each December and held until expiration.

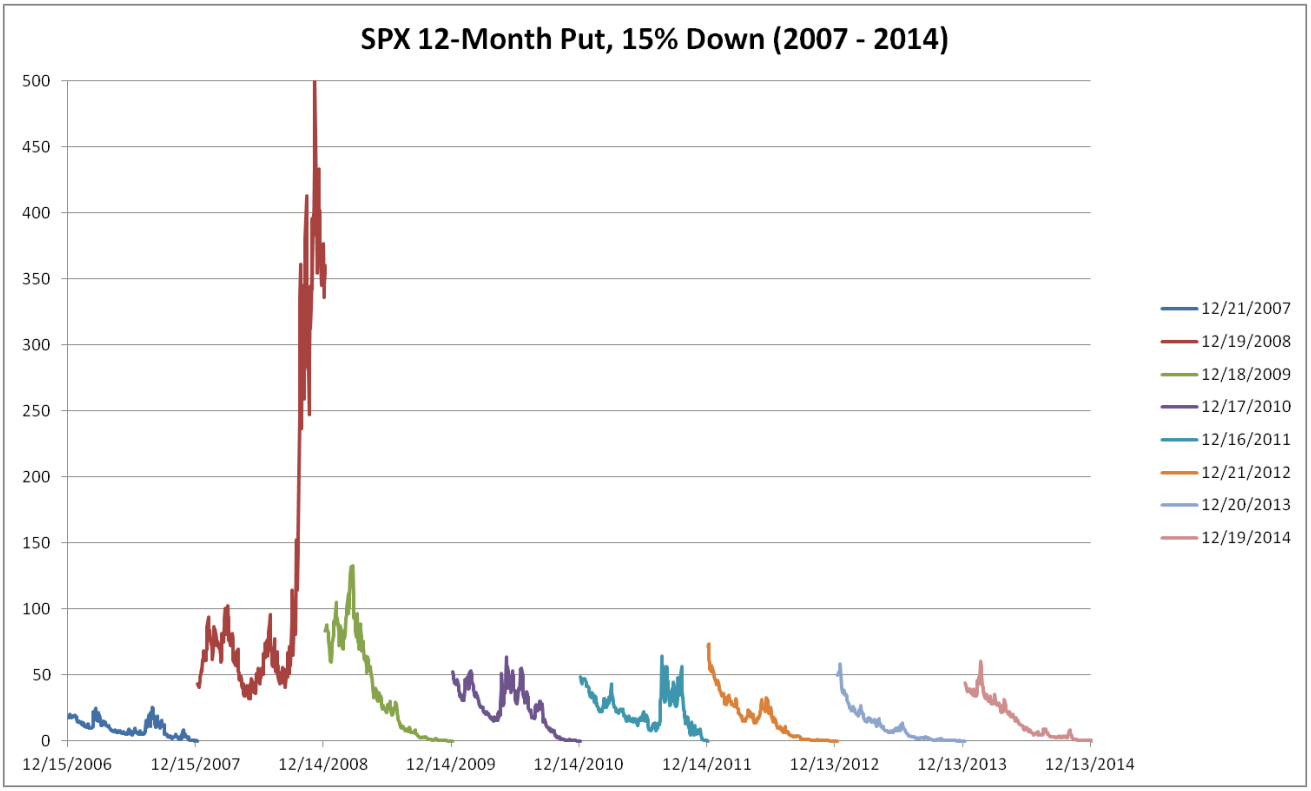
The following is the historical return of this put with no transaction costs:



