Adaptive Put Writing for the S&P-500 Index and Nasdaq Stocks:
The Austrian- and Doberman Pinscher Strategy.

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The Austrian Pinscher descends from the ancient Austrian country pinschers that were widespread still in the second half of the 19th century, being modest, versatile farm dogs.
BEHAVIOUR/CHARACTER: Assertive, lively, alert, playful and especially devoted and friendly dealing with people familiar to him. Towards strangers he is suspicious and an incorruptible guard. His hunting instinct is only slightly developed.
(from FCI-Standard N° 64, Austrian Pinscher).

Abstract:

It is well known that the implied volatility of S&P-500 index options usually overestimate the realized volatility of the S&P-500. The most elementary way to exploit this fact is the CBOE S&P 500 PutWrite Index PUT ([1],[2]). In a series of papers the group of Prof. Larcher at the University of Linz/Austria examined the possibility of improving the risk-adjusted performance of this basic approach ([3],[4]). This working paper uses the techniques of the geographically nearby Larcher group as a starting point. It is shown that one can improve the result by taking additionally the Implied-Volatility-Term-Structure into account. It addresses and answers also some "open questions, future research" topics of the Larcher papers. It is also investigated if the strategy can be applied to Nasdaq Stocks. The performance of the strategy is quite attractive. But one has to be alert like an Austrian Pinscher to avoid the considerable risk of Put Writing.
Note: Besides geographic proxy there is no relation between the Larcher group and this author.

Revision 1:

Revision 1 extends the historic simulation for the SPX Options till 2014-06-13. As the original parameters are not changed we perform an out of sample test. The attractive properties of the strategy are confirmed. Revision 1 is added before the Conclusion of the original paper.

Introduction:

There is a vast strand of literature about the fact that the implied volatility of S&P-500 index options overestimate the realized volatility of the S&P-500. This relation is only reversed in serious crashes. The majority of this literature is part of the efficient markets debate. The authors try to find an explanation which is consistent with the efficient market dogma. This is from the point of view of a hedge fund quant a theological discussion. The really interesting question is how to exploit this fact. The most basic strategy is the CBOE S&P 500 PutWrite Index. One writes each 3rd Friday a fully collateralized ATM Put. The Put is kept till expiry on the next 3rd Friday ([1]). It is shown in [2] that the PUT index clearly outperforms the S&P-500 from July 1986 till September 2008. But it should be noted that the final date of this time range is somewhat strange. Although the paper was published in Spring 2009 the investigation stops before the October 2008 massacre.
The Larcher group has published a series of papers (the most important are [3],[4]) about a practical feasible strategy which survives also such events as the 2008 crash. These strategies are also applied in real fund live. But I don't have any information about the performance of these funds.

The rules of the Larcher Strategy are:
1) The short Puts are OTM.
2) The short Puts are hedged by a far OTM long Put position. Larcher et. al. mention the possibility of a naked short position. But no results are reported.
3) There are two stop-loss criterion's:
3a) If the underlying moves below K*Strike of the short Put. K is a parameter around 1.0.
3b) The current (mark-to-market) loss of the position is above a given percentage of the available cash. Only this criterion is in the strict sense a Stop-Loss. But practically 3a) is more important. There is of course a close relationship between 3a) and 3b).

There are several measures for OTM. The most simple one is a given percentage of the underlying. A standard setting of the Larcher papers is SPX * 0.98. At of this writing the S&P is at 1872. This would correspond to a strike of 1835 or 1830. Another measure is to scale with the current VIX value. The paper mentions SPX * (1.0 – 0.1*VIX).
Note: The VIX is usually quoted in percent. In the usual quotation the factor should be 0.001.
The VIX is at this writing at 12.96. This would translate into the simple scaling factor of 0.987 or a current strike of 1845. Another possibility investigated in [3],[4] is to scale with the realized volatility of the last month.

In a recent paper about Covered Call Writing ([5]) I used the Black-Scholes delta as the OTM measure. For this study I initially tried the simple percentage measure and the BS delta. The delta performed consistently better. It seems to be for Puts the natural OTM measure. The VIX scaled measure is similar. But the VIX is an (model-free) average over the whole range of options. As the slope of the smile increases in times of troubles, the delta is more up to the point for OTM options trading.

The long Put strike of 2) is determined in the Larcher papers in relation to the strike of the short position. A typical value of K2 is 0.97*K1. For a short strike of 1830 one enters a long Put with a strike of 1775. To be consistent this study uses here again the BS-delta.

This paper adds an additional Stop-Loss and Entry criterion. It is based on the Implied-Volatility-Term-Structure IVTS. The IVTS was developed and successfully applied in a series of previous working papers (see [6] and the references herein). It is also applied with success in real trading live of the Sibyl fund. The IVTS is the relation between the short and long-term implied volatility. There are several possible combinations (see [6]). The most simple one is the relation between the 1-month VIX and the 3-month VXV.

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IVTS(t) = VIX(t)/VXV(t)
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The IVTS is usually smaller than 1.0. But in times of troubles the VIX explodes much faster than the VXV and the value can go up till 1.5. The IVTS was smoothed in [6] with a median-5 filter. This filter removes short (up to 2 days) implied-volatility spikes. This avoids short term whipsaws. The downside is that one reacts too late to market regime transitions. The median-5 filter improved the result in [6] considerable. This is also the case for Put Writing.
A high IVTS marks an unfavorable market regime for a PutWrite strategy. A new position is not entered if the IVTS is above a given threshold. The IVTS is also used as a Stop-Loss criterion. If the IVTS is above the exit threshold (which has to be higher than the enter level) one closes additionally to the conditions 3a) and 3b) the position.

In the Larcher papers the position is entered like for the PUT index each 3rd Friday. Without a Stop-

Loss the position is kept till the next 3rd Friday. In case of a premature Stop-Loss one stays till the next regular entry date on the sideline.
In [5] the position was rolled over already 2 days before on the Wednesday before the 3rd Friday. One reason for this rule was (and is) a technical one. The available time-series contain only data for the close at Thursday. There is no opening-quotation for the 3rd Friday available. Rolling over on Wednesday also seems to be the more realistic trading behavior. Only a fraction of the open positions is kept till expiry.
Additionally I investigate in the following the effect of rolling-down the position after a Stop-Loss.
As I had for the study in [5] options data for AAPL, GOOG and EBAY available I tested the strategy also for these Nasdaq stocks.
In [3] the authors calculated the performance of the strategy for a total of 4512 parameter combinations. This approach is in my view questionable. One has serious data-snooping effects. But the authors show also that there are several combinations which have a similar strong performance.
This work uses a different approach. The parameter values have been selected by hand. The main criterion for the choice was previous trading experience with similar strategies. Additionally a parameter setting has been selected which works reasonable for the SPX and the Nasdaq stocks. The SPX study was also first done for a time series till Dec. 2012. The rest for another data collection. This split was no research design. It was simply dictated by the lack of a complete time series.
One can easily find for each of the assets a superior parameter setting. But a setting which works for 5 different time series reasonable should be more robust.

