

# **Does Short Term Stop-Loss Rule can be Sufficient Substitute to Buy and Hold Strategy?**

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### **Abstract**

In this paper we show on US equity and bond indices what is the optimal stop-loss interval to use. In one hand, long term interval stop-loss can help investors to avoid market crashes while being out of the market, however, investors can also lose the best days too. On the other hand, statistically, short term stop-loss rule may not miss the best days because investors spends more time within the market, however, they expose to big drops. We prove that short-term (minimum daily) stop-loss is significantly outperform buy and hold strategy, long-term stop-loss portfolios and even improve trend following strategies by being additional timing layer – all for both long and short positions.

## a. Introduction

Stop loss is a risk management tool which help practitioners to control their risk by covering positions and moving to safety assets such as cash, short term Treasury bill, etc. Using stop loss has significant advantage and it's by decreasing portfolio volatility and drawdown, however, it may reduce portfolio return because investors are out of the market. Statistically, equity markets increases over time although big drops during different periods. Therefore, being out of the market can be risk too by missing positive days. As long as the volatility and drawdown decreases with higher magnitude than the return, we can consider a positive influence of the stop-loss trading rule on portfolio investor. Yufeng Han, Guofu Zhou and Yingzi Zhu (2014) shows how using stop loss with momentum (Jegadeesh and Titman, 1993) can avoid momentum crashes. Notwithstanding, they show how by using simple stop-loss method both increase the return and decrease the volatility and drawdown at the same time. Two important parameters has crucial effect on the stop-loss trading rule: (a) stop-loss level (b) stop-loss interval. Picking tight stop-loss level can throw investor very fast out of the market, while picking wide stop-loss level might be not effective and produce performance which are very similar to buy and hold strategy. The opposite logic works on the stop-loss interval: tight interval might be not effective because lower odds that the stop-loss will be trigger, while wide interval keep investor for a while out of the market. Main questions is what should be the 'n' period of being out of the market? After stop loss has triggered, when should investors to rebuild both their long and short positions? Most likely is to do it on rebalance date, but we'll show another approach for this phenomenon.

[TO BE COMPLETED]

## b. Data and methodology

We use daily ETF data from Bloomberg Terminal. The ETF represent diversified asset classes and sectors. For the equity asset class we use SPY (SPDR S&P 500 ETF TRUST), EFA (ISHARES MSCI EMERGING MARKET), for bond asset class we use TLT (ISHARES 20+ YEAR TREASURY BO).

Technicians use their strategy for extracting the winners and the losers from a given universe. When they decide to open long and short positions, it means they believe based on their strategy that the winners should outperform the losers. However, in time varying market the expected return of the strategy should be positive, but it doesn't mean the probability equal to 1. This is where the stop loss step in. for occasions like this, using stop loss as a risk management tool can cut off extremely portfolio loses, however it is significantly important to use it right. We claim that if the investor ranked correctly his assets, then eventually the winners will outperform the losers, although some crashes can happens in the middle. Therefore, investors should keen to be as close as they can to the buy and hold approach and not stay out of the market for a long time. In addition, it is very difficult timing the market and to know what is exactly the pick or the trophic. Missing best (long) days or worst (short) days because of the stop loss can be significant parameter on the portfolio, how significant? The annualized buy and hold return of the SPY from 1993-02-01 to 2015-01-31 was 9.136%, but if we remove only the best 10 observations (from 5540 observations), the annualized return shrinks to 5.57% - about 39% less each year! And what happens if we remove the worst 10 observations? The SPY annualized return increases to 13.02%, more than 42% per year. For bullish investor who missed the best 10 days or bearish investor who missed the worst 10 days this absence can be crucial. How can investor to avoid occasions like this without jeopardizing his portfolio when market goes for the wrong direction? Using the last sample, we can understand better what might be the influence of only 0.1% days (from during 22 years), therefore, our stop loss mechanism should consider this phenomenon which mean minimize the days out of the market.

On each every day we calculate the return with respect to the previous close:

$$(1) R_t^x = \frac{P_t^x}{P_{t-1}^c} - 1 - sg \quad , \quad x \in O, H, L$$

$$(2) 0 \leq sg \leq 0.01\%$$

Where  $x$  is the open, high and low price on day  $t$ . For long portfolio we calculate the open return,  $R_t^O$  and the low return,  $R_t^L$  while for short portfolio we calculate open return and high return,  $R_t^H$ .  $sg$  consider as slippage and our stop-loss level denoted by  $S$  where in:

Long portfolio:

$$(3) R_t^O \geq -S \geq R_t^L \rightarrow R_t = -S - sg$$

$$(4) R_t^O < -S \rightarrow R_t = R_t^O - sg$$

When the negative stop-loss level is between open to low return, then our daily return considered as the negative stop-loss level minus slippage<sup>1</sup>. When the negative stop-loss level is higher than the open return, then our daily return considered as the open return minus slippage.

Short portfolio:

$$(5) R_t^O \leq S \leq R_t^H \rightarrow R_t = S + sg$$

$$(6) R_t^O > S \rightarrow R_t = R_t^O + sg$$

When stop-loss level is between open to high return, then our daily return considered as the stop-loss level plus slippage. When the stop-loss level is lower than the open return, then our daily return considered as the open return minus slippage.

[TO BE COMPLETED]

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<sup>1</sup> We assume continuously trading without gaps within the trading hours.

### c. Performance

We ran different daily stop-loss level for both long and short portfolios with and without slippage first for different ETFs. Substantially we construct winners minus losers portfolio and equally weight portfolios from the long only. Finally, we implement the stop-loss rule as enhancement for simple moving average method.

#### a. Stop loss SPY vs. SPY

Between 01/01/04-2015/10/13 we back-tested this rule on the SPY ETF. In this period the top portfolio achieved 11.54%, 16.95% and -37.46% annualized return, standard deviation and drawdown, respectively, while the SPY performance were 7.25%, 19.45% and -55.19%. Furthermore, the long portfolio didn't miss the best daily return during this period (14.52%), but it did avoid the worst daily return (-9.85%) and its maximum daily loss were -6.23% instead. When we examine the bottom portfolio, we receive corresponded results – Bottom portfolio performance are: 5.22%, 17.15% and -57.45% annualized return, standard deviation and drawdown, respectively. We can find that the bottom portfolio didn't miss the worst daily return during this period (-9.85%), which is the aim of short sellers investors, but it did avoid the maximum daily return (14.52%) and gained only 7.13% instead.