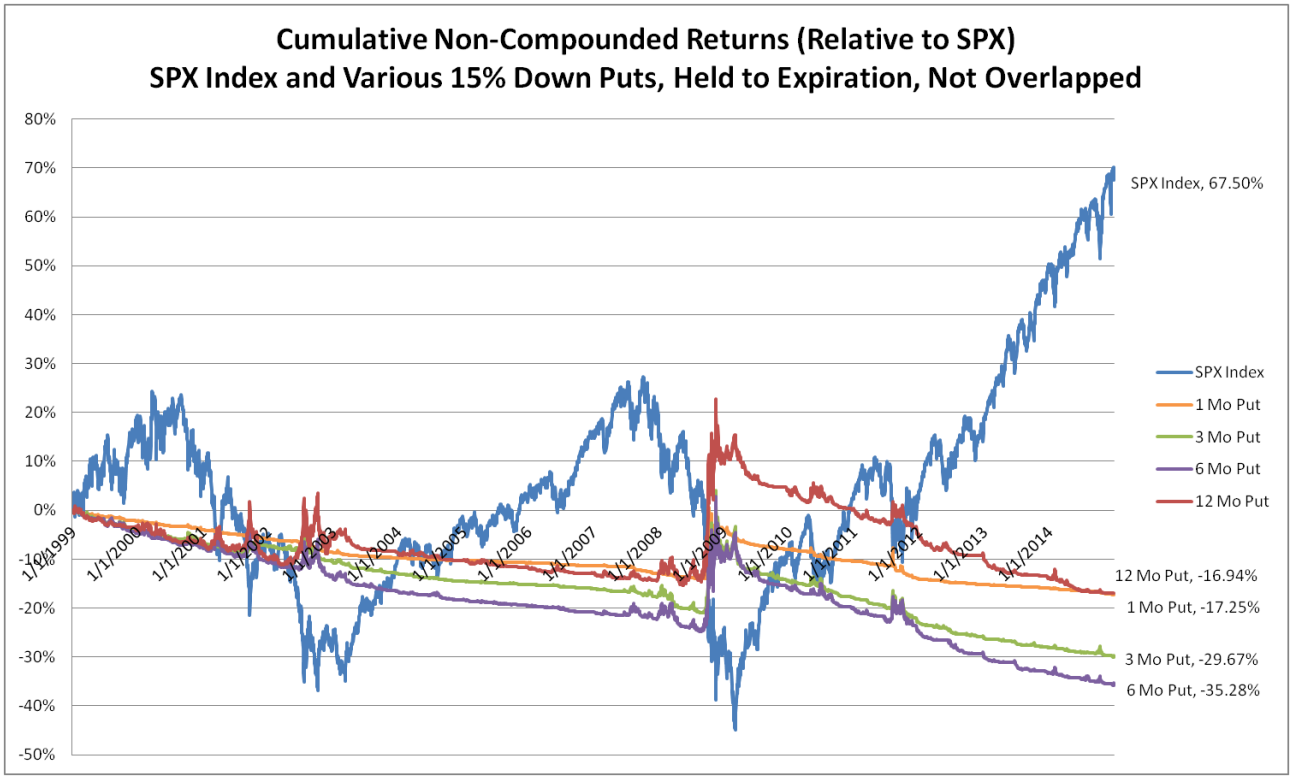
The put loses 16.94% over the 16 year period, corresponding to an average annual loss of 1.06%. This return takes into account the two years (2002 and 2008) in which the hedge paid off. Without these payoffs the average cost of the put is 3.35% annually.

The following two charts show the value of each put from entry (one year before expiration) until expiration. Note that the vertical scale differs between the two graphs.





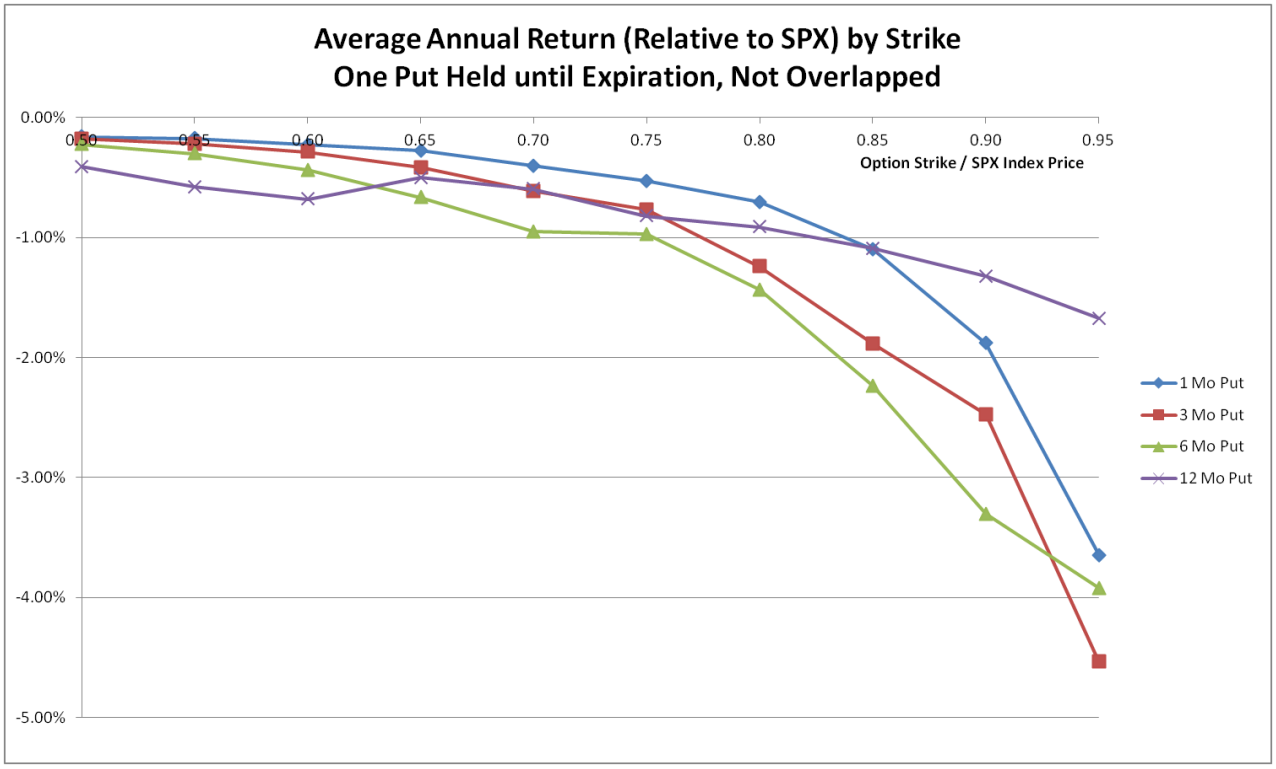
Next, we compare 1-month, 3-month, 6-month, and 12-month non-overlapping option hedges, held until expiration. We still use a 15% down put for each maturity, and no transaction costs.