Results:

Graphic-1 shows the performance of the strategy for SPX options from 2007-12-03 till 2012-12-11. The time range is dictated by the available data. The OTM delta of the short Put is -0.22 and -0.10 for the long hedge. The closest strike with a delta >= -0.22 or -0.10 is selected. The exit-Factor is 1.01. Once the underlying is below 1.01*strike of the short Put the position is closed. Condition 3b) is set to 15% of the available cash. This condition is never triggered, because the other 2 Stop-Loss rules are stronger. The position is also closed if the median-5 filtered IVTS is above 1.05. The enter threshold is 1.0. A position is not entered if the IVTS is above 1.0. The Pinscher is in the 2008 crash quite alert. The position is closed at 2008-09-11. One stays till 2008-12-15 on the sideline.

The initial cash is 500.000$. This is an arbitrary number used in previous studies. The PutWrite Index and also the Larcher strategies are fully collaterialized. The volume is calculated as

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Vol =  Cash*K/(Strike*100.0)
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K == 1.0 for a fully collateralized position. One would even survive a naked position if the S&P falls to Zero. The current calculations uses a K of 4.0. As the position is hedged by a long position with a strike which is typically 50 points below the short, the worst case can even theoretically not happen.
The Puts are also much more OTM. Although the strategy has a quite attractive Sharpe-Ratio of 1.05, the returns would be for a fully collateralized position not very impressive. The setting K==4.0 corresponds also to the leverage which is used in the Sibyl-Fund for already traded positions.

As an additional rule the position is rolled down after a stop loss, if the maturity is larger than 2 weeks. If the maturity is less than 2 weeks it does not pay the fuss and risk. But the IVTS must be – like for the regular rollover – below the enter threshold of 1.0. If the Stop-Loss happens because the IVTS is above 1.05 no roll-down is done. Only the conditions 3a) and 3b) can trigger a roll-down. The roll-down strikes are determined as before with the BS-delta. They are due to the shorter maturity closer to the underlying (this depends of course also on the volatility). This demonstrates also the superiority of the

delta-measure. For the measures used in the Larcher papers one would have to define different OTM factors for the roll-down. This is probably one of the reasons why the roll down is postponed to further studies.
Following [3] and [5] the price of the short option is set to

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2/3*bid + 1/3*ask
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and