To be complete – explain the meaning of table 1 results.

b. Stop loss TLT vs. TLT

Between 01/01/04-2015/10/13 we back-tested this rule on the TLT ETF. The long portfolio achieved 10.58%, 13.48% and -21.25% annualized return, volatility and drawdown, respectively, while the benchmark achieved 7.32%, 14.09% and -26.58%. Furthermore, the long portfolio didn't miss the best day in this period, 5.17% daily return, but it did avoid the worst daily return (-5.04%) and had only -3.48%. with the bottom portfolio the results are corresponded to the top: 2.74%, 13.25% and -33.18% annualized return, volatility and drawdown, respectively. Also here the short portfolio didn't miss the worst daily return, -5.04%, but it did avoid the maximum daily return (5.17%) and reached only 3.54%.

c. SPY-TLT portfolio



d. SPY SMA

e. TLT-SMA

#### **d. Strength and weakness – overnight effect**

We have shown how significant is the impact of missing the best and worst observation on the S&P index between 1993-02-01 to 2015-01-31. For long (short) investors, missing the best (worst) 10 observation means decreasing (increasing) the annualized return by approximately 39% (42%), respectively. Therefore, equity investors should be fully invested in the markets. Nevertheless, being invested in the market might not be enough because the timing has meaning too. Let us decompose the daily return to two different periods: overnight return and day return. The overnight return equal to  $P_{t+1}^o/P_t^c - 1$  while the day return equal to  $P_{t+1}^o/P_{t+1}^c - 1$ . Overnight returns tend to be higher than day returns. This effect happens because high opening prices which decline subsequently in the first hour (Michael Cliff, Michael J Cooper and Huseyin Gulen (2008)). It means that the biggest price changes appears overnight and being embedded within the opening price. During the overnight a lot of information flows, both macro and micro data, general news, financial statements (most of the important financial statements of companies are being published when the market is close), etc. Investors can't do anything with all of the data and they need to wait for the opening to react (we ignore OTC trading, pre-market and after hour trading). All of the information which gathered between  $P_t^c$  to  $P_{t+1}^o$  is going to be concentrated and implemented at the first second of the open price. When the market is opened, investors can decide whether to buy or sell their securities based on the data from the last trading day. This is why being invested during overnight is crucial for optimizing the daily return. This phenomenon shows that investors who buy (sell) the market at the opening and sell on the closing on daily basis are not protected from missing the best (worst) days. Using this phenomenon, we have decided to return to the market when the stop-loss is triggered at the closing of the same day – to ensure we won't miss the open return of the next day.

The daily stop-loss indicator can't avoid the open return. If the market plunge at the opening and the open price is lower (higher) than our long (short) daily stop-loss, then

[TO BE COMPLETED]

**e. Conclusion**

[INSERT EXPLANATION HERE]

**f. References**

- a. Jegadeesh, Narasimhan and Sheridan Titman, 1993, Returns to buying winners and selling losers: Implications for stock market efficiency, *Journal of Finance* 48, 65–91.
- b. Yufeng Han, Guofu Zhou and Yingzi Zhu, 2014, Taming Momentum Crashes: A Simple Stop-Loss Strategy.
- c. Mebane T. Faber, 2007, A Quantitative Approach to Tactical Asset Allocation, *The Journal of Wealth Management*.
- d. Michael Cliff, Michael J Cooper and Huseyin Gulen, 2008, Return Differences between Trading and Non-trading Hours Like Night and Day, unpublished working paper.
- e. Odean, Terrance, 1998, Are investors reluctant to realize their losses? *Journal of Finance* 53, 1775–17.

**g. Appendix**

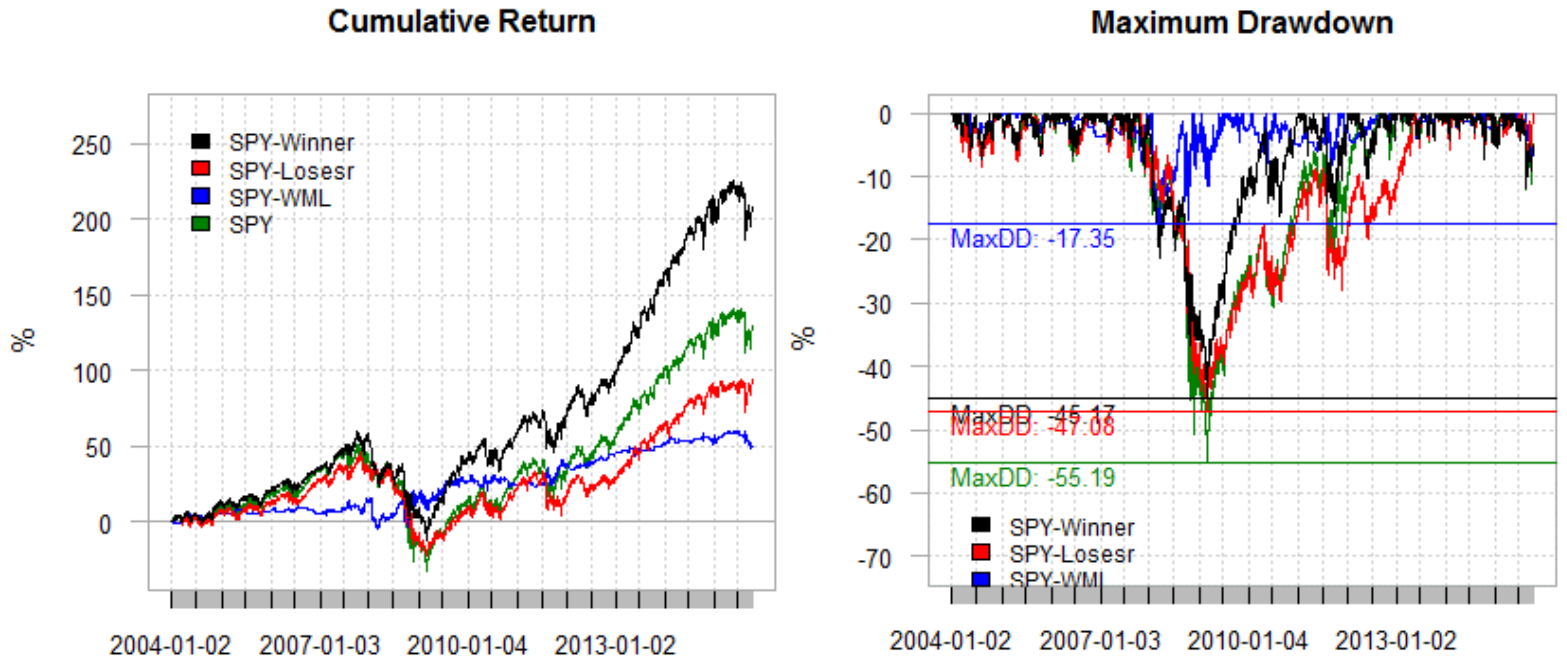
**Table 1: summary statistics of 1% daily stop loss – 01/01/2004 – 13/10/2015**