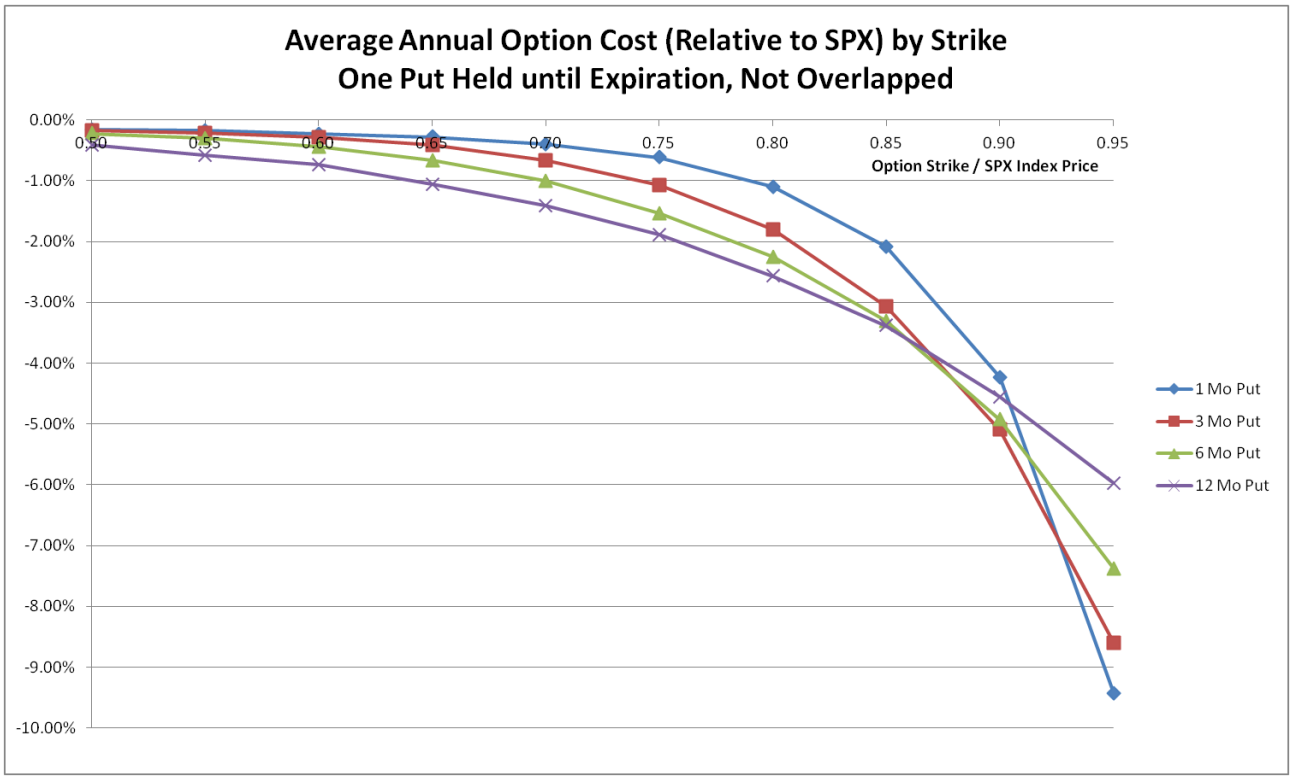
The 1-month put pays off three times (Sep 2001, Oct 2008, Nov 2008), the 3-month put pays off three times (Sep 2001, Sep 2002, Dec 2008), and the 6-month put pays off once (Dec 2008). Including these payoffs, the average annual losses for the hedges are 1.08%, 1.85%, and 2.20% for the 1-month, 3-month, and 6-month options respectively, compared to 1.06% for the 12-month option. However the average annual costs of the hedges without any payoffs are 2.07%, 3.04%, and 3.27% for the 1-month, 3-month, and 6-month options respectively, compared to 3.35% for the 12-month option.

We now consider a range of strikes, expressed as percentage of spot, and include a transaction cost for entry into the option position that is 1% of the total cost of the option. No cost is associated with the exit from the position on expiration.