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2/3*ask + 1/3*bid
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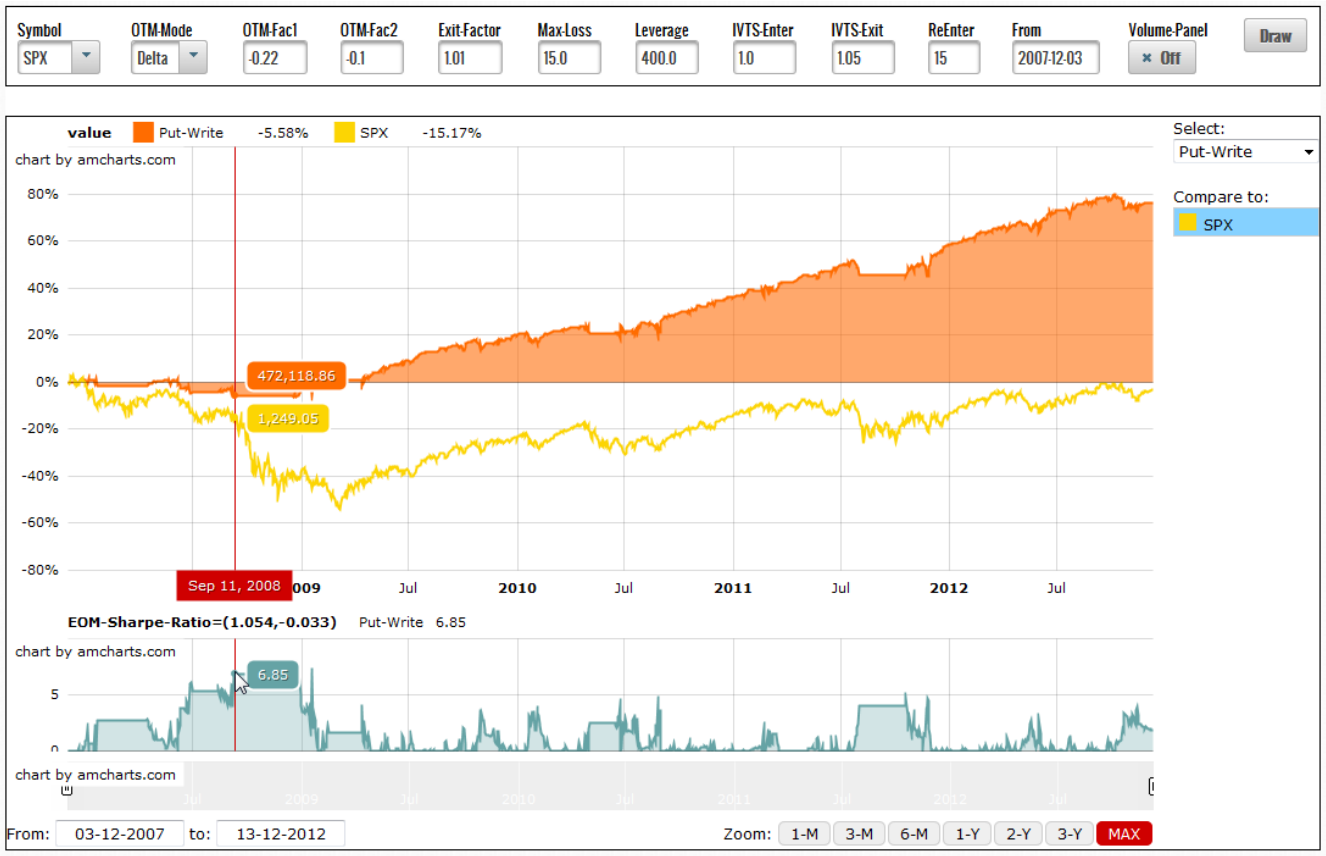
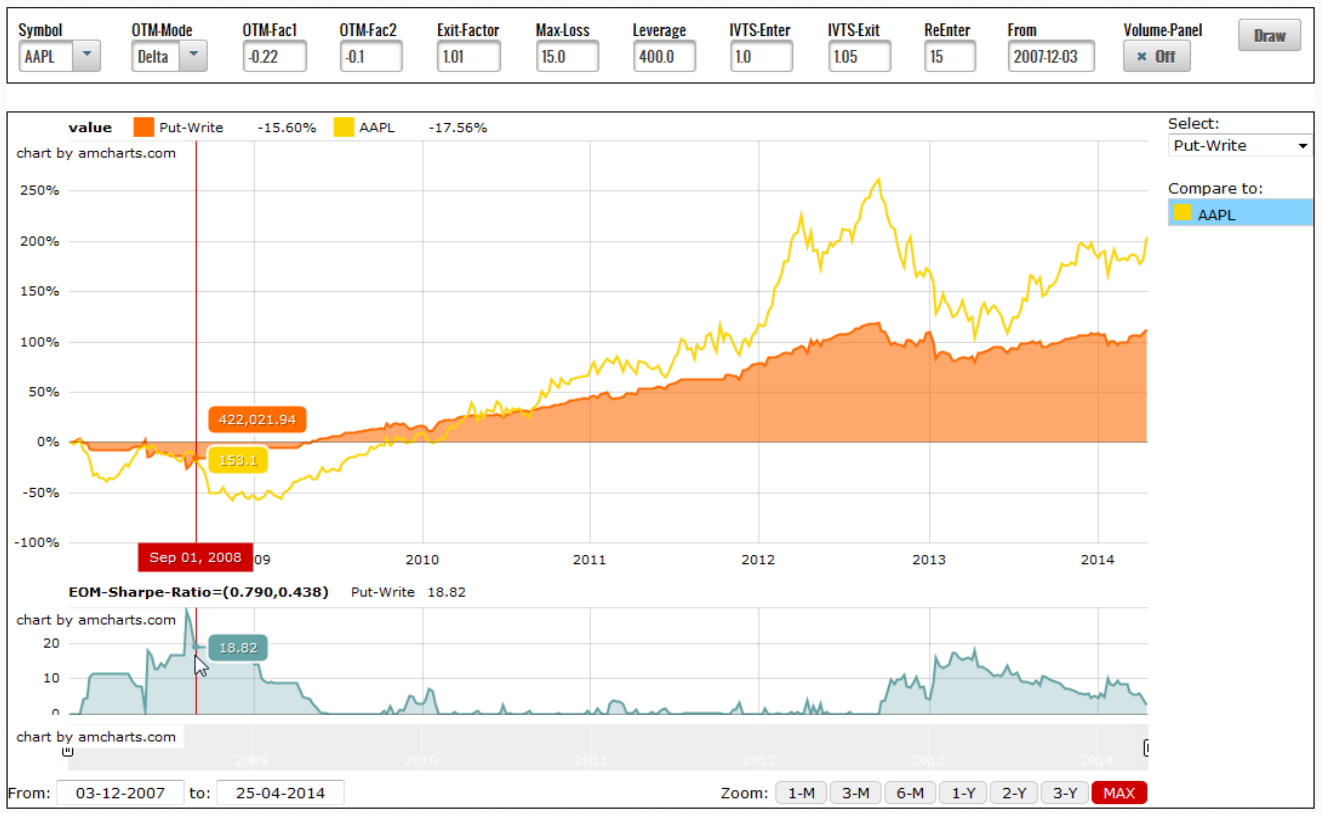
for the closing long. This models the bid-ask spread. No additional trading costs are taken into account.



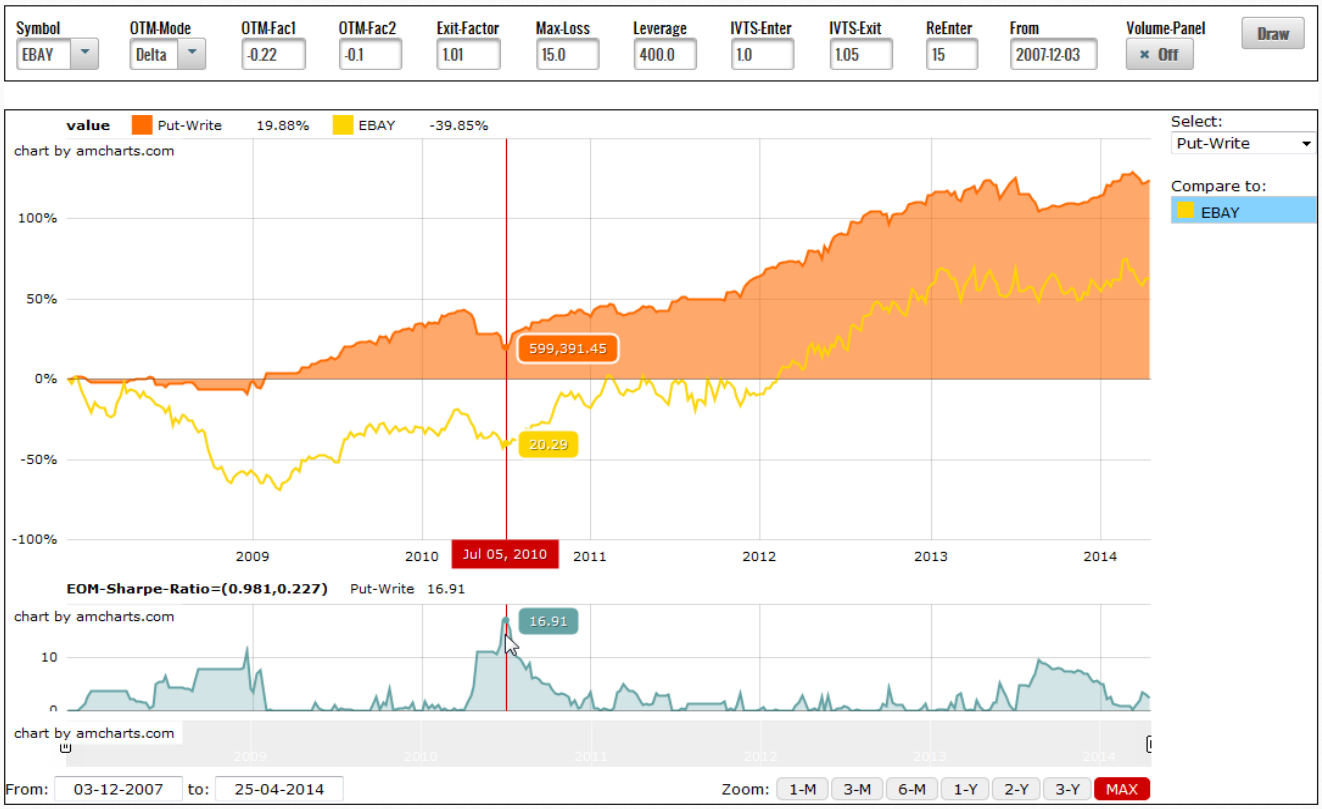
Graphic-1: SPX Pinscher (orange) and SPX Index (yellow) from 2007-12-03 till 2012-12-11

