Adaptive Covered Call Writing for Nasdaq Stocks:
The Turtle Strategy
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*Turtles* are reptiles characterized by a special bony shell developed from their ribs and acting as a shield. The earliest known turtles date from 220 million years ago, making turtles one of the oldest reptile groups.
(en.wikipedia.org/wiki/Turtle)

**Abstract:**
Covered Call Writing is a venerable strategy. It is usually added to an existing portfolio of stocks. One trades-off upwards potential in strong rallies against a constant stream of additional income from options writing. This work investigates various aspects of this strategy for Apple, Ebay and Google over the last 8 years. It is shown that an adaptive approach works best. The turtle is no silver bullet, but one gets at least the same performance in a considerable smoother way. The reduced volatility is – over the considered time range – a free lunch. In a second step long Puts are added for additional downside protection. The strategy becomes a (loose) Collar. The Collar improves the Sharpe-Ratio, but the overall profit is considerable lower.

**Introduction:**
The incentive for this study came from clients of the Sibyl-Fund. They hold Apple (AAPL), Google (GOOG) and Ebay (EBAY) stocks. Covered Call Writing is a venerable strategy to improve the performance of a stock portfolio. The classical performance measure for such a strategy is the CBOE Buy Write Monthly Index BXM introduced by Whaley (see [1]). The BXM writes each 3rd Friday the next ATM SPX Calls. The position is kept till expiry one month later. The BMX is a baseline. It is by no means an optimal strategy. But one can invest into the BXM via the ETF PBP. The PBP did better than the SPY in the 2008 crash. But it's performance is – in contrast to the SPY – since 2010 almost flat. There are other ETFs like the BWV and the HSPX which claim to be S&P-500 BuyWrite Strategies. These ETFs perform better but still lag far behind the SPY. Buy Write strategies are a trade-off between limiting the upside potential and cashing in the Call-premium (see [2]). One can tune this trade-off: Instead of ATM one can write OTM Calls. In the classical setting the ratio is 1:1. One writes one Call for 100 stocks. This ratio can be varied in an adaptive way. One can roll-over the position on other dates than the 3rd Friday. One can hold the stock portfolio fixed and finance the Calls from Cash. Alternatively one reinvests the wins from the options position in stocks and sells stocks to finance the losses. The current study addressed these questions for the stocks mentioned above.

**Data and Trading:**
For this study daily data were bought from DeltaNeutral. The data start at 2006-01-03 and end at 2014-04-24. The time range covers very different market regimes. The crashes of 2008 and 2011, but also the strong rallies since 2010. From the data one can not readily implement the 3rd Friday to 3rd Friday strategy. There are no closing prices available. Besides this it seems to be better to roll-over already 2 trading days (usually Wednesday) before the 3rd Friday. This was in a preliminary study the best rollover date.
Following [3] the price of the short option is set to 
\[ \frac{2}{3} \text{bid} + \frac{1}{3} \text{ask} \]
and
\[ \frac{2}{3} \text{ask} + \frac{1}{3} \text{bid} \]
for the closing long. This models the bid-ask spread. No additional trading costs are taken into account.

It is generally noted ([2],[4],[5]) that OTM Calls perform better. But there are different measures of OTM possible. The most simple and usual one is a minimum percentage over the underlying. If Apple trades at 500.00, a 4% OTM would be the nearest strike greater equal 520. A second alternative is to take the standard-deviation of the returns in the last month into account. This value is taken as the forecast for the next month. One defines then a fraction of the monthly standard-deviation as the OTM measure. A third alternative is to calculate the implied delta of the option. One selects the closest strike with a delta smaller than e.g. 0.47. The simple percentage rule does not take the volatility of the stock into account. The realized volatility measure is more backwards looking, the delta method uses the expectation of the options trader for the coming month. The percentage rule and the delta approach performed in the historic simulation about equal. The realized-volatility measure is clearly worse. The results section hence shows only the performance of the close contenders.

Adjusting the stock position at each rollover date is also clearly better than a Buy&Hold strategy which finances the options from cash. The effect of this strategy is that one buys/sells against the market movement. If the stocks have fallen or moved sideways in the last month, the open call position is (almost) worthless. One buys at the rollover date from the premium of the new position additional stocks. If the market has risen fast, the old position is worth more. One finances the difference by selling (expensive) stocks. The result section shows therefore only this variant.