The following shows the average annual returns for the 1-month, 3-month, 6-month, and 12-month put, at strikes from 50% of spot to 95% of spot, with a transaction cost of 1% of the option price:

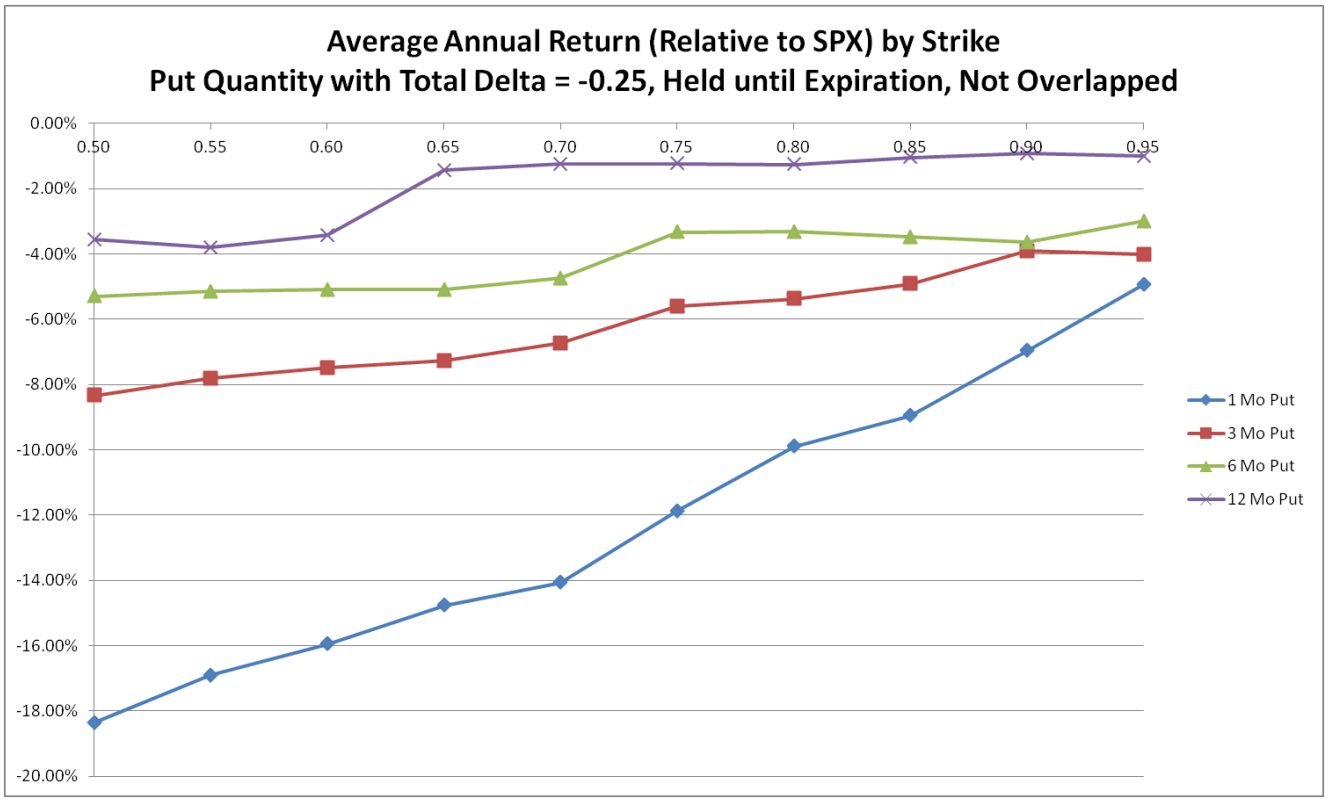


The average annual cost of the option hedge, without any returns from payoffs, is shown below:



The results shown so far have been for hedges with the quantity of options that makes the notional value equal to the SPX index. However for comparing the cost or return of a hedge, this unfairly biases in favor of deep out-of-the-money puts, because these cost less and therefore lose less, but they do not provide as much of a hedge. Since the day-to-day return of a hedge for a downward SPX move is expected to be proportional to the total delta of the hedge, which for a fixed quantity of options will vary between maturities and strikes, it makes more sense to compare results where the option contract quantities are normalized to produce the same overall negative delta to the SPX index.

In the following graph, the results from the first graph on the previous page are re-stated with quantities adjusted so that the total delta of the hedge (relative to the SPX index) is -0.25:



Now we can see that to get a hedge with an effective delta of -0.25 relative to SPX, it is better to buy longer maturities than shorter maturities, and it is better to buy puts closer to the money than puts further from the money. The 12-month put appears to provide the best average return, with strikes of 85% of spot and above being optimal. In order to achieve the most convexity within this range of strikes, we will choose the one furthest from the money, the 85% strike (i.e. 15% down) as the best hedge in Category 1.

2) Options Held until Expiration, Overlapping Holding Periods

Strategies that hold options until expiration have the advantage of producing a reliable payoff for a given drop in the index over a fixed time period (corresponding to the term of the option), but as noted above, with non-overlapping holding periods these strategies are less reliable when the goal is to protect against drops in the index over more general periods of time.

For example, hedging with a 15% down, 12-month put from each Dec to the next Dec pays nothing when a 25% drop occurs over the 12 months from July 1 of one year to July 1 of the next year, if the drop is evenly spread between the two calendar years and the index is unchanged over the remainders of the years. The hedge also pays nothing when a drop greater than 15% occurs within a 12-month holding period, but then the price recovers sufficiently by the end of the period.

This problem can be partially alleviated by dividing the hedge into multiple holding periods that overlap. For example, the current availability of SPX option maturities (see chart above) allows the following combinations:

- 36-month puts with 3 concurrent positions (Roll Interval = 12 months)
  - Dec to Dec (Yr 0), Dec to Dec (Yr 1), and Dec to Dec (Yr 2)

- 24-month puts with 4 concurrent positions (Roll Interval = 6 months)
  - Dec to Dec (Yr 0), Jun to Jun (Yr 0), Dec to Dec (Yr 1), and Jun to Jun (Yr 1)

- 12-month puts with 4 concurrent positions (Roll Interval = 3 months)
  - Dec to Dec, Mar to Mar, Jun to Jun, and Sep to Sep

- 6-month puts with 2 concurrent positions (Roll Interval = 3 months)
  - Two of the following: Dec to Jun, Mar to Sep, Jun to Dec, or Sep to Mar

- 3-month puts with 3 concurrent positions (Roll Interval = 1 month)
  - Three of the following: Dec to Mar, Jan to April, Feb to May, etc.

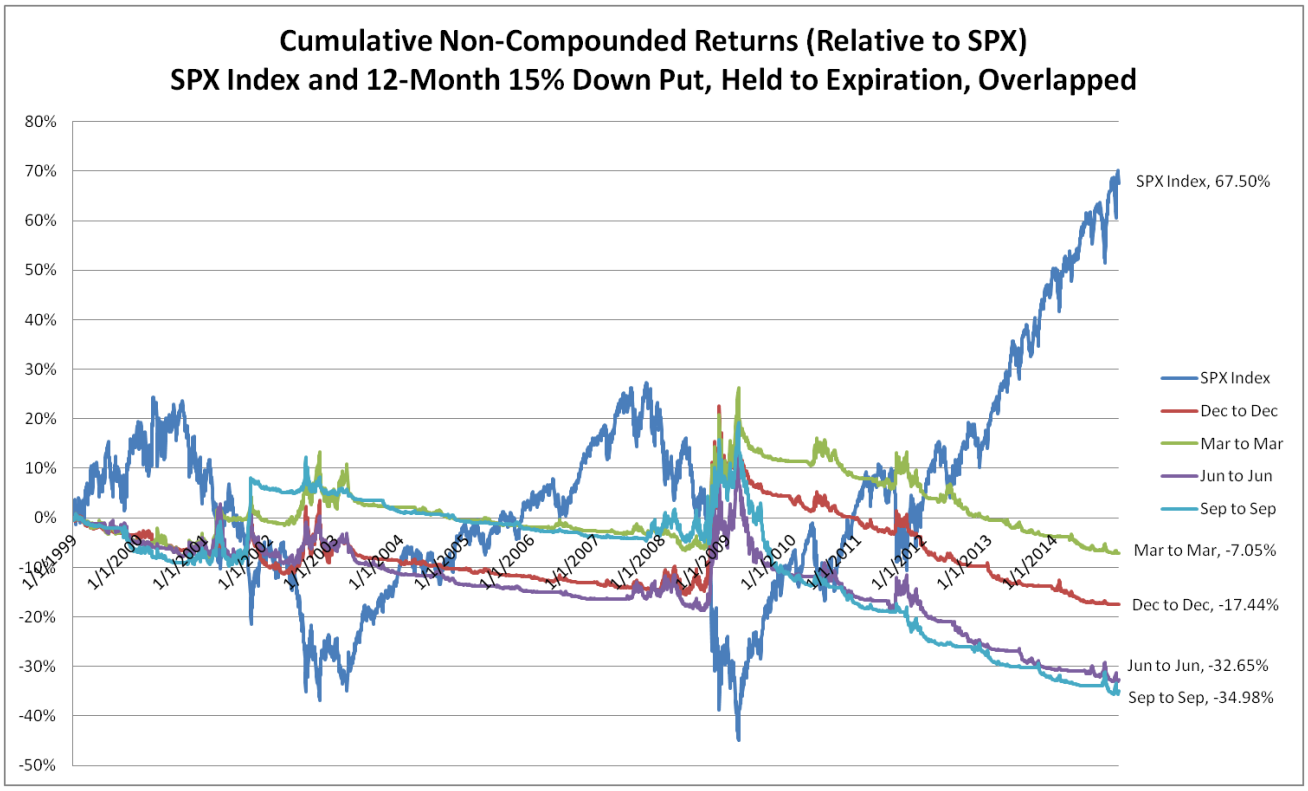
It is important to note, however, that with overlapping holding periods it is necessary to split the total hedging budget between each of the concurrent positions, so without increasing the budget it is not possible to hedge the full notional amount of the index against the specified drop in each holding period. Using the example of the 15% down, 12-month put with four overlapping holding periods, in the worst case a 15% drop is exceeded in only one of the four periods, resulting in a payoff that represents only one quarter of the index value.

The parameters to be specified for this category of hedge are:

- Maturity (same as Holding Period)
- Roll Interval
  - Concurrent Positions (must be an integer) = Holding Period / Roll Interval
- Strike

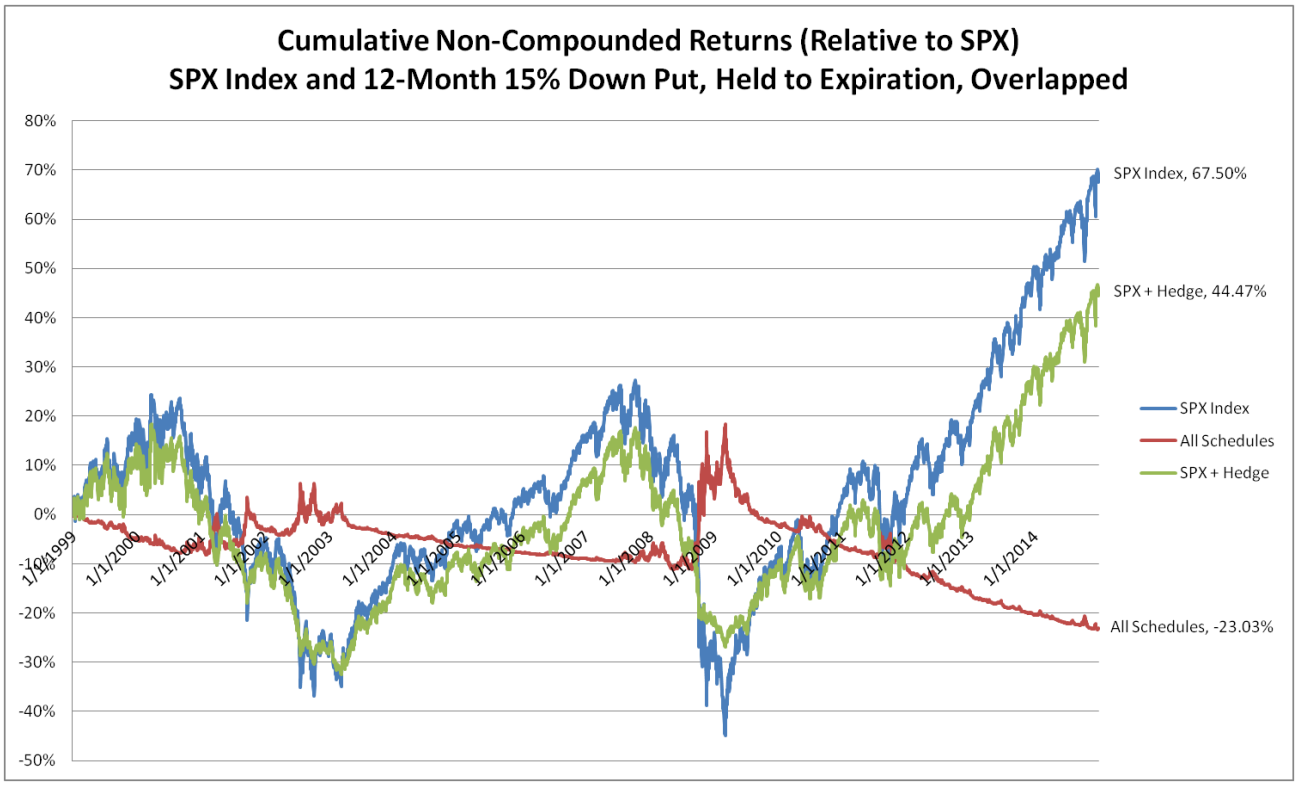
The average performances of the hedges in this category will differ from those in Category 1 only as a result of idiosyncrasies of the time periods used for backtesting, but the general relationship between maturity, strike, and performance should be similar to that discovered previously. Therefore for this category we will examine only one case in detail, that of the 12-month, 15% down put found to be optimal for Category 1. For the Category 2 version of this hedge we will use a roll interval of three months, resulting in four concurrent positions corresponding to four holding schedules: Dec to Dec, Mar to Mar, Jun to Jun, and Sep to Sep. A 1% transaction cost will be used. (For the Mar to Mar and Sep to Sep schedules, the roll day is extended to the Friday one week after the previous expiration Friday, based on the historical availability of those 12-month options.)

The results for each of the schedules separately (shown here each with the full notional amount) are as follows:



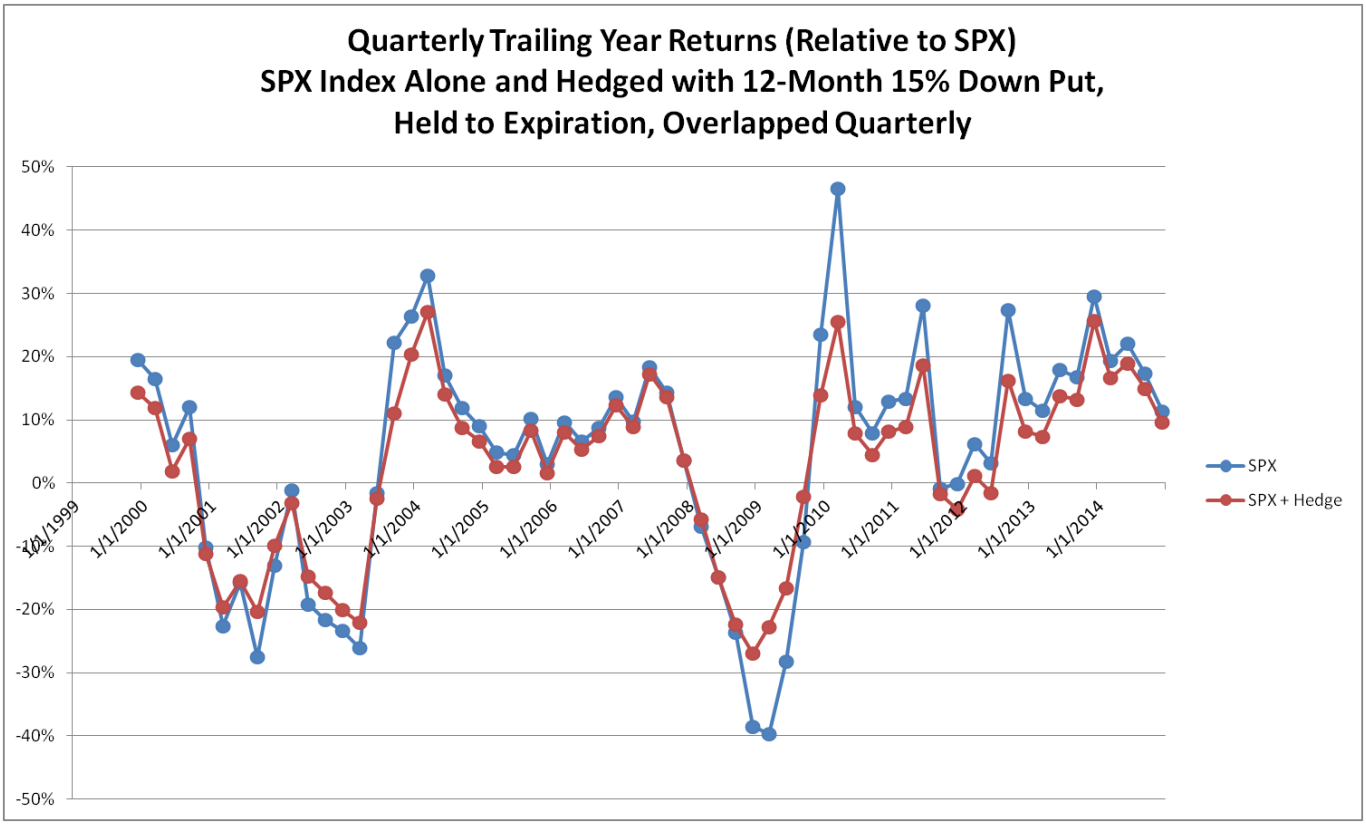
Including the 1% transaction cost for options when purchased, the average annual losses for the hedges are 1.09%, 0.44%, 2.04%, and 2.19% for the Dec to Dec, Mar to Mar, Jun to Jun, and Sep to Sep schedules respectively, for an average annual loss of 1.44%. The average annual costs of the hedges without any payoffs are 3.38%, 3.19%, 3.41%, and 3.86% for the four schedules, respectively, with an average annual cost of 3.46%.

In practice, one-quarter of the total notional amount will be covered by options in each of the four schedules, resulting in a hedge with the following performance:

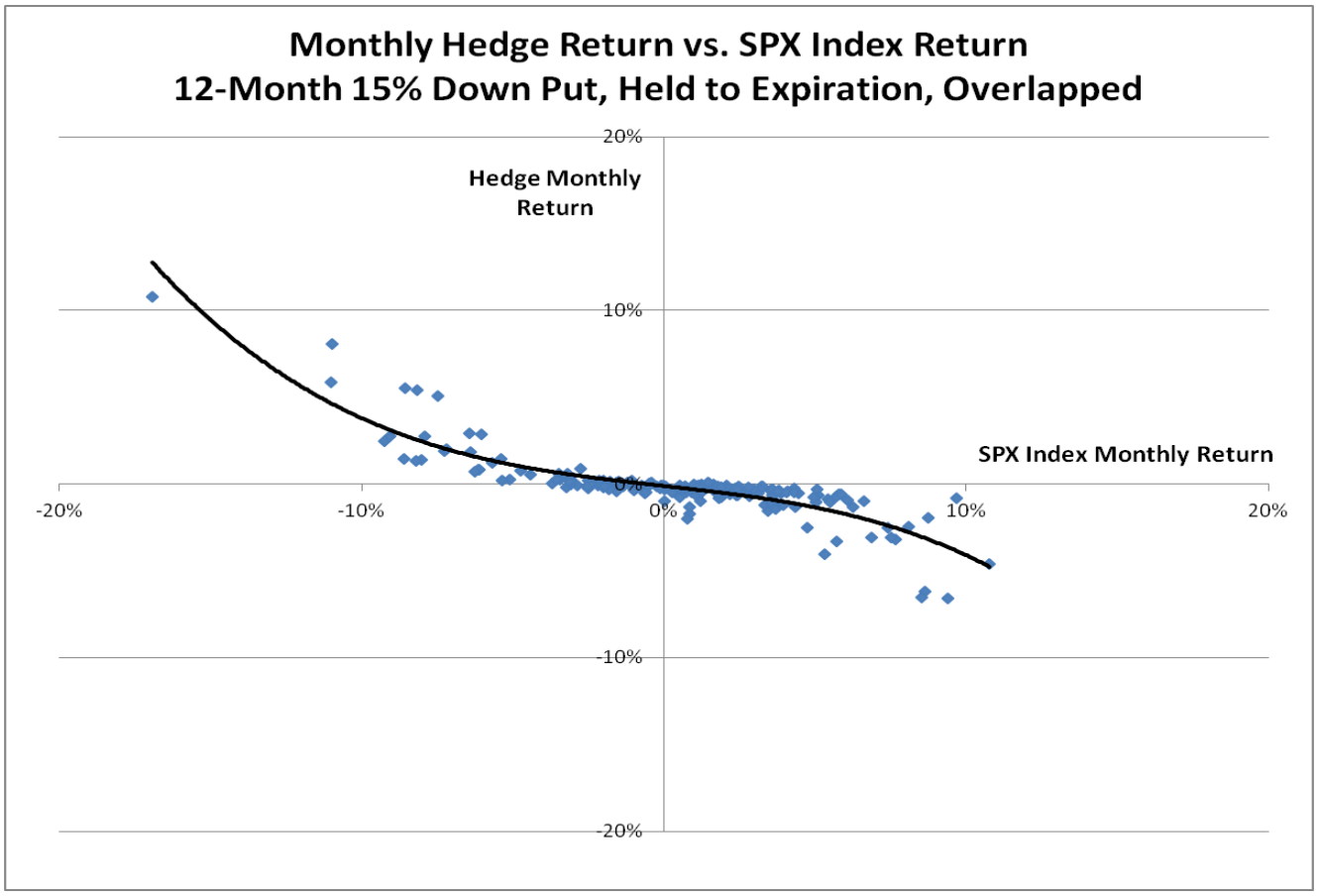


The total non-compounded return of -23.03% for the 16 year period of the test corresponds to the average annual return of -1.44% noted previously. The annual cost of the options for this hedge (without payoffs) is again 3.46%.

The following chart shows the trailing 12-month returns for both the SPX index alone and the index together with the hedge, measured quarterly. The hedge reduces the worst of the portfolio losses, but because of the staggered holding schedules, even with the hedge it is still possible for a trailing 12-month return to exceed a 15% loss:



We can also examine the convexity of the hedge payoffs by plotting the monthly returns of the hedge against the monthly returns of the index, as shown in the following scatter plot:



As this plot shows, when the index drops substantially, the hedge payoff kicks in to provide the expected protection.

Despite the fact that the full notional amount of the index is no longer covered by any one hedging schedule, if options are going to be held until maturity, it makes good sense to spread out the hedges between different holding schedules, in order to defend against losses over more general time periods. Therefore the hedge shown above is the preferred choice among hedges in Categories 1 and 2. Results for option hedges in Categories 3 and 4 are not presented here.

Conclusion

Hedging exposure to the SPX index with puts is problematic. In general, SPX puts are expensive, and they get more expensive relative to their payoffs as we move out of the money and to shorter maturities. Another problem is that the option payoffs are specific to the holding periods that are chosen. In order to minimize the cost of hedging while covering a range of holding periods, a possible choice is to buy 12-month puts that are 15% below the money, covering one-quarter of the index notional with each of four holding schedules (Dec to Dec, Mar to Mar, Jun to Jun, and Sep to Sep). Backtests show that with a 1% transaction cost, for the 16-year period from 1/1/1999 through 12/31/2014 this hedge returned an average of -1.44% annually relative to the SPX index, with an average annual option cost of 3.46% (i.e. the average annual return if no options had finished in the money would have been -3.46%).