The Pinscher has in the considered time range a performance of 76.3% to -3.7% of the SPX. The Sharpe-Ratio is 1.05. The max. relative Drawdown is 7.7% at 2008-12-17. The max. relative Drawdown of the SPX is 54.9% at 2009-03-06.

Graphic-2 shows the result for the AAPL Pinscher. The time range is from 2007-12-03 till 2014-04-24. I had from the studies in [5] a longer time-series available. The overall return is 112.7% to 204% of AAPL. The return of the Pinscher is restricted by the collected premiums. It is with the given leverage not possible to match the extreme rally of AAPL in 2012. But the Sharpe-Ratio is 0.79 to 0.44.
The max. relative Drawdown is 28.9% at 2008-11-08. This happens already before the full crash in Oct. 2008. It is the consequence of a roll-down which ends in a second Stop-Loss. If one avoids the roll-down the blue drawdown spike left to the red line in Graphic-2 is eliminated. The Sharpe-Ratio increases to 0.82 and the overall win to 132.2%. This is not the only occasion where the roll-down makes things worse. It works in general for the Nasdaq stocks less well than for the SPX. A possible



Graphic-2: AAPL Pinscher (orange) and AAPL (yellow) from 2007-12-03 till 2014-04-24

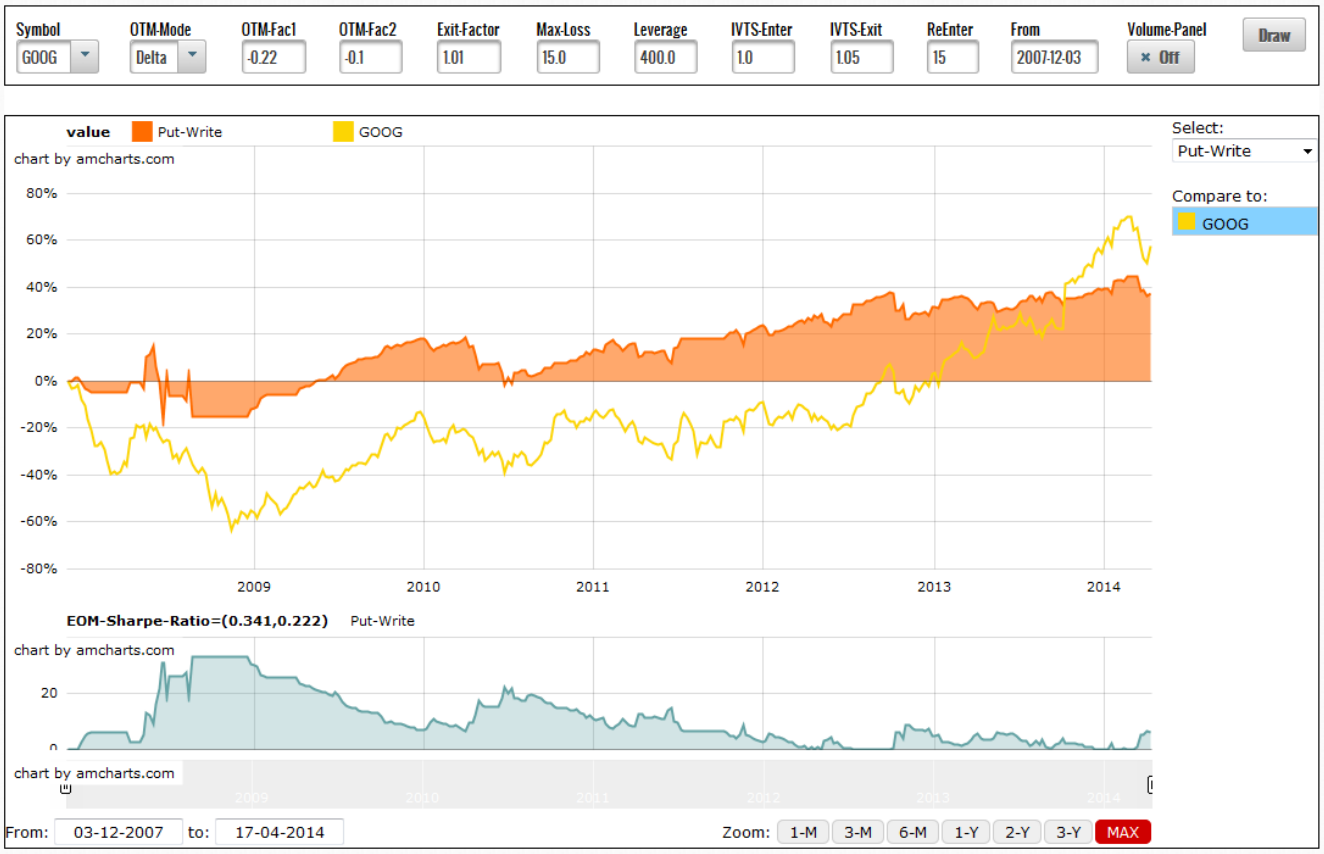


Graphic-3: EBAY Pinscher (orange) and EBAY (yellow) from 2007-12-03 till 2014-04-24

explanation is: The roll-down is avoided if the IVTS is triggered. The IVTS is by construction directly related to the behavior of the SPX. But there is an ample idiosyncratic behavior of the Nasdaq stocks. Note Revision-1: Another explanation are quarterly reports effects. The strategy does not take the quarterly reports into account [7].