We compare the summary statistics of the daily returns of the buy and hold SPY, daily stop loss SPY top and daily stop loss SPY bottom. For stop loss level we use dynamically 1% with respect to last adjusted close (daily calibration).

<b>Variable</b>	<b>Mean (%)</b>	<b>SD (%)</b>	<b>DrawDown (%)</b>	<b>SR</b>	<b>Calmar Ratio</b>	<b>Skewness</b>	<b>Kurtosis</b>
Panel A: 1% last close daily stop-loss							
<b>SPY-Winner</b>	9.97	16.42	-45.17	0.61	0.22	1.92	25.59
<b>SPY-Loser</b>	5.74	16.39	-47.08	0.35	0.12	-1.68	13.13
<b>SPY-WML</b>	3.46	12.3	-17.35	0.28	0.2	1.21	29.03
<b>SPY</b>	7.25	19.44	-55.19	0.37	0.13	0.21	19.15
Panel B: 1% long stop-loss, 1.5% short stop-loss							
<b>SPY-Winner</b>	9.97	16.42	-45.17	0.61	0.22	1.92	25.59
<b>SPY-Loser</b>	4.89	17.19	-47.08	0.35	0.12	-1.68	13.13
<b>SPY-WML</b>	4.25	11.84	-17.63	0.36	0.24	-1.46	11.84
<b>SPY</b>	7.25	19.44	-55.19	0.37	0.13	1.34	19.15
Panel C: 1% open daily stop-loss							
<b>SPY-Winner</b>	11.54	16.95	-37.46	0.68	0.31	1.61	22.67
<b>SPY-Loser</b>	5.21	17.15	-57.45	0.3	0.09	-1.32	12.97
<b>SPY-WML</b>	5.37	10.4	-10.89	0.52	0.49	0.56	31.17
<b>SPY</b>	7.25	19.44	-55.19	0.37	0.13	0.21	19.15