**The Apple-Results:**
Graphic-1 shows the result for a fixed percent OTM of 4\% in comparison to a Buy&Hold strategy (yellow). The initial value is 500.000$. One buys for this amount 6688 Apple stocks. The Covered-Call has a Sharpe-Ratio of 0.78 to 0.61 of Buy&Hold. The maximum relative drawdown is on 2008-11-17 (red line in Graphic-1) 48.1%. The relative drawdown of Buy&Hold is at this date 58.2%. The final overall win at 2014-04-24 is 676.2\% to 644.1\%. The Covered Call has in all respects an edge over Buy&Hold. But there are also phases like Nov. 2011 till Sep. 2012 were Buy&Hold is much better. It is no surprise that the Covered-Call does in down- and sidewards market better but lags behind in strong rallies.

Graphic-2 shows the performance of a strategy where the OTM measure is determined by a delta of 0.48. A delta of 0.48 is usually somewhat closer to the underlying as the fixed 4\% offset. The performance is smoother. The Sharpe-Ratio is 0.77, the max. relative drawdown at 2008-11-17 reduces to 46.1\%, but the final win is with 528.3\% considerable lower.

In [5] the authors propose an adaptive strategy. The Covered-Call ratio is increased to 1.25 in quiet market phases and lowered to 0.75 in market turmoils. The authors note that this sounds counter intuitive. But they claim that the adaptive rule improves nevertheless the performance in the considered time-range from 1997 till 2005. The results are repeated in [4]. The argument is that sharp and short market drops are followed by strong recoveries. Reducing the ratio to 0.75 improves the performance in the recovery phase.
Graphic-1: AAPL 4% OTM (orange), Buy&Hold (yellow) from 2006-01-03 to 2014-04-24

Graphic-2: AAPL 0.48 Delta OTM (orange), Buy&Hold (yellow) from 2006-01-03 to 2014-04-24
Graphic-3: Adaptive AAPL 4% OTM (orange), Buy&Hold (yellow) from 2006-01-03 to 2014-04-24

Graphic-4: Adaptive AAPL 0.48 Delta OTM (orange), Buy&Hold (yellow) from 2006-01-03 to 2014-04-24
The adaptive rule of [5] is not just counter-intuitive. It performs also rather poor from 2006 to 2014. But turning the idea around improves the performance. One calculates the mean of the implied volatility from ATM till 10% OTM calls. One can consider this measure as a poor man's Apple-VIX. The threshold for a violent regime is set to 60%. For the quiet regime it is 30%. In the violent regime the ratio is increased to 1.25, in the quiet regime it is reduced to 0.75, in between one trades the usual 1:1 ratio. This simple rule works quite well.

The performance of the adaptive strategy for the 4% OTM Call can be seen in Graphic-3. The Sharpe-Ratio improves to 0.81 (0.78), the max. relative drawdown at 2008-11-17 is 46.6% (48.1%) and the overall win is 758.1% (676.2%). One gets less drawdown, a smoother behavior with a higher win. Graphic-4 shows the performance of the 0.48 delta writing. The Sharpe-Ratio increases to 0.81 (0.77), the max. relative drawdown is 44.1% (46.1%) and the final win is 632% (528.3%). The adaptive strategy harmonizes somewhat better with the delta OTM setting. The regime classification and the OTM measure use both the implied volatility of the options.

The Google-Results:
The best performance is here for OTM 4.5%. The Sharpe-Ratio is 0.38 with 0.34 for Buy&Hold. The max. relative drawdown is 58.8% (64.4%) at 2008-11-17. The final win is 109.7 to 139% for Buy&Hold. Buy&Hold passes by in the extreme rally of 2013. But the adaptive strategy does much better than the plain covered-call. The Sharpe-Ratio improves to 0.42, the max. relative drawdown is 58.2% and the final win is 132.6% (see Graphic-5).