Graphic-3 shows the performance of the EBAY Pinscher in the same time range than for AAPL. The performance of EBAY was far less spectacular than AAPL. But the Pinscher performs better than the AAPL breed. The overall performance is 123.9% to 62.6% of the stocks. The Sharpe-Ratio is 0.98 to 0.27. The max. relative Drawdown is 16.9% to 69.8%. EBAY moves over several periods sideways. This is no problem for the Pinscher. The strategy suffers either from sharp drops or a bears-rally.

The GOOG Pinscher has the worst performance (Graphic-4). The stock shows sharp drops and longer periods of decline. But this is compensated by very strong bull-rallies. The Pinscher can not fully participate in these rallies. It behaves similar to a Covered Call. The overall performance is 37.2% to 57.6% of the underlying. The Sharpe-Ratio of the Pinscher is 0.34 to 0.22 of the stock. The max. relative Drawdown is 33.0% to 63.5%.



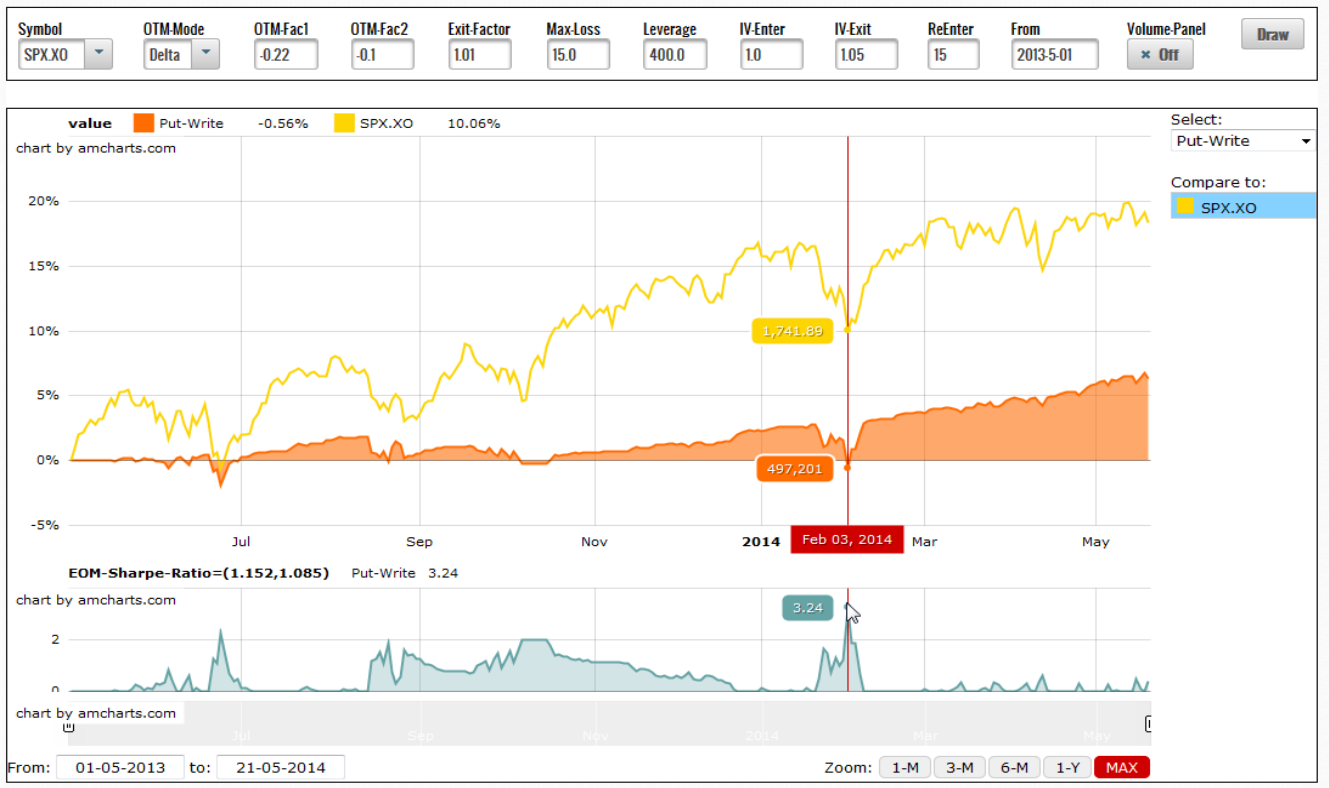
Graphic-4: GOOG Pinscher (orange) and GOOG (yellow) from 2007-12-03 till 2014-04-24

The HF SPX Pinscher:

The historic simulation was so far based on historic daily time-series. The exit conditions are only tested at the close. Usually the underlying has already moved (far) below the exit threshold. But it can also happen that the price moves intraday below the threshold and is at the close above. It is very likely that one looses overall some extra money by reacting too late. But this can happen also in real trading live.

The main problem of the previous study is that the SPX time-series ends already in Dec. 2012. I have collected in real-time HF-data from IqFeed. Unfortunately this data are only available since May 2013. The strikes have only be collected in 25 increments. These 25 modulo 0 strikes (1600, 1625, 1650 ….) have for OTM Puts a (much) higher volume than the strikes in between. As the download capacities are limited I concentrated on the 25 modulo 0 strikes. The effect of this selection is that the actual delta is usually (considerable) below the thresholds. If one has the full range of strikes available the delta is in contrast quite close to the target value.

As there are HF data available the exit triggers are tested intraday every 5 minutes. It is also an out of sample test. The parameters of the strategy were first determined with the daily data and then applied to this sample.



Graphic-5: SPX-HF Pinscher (orange) and SPX Index (yellow) from 2013-05-01 till 2014-05-19

Graphic-5 shows the result of this calculation. The Pinscher is obviously much smoother but the index outperforms the strategy by a wide margin. The overall win is 6.3% to 18.3%. The Sharpe-Ratio is with 1.15 to 1.08 in favor to the options strategy. The max. relative Drawdown is 3.2% to 5.8% on 2014-02-03. One sees again the similarity of the behavior with a Covered Call (see also the results in [5]).

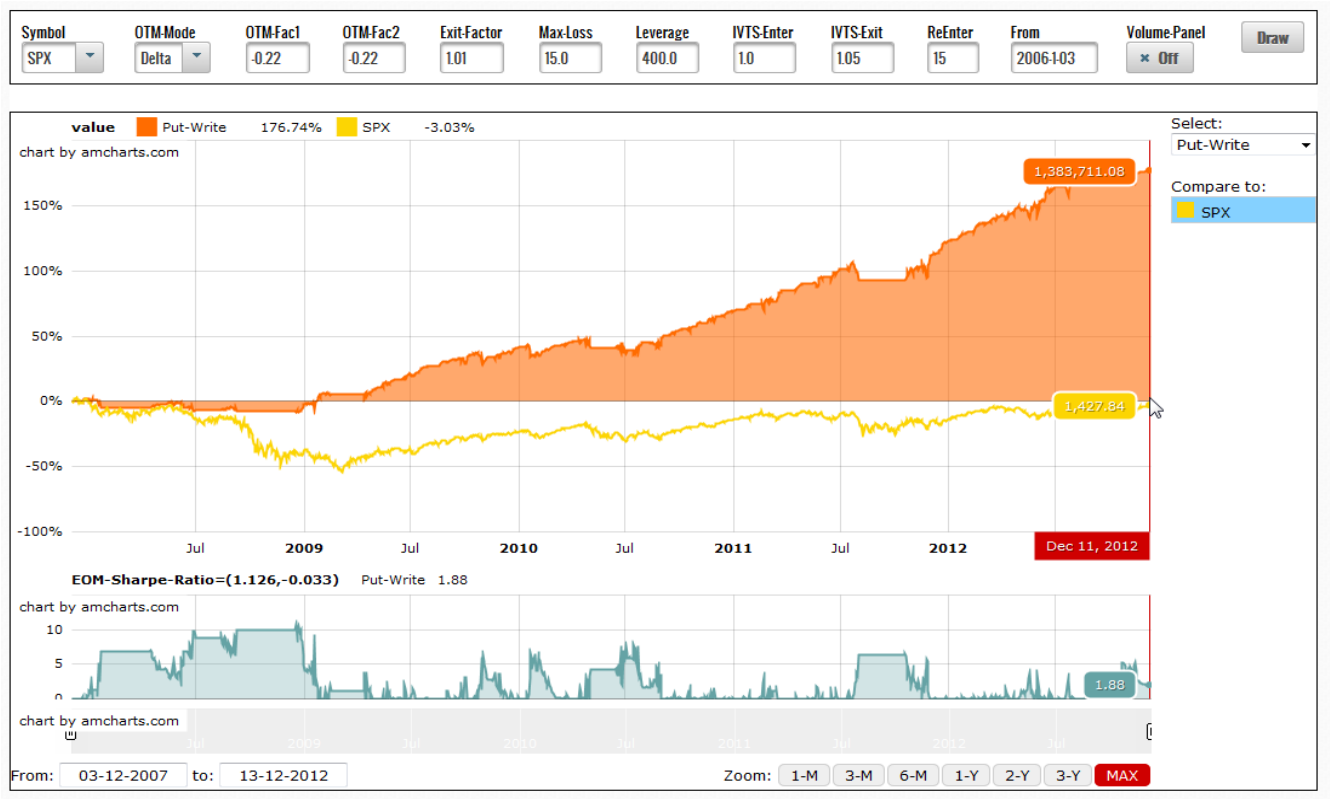
One could of course increase the leverage to boost the performance.

The Doberman Pinscher:

The Doberman Pinscher or simply Doberman, is a breed of domestic dog originally developed around 1890 by K. Dobermann, a tax collector from Germany.
(en.wikipedia.org/wiki/Doberman_Pinscher)

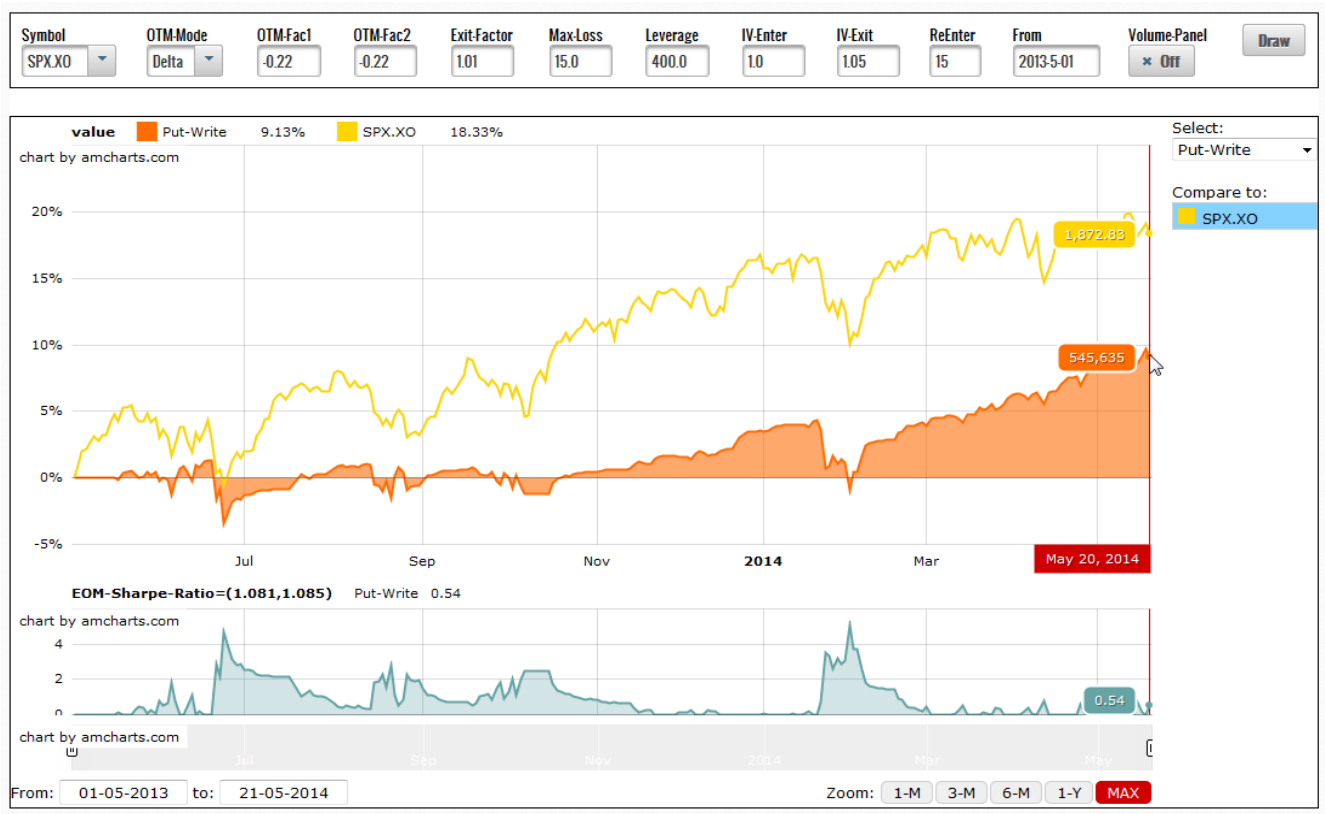
The Doberman is taller and more aggressive than his Austrian cousin. If a stranger enters a house the Austrian barks, the German attacks.
Note: The dogs represent quite well the different national behaviors.

The Doberman strategy trades only the short Put. The combination of OTM short and far OTM long has the problem that one trades against the smile. The implied-volatility of the far OTM is higher.
Graphic-6 shows the performance of the Doberman for the daily data (the related Austrian Pinscher chart is Graphic-1).
The Doberman has a performance of 176.7% (76.3%). The Sharpe-Ratio is 1.13 (1.05). The max. relative Drawdown is 10.8% (7.7%) at 2008-12-17. The numbers in parenthesis are the values for the Austrian. The Doberman has a somewhat larger Drawdown, but otherwise he is clearly superior.
The situation is not so clear cut for the HF time series. The overall win is 9.1 (6.3%). The Sharpe-Ratio is 1.08 (1.15). The max. relative Drawdown is 5.1% (3.2%) on 2014-02-03.



Graphic-6: SPX Doberman (orange) and SPX Index (yellow) from 2007-12-03 till 2012-12-11

The Doberman works also well for EBAY. The overall performance is 418.3% (123.9%). The Sharpe-Ratio is 0.97 (0.98). The max. relative Drawdown is 37.6% (16.9%). There is simply more risk and more fun. But it is a full blown disaster for AAPL and GOOG.



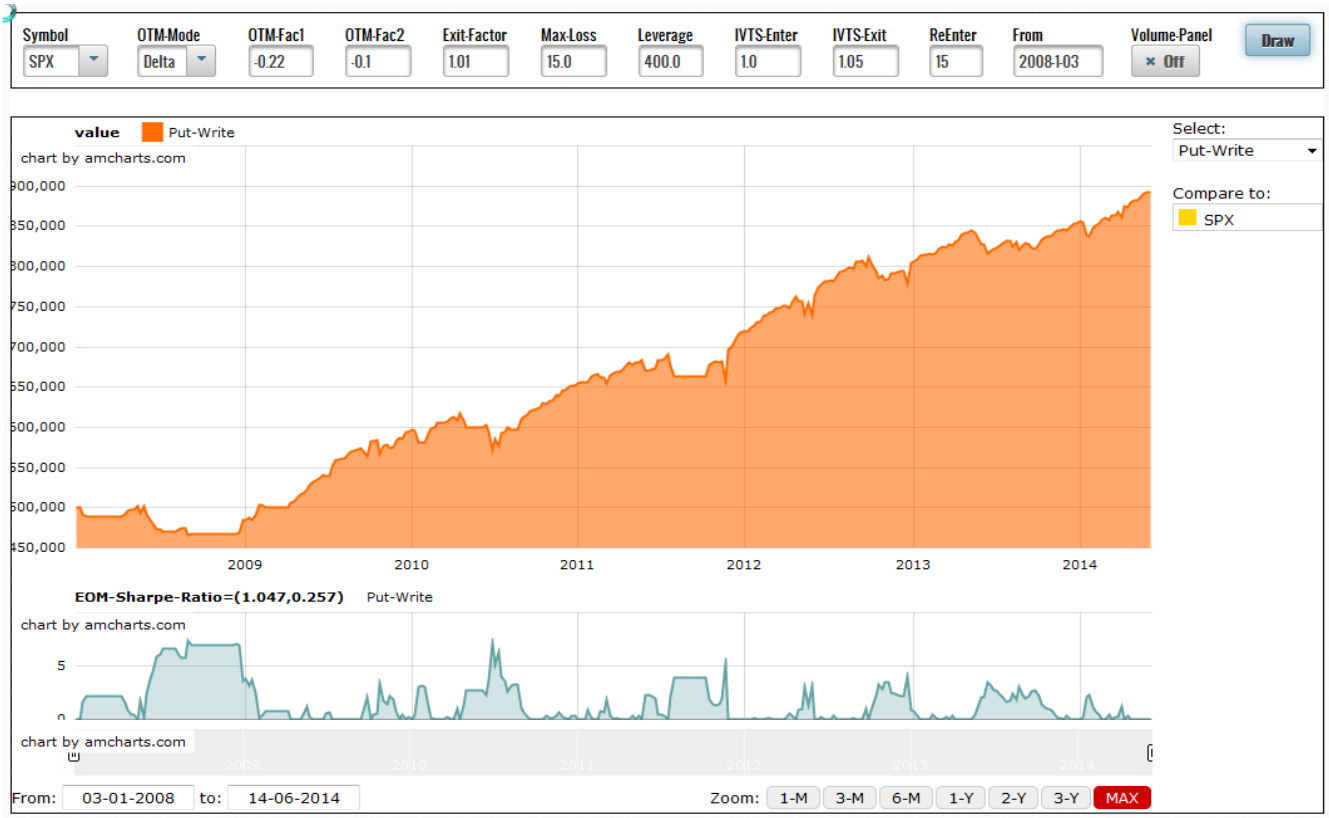
Graphic-7: SPX-HF Doberman (orange) and SPX Index (yellow) from 2013-05-01 till 2014-05-19

Extending the SPX Options simulation (Revision 1):

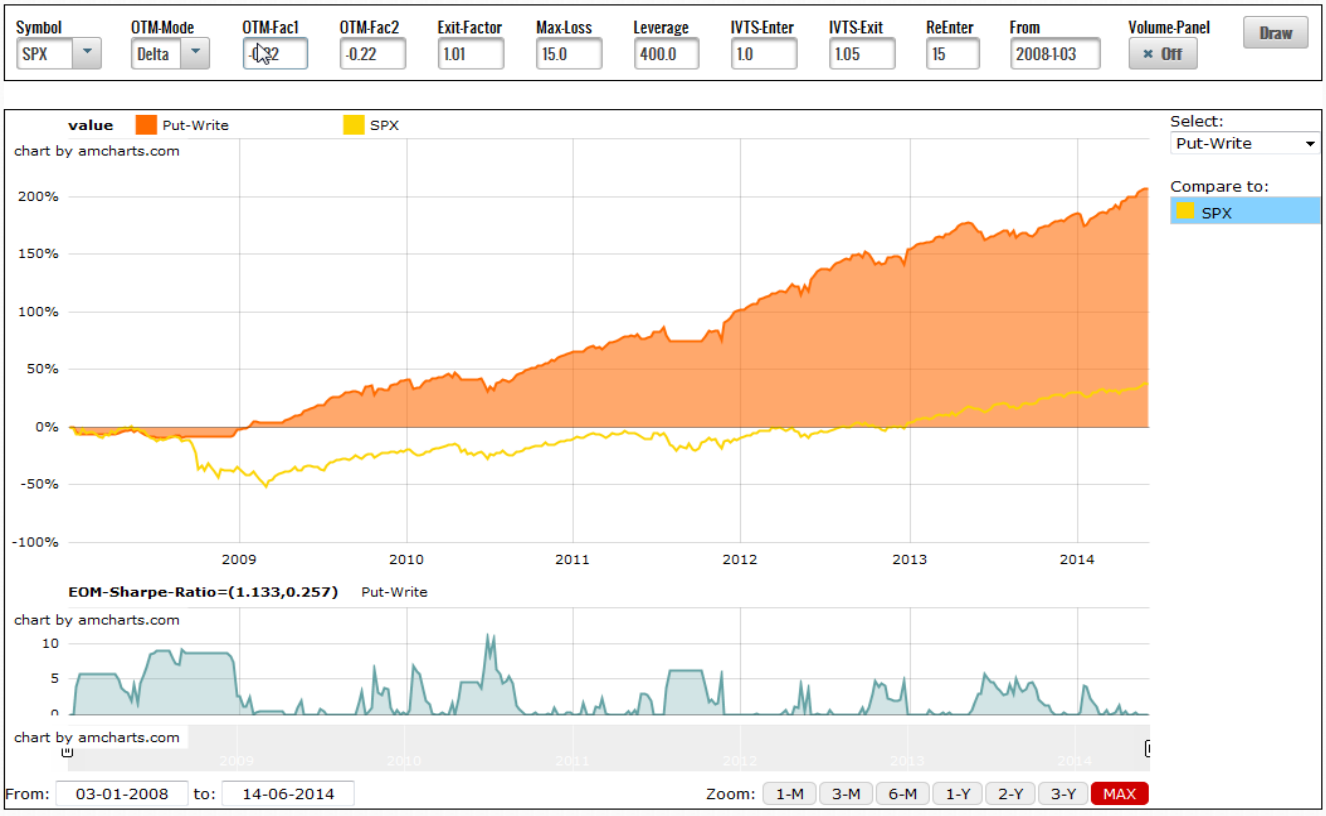
In the original version the historic simulation ended at 2012-12-11. The Sibyl-fund has bought in the meantime new SPX Options data from Deltaneutral. The range of this time-series is from 2008-01-03 till 2014-06-13. The calculation of Graphic-1 is hence repeated for this new time range. The data of the original study are from another data-provider. I could have concatenated the two time-series to extend the simulation back to 2007. But the format and the available information is different. Sticking the two data sets together would have been a nasty task without much additionally insight. Hence the current study uses only the available Deltaneutral data. The used methods are exactly the same. But there are slight discrepancies in the two data sets. So the results differ also slightly in the common time range.

Graphic-8 shows the result of the extended historic simulation. The Pinscher has in the considered time range a performance of 78.4% to 37.2% of the SPX (The SPX has catch-ed up since the end of the previous study). The Sharpe-Ratio is 1.05 to 0.26. The Sharpe Ratio of 1.05 is exactly the same value than in the original study. The max. relative Drawdown is 7.4% at 2008-09-01. The max. relative Drawdown of the SPX is 52.9% at 2009-03-06.

Graphic-9 shows the performance of the Doberman. The overall win are impressive 206.2% with a Sharpe-Ratio of 1.13. This is again the same Sharpe-Ratio than in the original study. The max. relative Drawdown is 10.8% at 2010-06-28.



Graphic-8: SPX Pinscher (orange) and SPX Index (yellow) from 2008-01-03 till 2014-06-13



Graphic-9: SPX Doberman (orange) and SPX Index (yellow) from 2008-01-03 till 2014-06-13

Conclusion:

The Pinscher strategies have a similar performance pattern than Covered-Call Writing as discussed in [5]. The Turtle is preferable to the Pinscher if one owns the stock already (this was the starting point for the analysis in [5]). But for the SPX the Pinscher seems to be more appropriate. The results in [3],[4] can not directly be compared to this study. Adding the IVTS trigger improves the performance for the available time series significantly. It also seems to be advantageous to roll over already on Wednesday. The roll down works reasonable for the SPX. It is a mixed blessing for the Nasdaq stocks. If one wants to play save the Austrian Pinscher is the better choice. The Doberman is more risk and fun.
The out of sample test of Revision-1 confirmed the original results. The Sharpe-Ratio and the overall characteristics of the original performance are practically the same.

Further Work:

Another interesting combination could be a short Put and a long VIX Futures position (or the other way round). Instead with a long Put one hedges with VIX Futures. This combination is probably only for the SPX a viable alternative. The motivation of this hedge is that the VIX represents an implied-average. The implied volatility of the far OTM long Put is higher. But VIX futures have their own logic and only an empirical investigation can answer this question.
Note Revision-1: This work has been done in the meantime. It works indeed reasonable. The results can be found in [8].

References:

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[2] Ungar, J., Moran M.: The Cash-secured PutWrite Strategy and Performance of Related Benchmark Indexes. Journal of Alternative Investments, Spring 2009
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