**Figure 1 - Table 1 – Cumulative Return and Maximum drawdown 01/01/2004 – 13/10/2015**

**Figure 1.1 - Panel A:**



**Figure 1.2 - Panel B:**

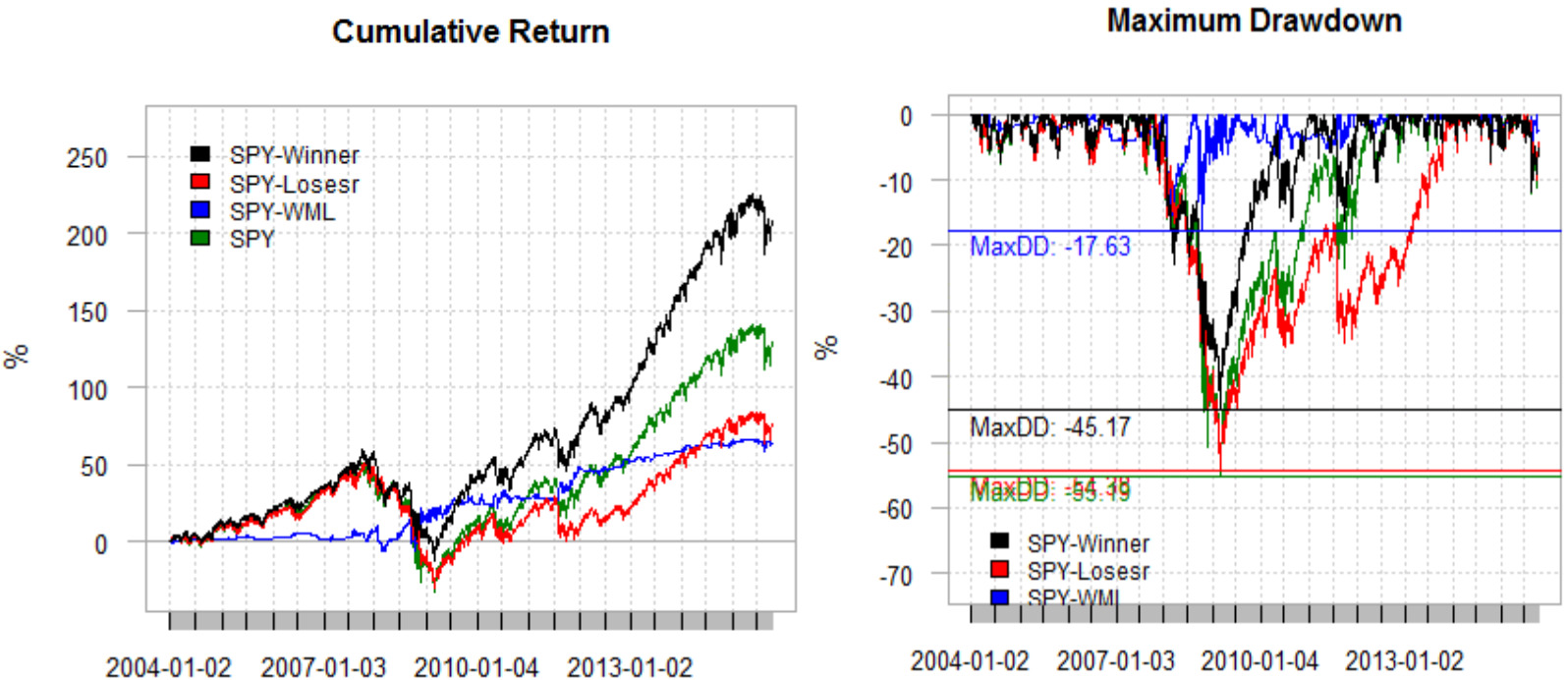
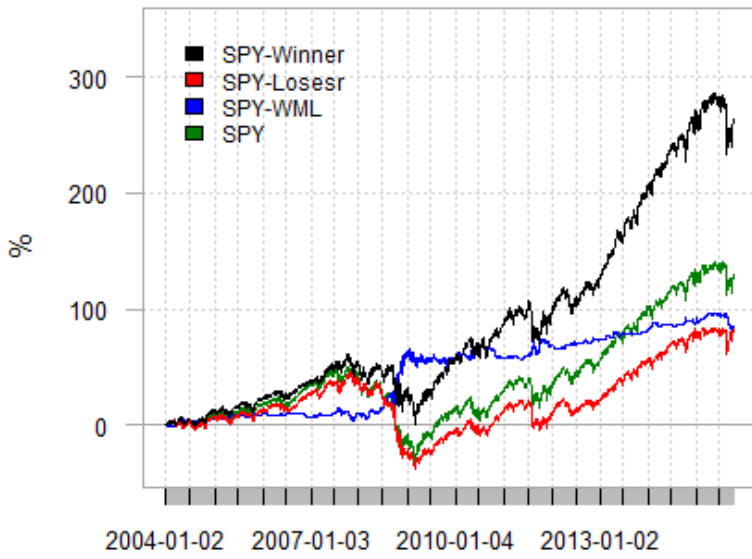
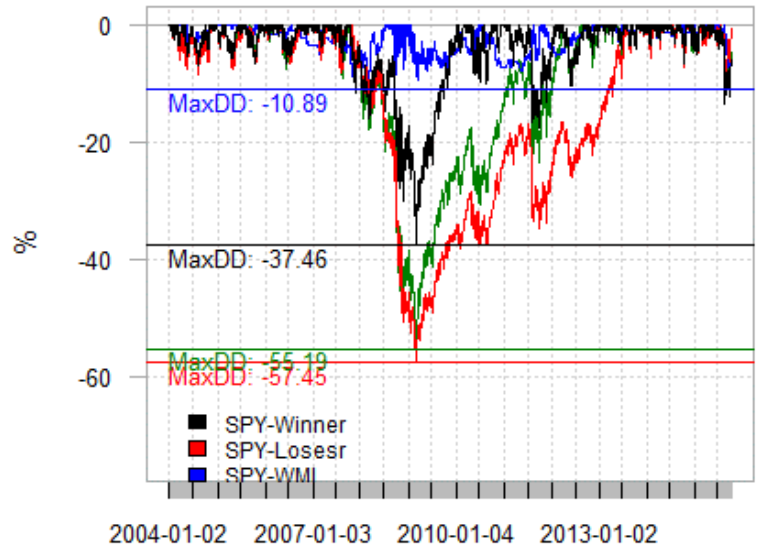


Figure 1.3 - Panel C:

Cumulative Return



Maximum Drawdown





**Table 2: summary statistics of TLT daily stop loss – 01/01/2004 – 13/10/2015**

We compare the summary statistics of the daily returns of the buy and hold TLT, daily stop loss TLT top and daily stop loss TLT bottom. For stop loss level we use dynamically 1% with respect to last adjusted close (daily calibration).

<b>Variable</b>	<b>Mean (%)</b>	<b>SD (%)</b>	<b>DrawDown (%)</b>	<b>SR</b>	<b>Calmar Ratio</b>	<b>Skewness</b>	<b>Kurtosis</b>
Panel A: 1% last close daily stop-loss							
<b>TLT-Winner</b>	12.42	13.08	-21.3	0.95	0.58	0.59	4.41
<b>TLT-Loser</b>	2.51	13	-35.88	0.19	0.07	-0.54	4.03
<b>TLT-WML</b>	9.47	6.02	-10.05	1.57	0.94	0.58	16.7
<b>TLT</b>	7.21	14.09	-26.58	0.51	0.27	0.05	4.88
Panel B: 0.5% last close daily stop-loss							
<b>TLT-Winner</b>	14.94	12.19	-21.3	0.95	0.58	0.59	4.41
<b>TLT-Loser</b>	0.83	11.98	-35.88	0.19	0.07	-0.54	4.03
<b>TLT-WML</b>	13.75	8.49	-20.11	1.62	0.68	-0.82	5
<b>TLT</b>	7.21	14.09	-26.58	0.51	0.27	0.37	4.88
Panel C: 1% open daily stop-loss							
<b>TLT-Winner</b>	10.48	13.42	-21.25	0.78	0.49	0.39	4.6
<b>TLT-Loser</b>	2.64	13.25	-33.18	0.2	0.08	-0.33	4.46
<b>TLT-WML</b>	7.51	5.05	-6.8	1.49	1.11	0.84	21.3
<b>TLT</b>	7.21	14.09	-26.58	0.51	0.27	0.05	4.88

Figure 2-Table 2 – Cumulative Return and Maximum drawdown 01/01/2004 – 13/10/2015

Figure 2.1 - Panel A:

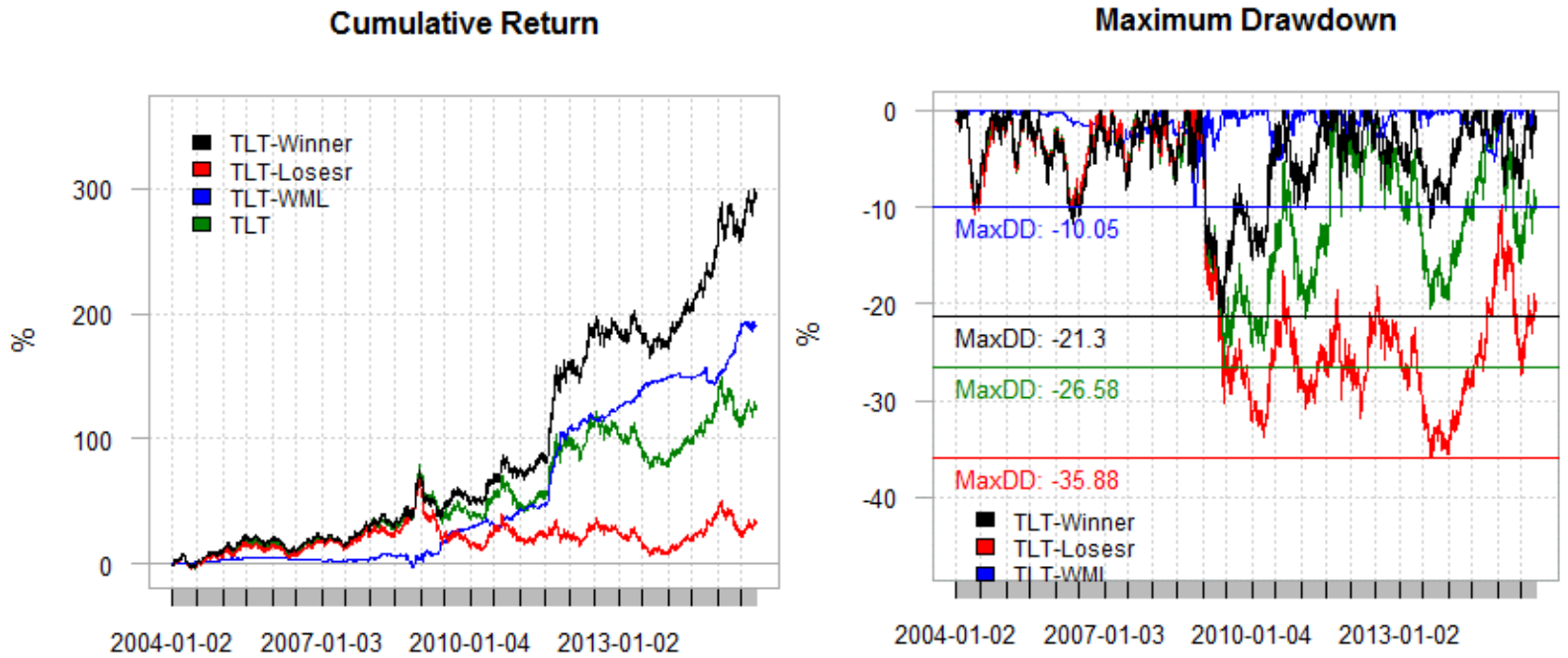


Figure 2.2 – Panel B:

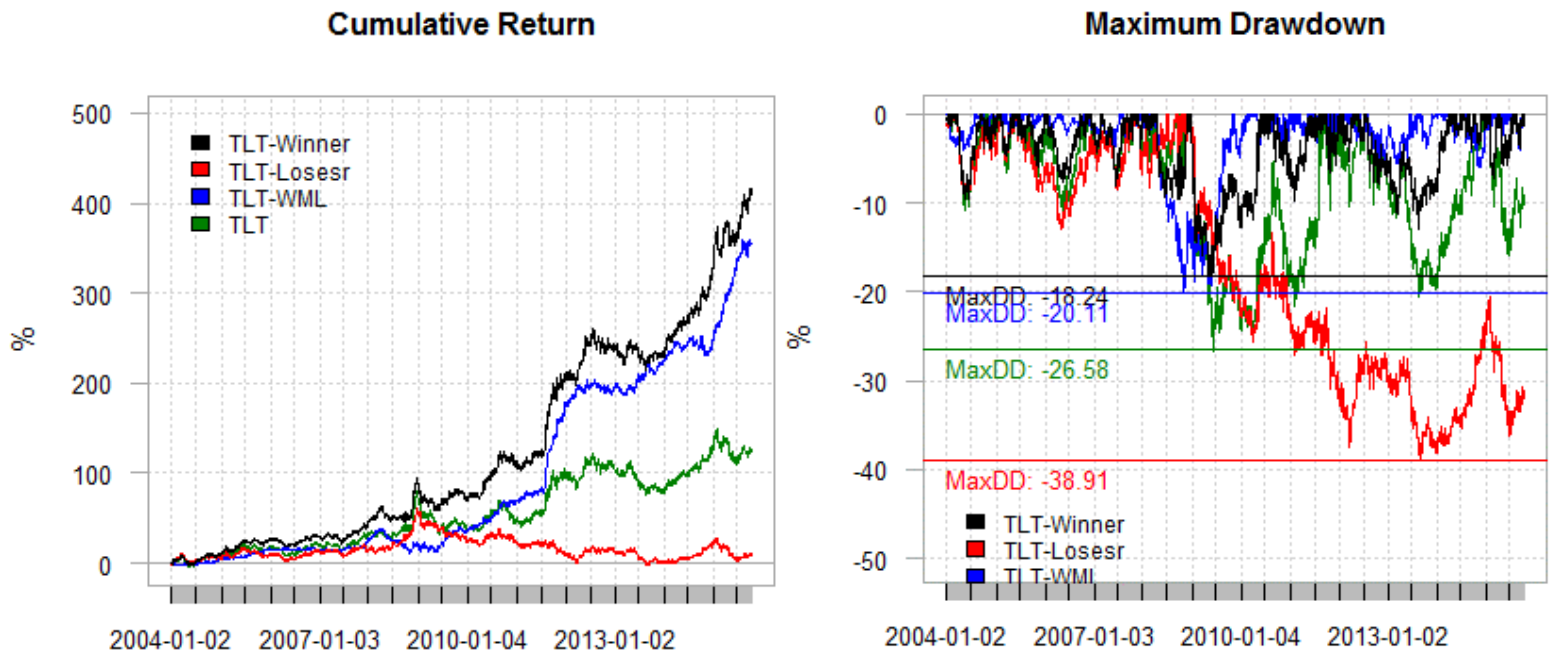
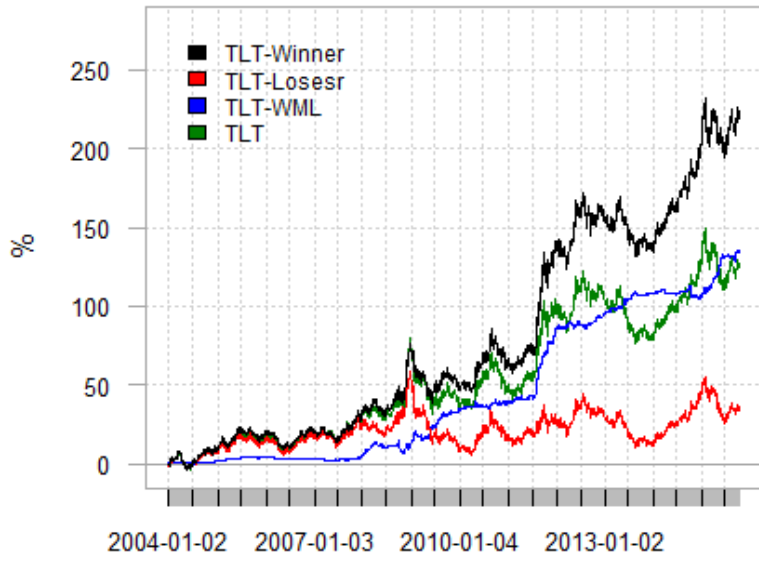
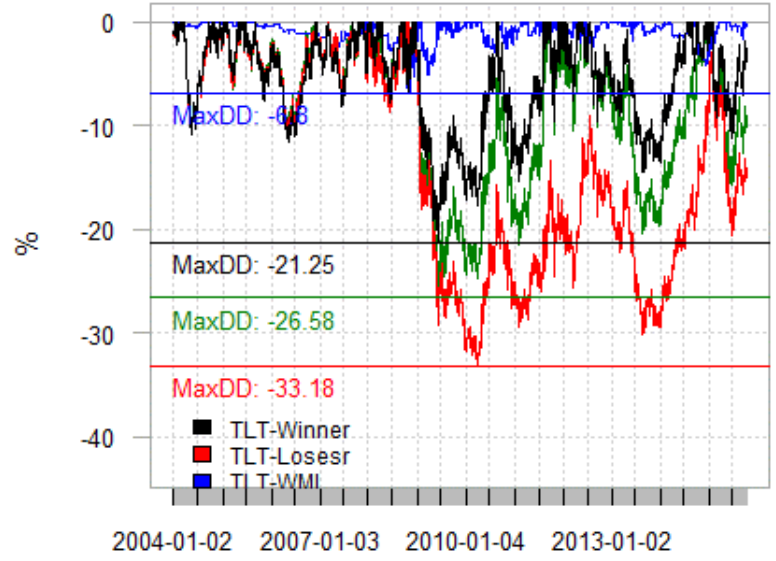


Figure 2.3 – Panel C:

Cumulative Return



Maximum Drawdown



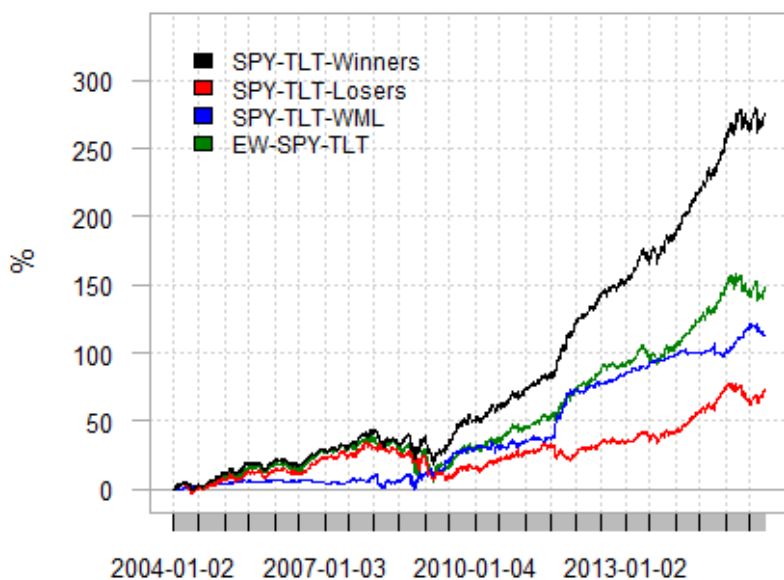
**Table 3: summary statistics of SPY-TLT equal weight portfolio with daily stop loss –  
01/01/2004 – 13/10/2015**

We compare the summary statistics of the daily returns of the equally weight buy and hold SPY-TLT, daily stop loss equally weight SPY-TLT top and bottom. For stop loss level we use dynamically 1% with respect to last adjusted close (daily calibration).

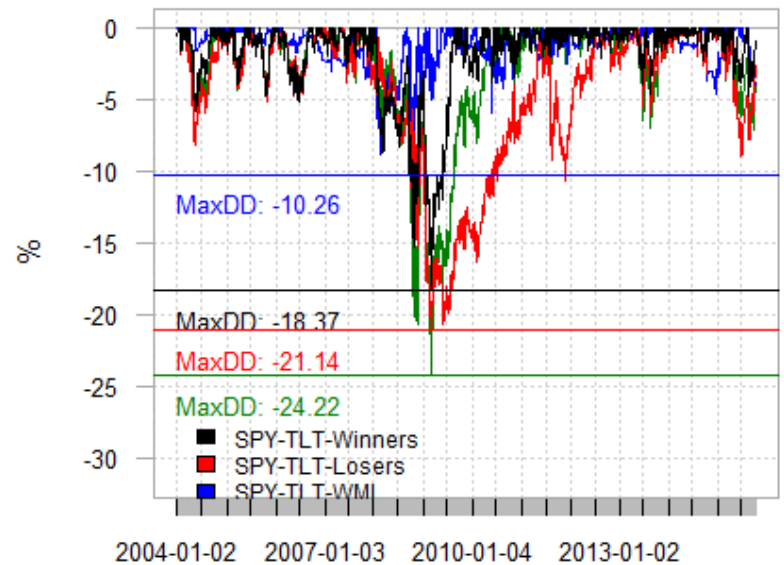
Variable	Mean (%)	SD (%)	DrawDown (%)	SR	Calmar Ratio	Skewness	Kurtosis
1% last close daily stop-loss							
<b>SPY-TLT-Winner</b>	11.89	8.54	-18.37	1.39	0.65	0.82	15.34
<b>SPY-TLT-Loser</b>	4.74	8.31	-21.14	0.57	0.22	-0.87	7.79
<b>SPY-TLT-WML</b>	6.63	7.42	-10.26	0.89	0.65	0.98	21.16
<b>EW-SPY-TLT</b>	7.99	9.07	-24.22	0.88	0.33	0.16	10.9

**Figure 3-Table 3 – Cumulative Return and Maximum drawdown 01/01/2004 – 13/10/2015**

**Cumulative Return**



**Maximum Drawdown**

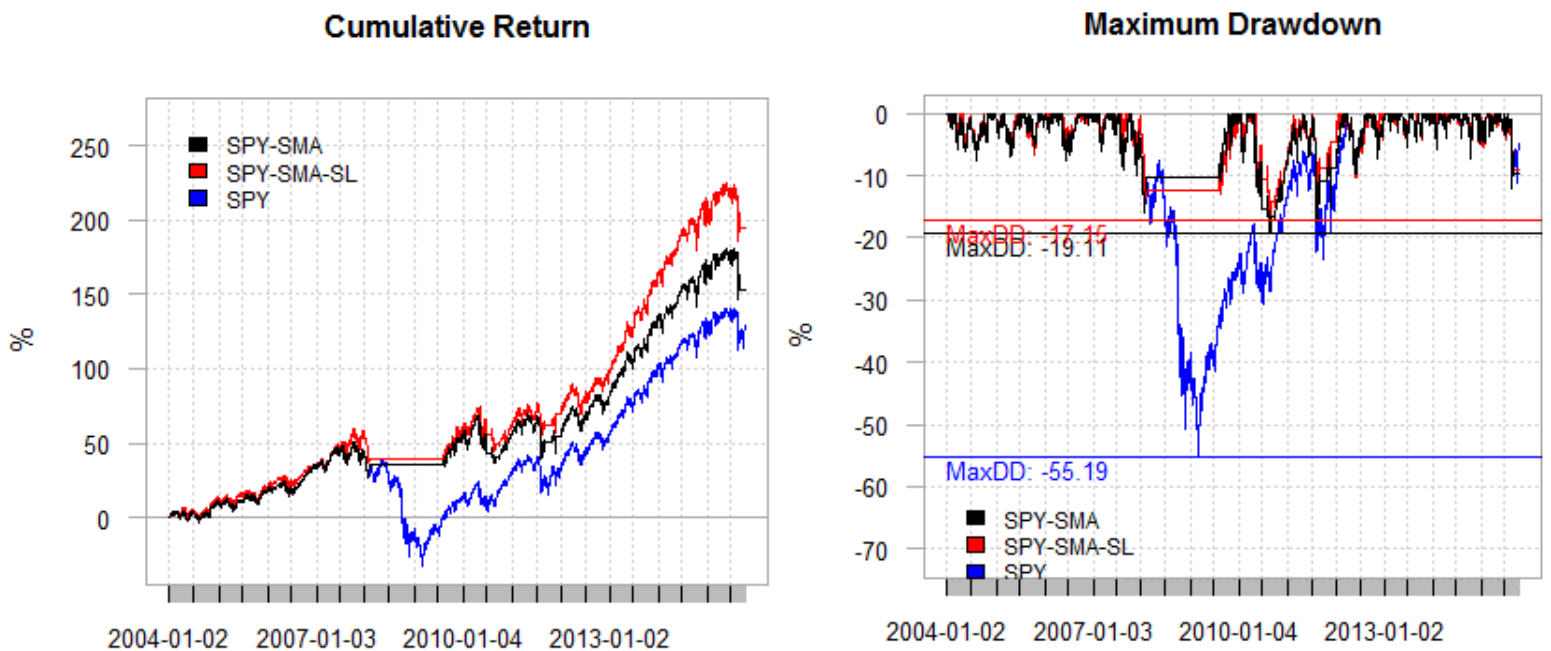


**Table 4: summary statistics of SPY-SMA with daily stop loss – 01/01/2004 – 13/10/2015**

[INSERT EXPLANATION HERE]

Variable	Mean (%)	SD (%)	DrawDown (%)	SR	Calmar Ratio	Skewness	Kurtosis
1% last close daily stop-loss							
<b>SPY-TLT-Winner</b>	8.21	12.77	-19.11	0.64	0.43	-0.45	8.74
<b>SPY-TLT-Loser</b>	9.61	11.51	-17.15	0.84	0.56	0.39	6.53
<b>SPY-TLT-WML</b>	7.25	19.44	-55.19	0.37	0.13	0.21	19.15

**Figure 4-Table 3 – Cumulative Return and Maximum drawdown 01/01/2004 – 13/10/2015**



**Table 5: summary statistics of TLT-SMA with daily stop loss – 01/01/2004 – 13/10/2015**

<b>Variable</b>	<b>Mean (%)</b>	<b>SD (%)</b>	<b>DrawDown (%)</b>	<b>SR</b>	<b>Calmar Ratio</b>	<b>Skewness</b>	<b>Kurtosis</b>
Panel A: 1% last close daily stop-loss							
<b>SPY-SMA</b>	8.21	12.77	-19.11	0.64	0.43	-0.45	8.74
<b>SPY-SMA-SL</b>	9.61	11.51	-17.15	0.84	0.56	0.39	6.53
<b>SPY</b>	7.25	19.44	-55.19	0.37	0.13	0.21	19.15
Panel B: 1% open daily stop-loss							
<b>SPY-SMA</b>	8.21	12.77	-19.11	0.64	0.43	-0.45	8.74
<b>SPY-SMA-SL</b>	10	11.76	-16.96	0.85	0.59	0.13	7.68
<b>SPY</b>	7.25	19.44	-55.19	0.37	0.13	0.21	19.15

Figure 5-Table 5 – Cumulative Return and Maximum drawdown 01/01/2004 – 13/10/2015

[INSERT EXPLANATION HERE]

Figure 5.1 – Panel A:

Cumulative Return

Maximum Drawdown

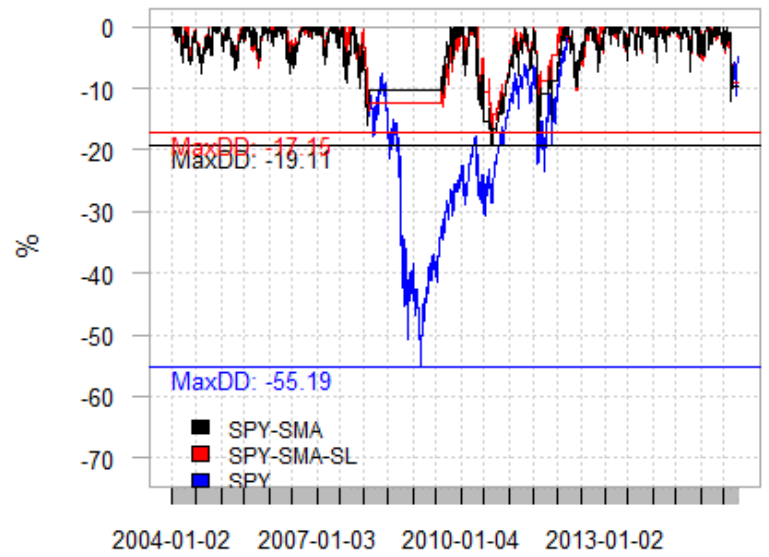
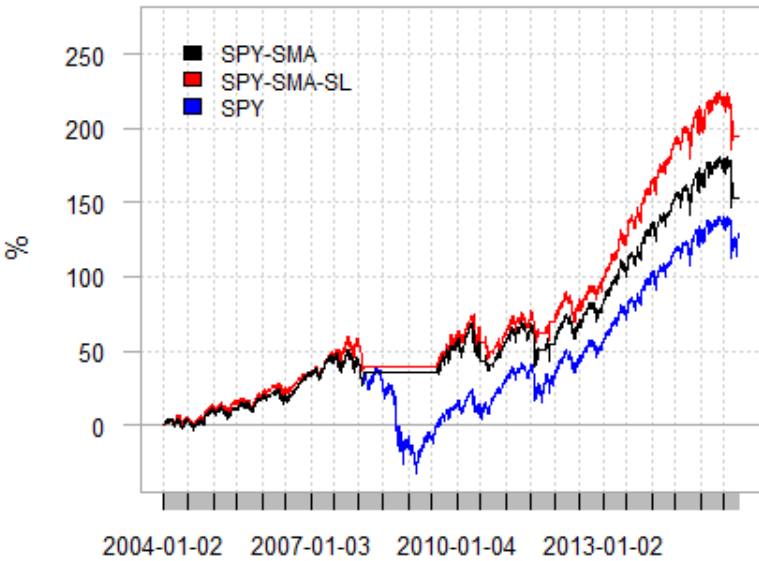
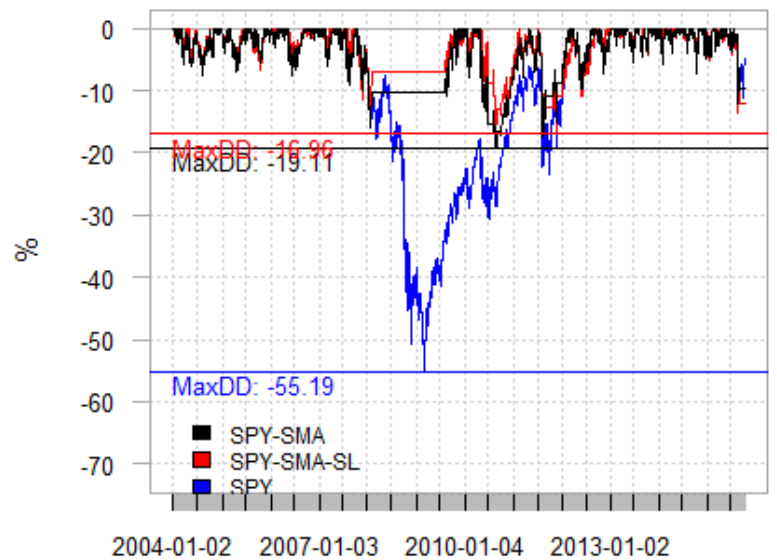
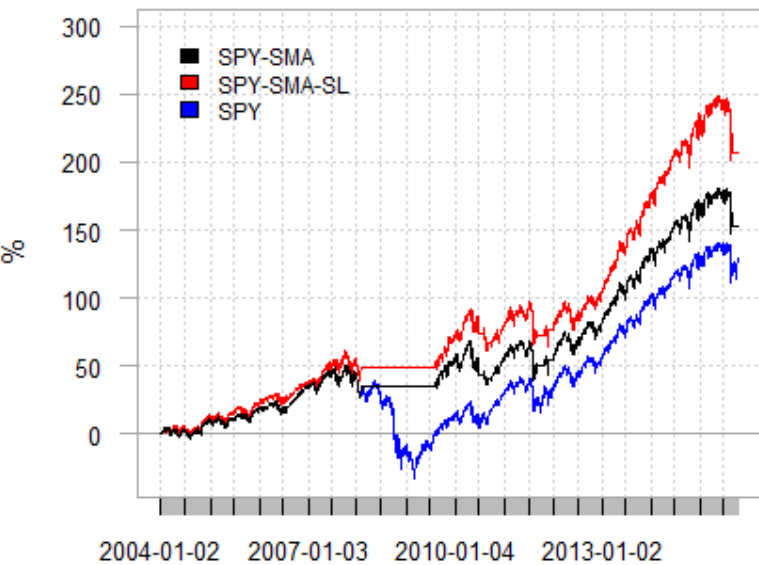


Figure 5.2 – Panel B

Cumulative Return

Maximum Drawdown







**Table 6: summary statistics of SMA with daily stop loss – 01/01/2015– 30/10/2015**

Variable	Mean (%)	SD (%)	DrawDown (%)	SR	Calmar Ratio	Skewness	Kurtosis
Panel A: 1% last close daily stop-loss							
<b>SPY-Winner</b>	2.52	13.47	-11.77	0.19	0.21	-0.26	7.94
<b>SPY</b>	2.64	14.12	-11.91	0.19	0.22	-0.28	5.57

**Figure 6-Table 6 – Cumulative Return and Maximum drawdown 01/01/2004 – 13/10/2015**

[INSERT EXPLANATION HERE]

**Figure 6.1 – Panel A:**