The strategy with a delta of 0.47 has a Sharpe-Ratio of 0.47, the max. relative drawdown is 54.1% and the final performance is 132.4% (see Graphic-6). For Google the delta OTM measure seems to have an edge.
The Ebay-Results:
The performance of the Ebay stock is in the considered time range less spectacular. The overall win is just 17.6% with a Sharpe-Ratio of 0.09. The stock suffered much longer in the 2008 crash. The max. relative drawdown is at 2009-03-02 with 77.7%. It is for Ebay much better to place the call closer to the underlying. The best percentage offset is 1.5%. The best delta is 0.495. The implied volatility of Ebay is also lower. The thresholds for the violent and quiet market regimes are hence lowered to 50% and 25%. The adaptive approach is clearly better than a fixed 1:1 ratio.
The 1.5% OTM call has a Sharpe-Ratio of 0.18. The max. relative drawdown at 2009-03-02 is 65.6% and the overall win is 38.1%. (Graphic-7). The 0.495 delta call performs somewhat better. The Sharpe-Ratio is 0.19, the max. relative drawdown is 62.9% and the overall performance is 41.3% (Graphic-8). The performance of the delta OTM measure is especially smoother. It adjusts better to the current market conditions.
Graphic-7: Adaptive EBAY 1.5% OTM (orange), Buy&Hold (yellow) from 2006-01-03 to 2014-04-24

Graphic-8: Adaptive EBAY 0.495 Delta OTM (orange), Buy&Hold (yellow) from 2006-01-03 to 2014-04-24
The loose Collar:
The Covered-Call provides only a modest downside protection. One can add additional protection with a long Put position. There are an almost infinite amount of different strategies possible. As the Collar was not the primary focus of this study only a simple add-on was investigated. One buys for half of the call premium long Puts. The lowest strike was selected which has at least the same price than the Call. The Puts have a higher implied volatility. This rule means that the strike of the Puts have about the same distance to the underlying. The Puts follow the same adaptive rules and rollover dates. They are just an add-on to the Calls. The strategy was termed loose Collar, because in the conventional Collar one has on both sides a 1:1 ratio between stocks and options. The downside protection is during rallies 0.375, in a modest market regime 0.5 and in times of troubles 0.625.

Graphic-9 shows the performance of the loose Collar for AAPL with a 4% OTM Collar (the Put has a similar distance). The Sharpe-Ratio improves to 0.86 (0.81), the max. relative drawdown at 2008-11-17 is 35.9% (46.6%) and the overall win is 568.8% (758.1%). The additional downside protection is not for free. But as can be seen in Graphic-9 one gets in comparison to the stock-position a much smoother behavior. The Sharpe-Ratio of the stocks is just 0.62. One could of course increase the downside protection to 1.0. This smooths the performance further and increases the Sharpe slightly to 0.87. But it the overall win drops to 400%.

Graphic-9: Loose Collar AAPL 4% OTM (orange), Buy&Hold (yellow) from 2006-01-03 to 2014-04-24
The loose Collar has for GOOG with 4.5% OTM has a Sharpe-Ratio of 0.48 (0.42), the max. relative drawdown is 48.8% (58.2%) and the final win is 122.6% (132.6%). The Sharpe-Ratio of Buy&Hold is 0.34.

The loose Collar for EBAY with a Delta of 0.495 has a Sharpe-Ratio of 0.21 (0.19), the max. relative drawdown is 48.8% (62.9%) and the overall win is 28.9% (41.3%). The Sharpe-Ratio of Buy&Hold is 0.09 (see Graphic-11).

**Conclusion:**
The Adaptive Covered Call aka Turtle is an improvement over a plain Covered Call approach. It is a viable alternative to a Buy&Hold strategy. The performance is smoothed and one gets even for the two strongly trending stocks AAPL and GOOG over the considered time range the same or a higher win. But one has to live with the fact that the profit is capped in very strong rallies.

The loose Collar is a more conservative approach. The Collar is in contrast to the Turtle no free lunch. The increased downside protection reduces the win. The Turtle seems to be relative optimal. The loose Collar has probably some room for improvement. One could buy Puts with a maturity of 2 or 3 months. But this makes the handling of the position more complicated. In the current setting one knows exactly the amount of money which can be spent for the Puts and for selling or buying stocks. This gets more complicated if one extends the Put position. One could think about to roll the longer dated Puts with a remaining maturity of 1 or 2 months over.

These questions were postponed to a forthcoming working paper. For the time being the Turtle is an interesting new animal in the Sibyl-Fund zoo.
Graphic-11: Loose Collar EBAY Delta 0.495 OTM, Buy&Hold from 2006-01-03 to 2014-04-24

References: