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***Golden Cross or other
Simple Moving Average Crossover Strategies?***

A Critical Quantitative Review (of all possible Simple Moving Average combinations)!

Golden Cross or other Simple Moving Average Crossover Strategies? A Critical Quantitative Review (of all possible SMA combinations)!

Abstract

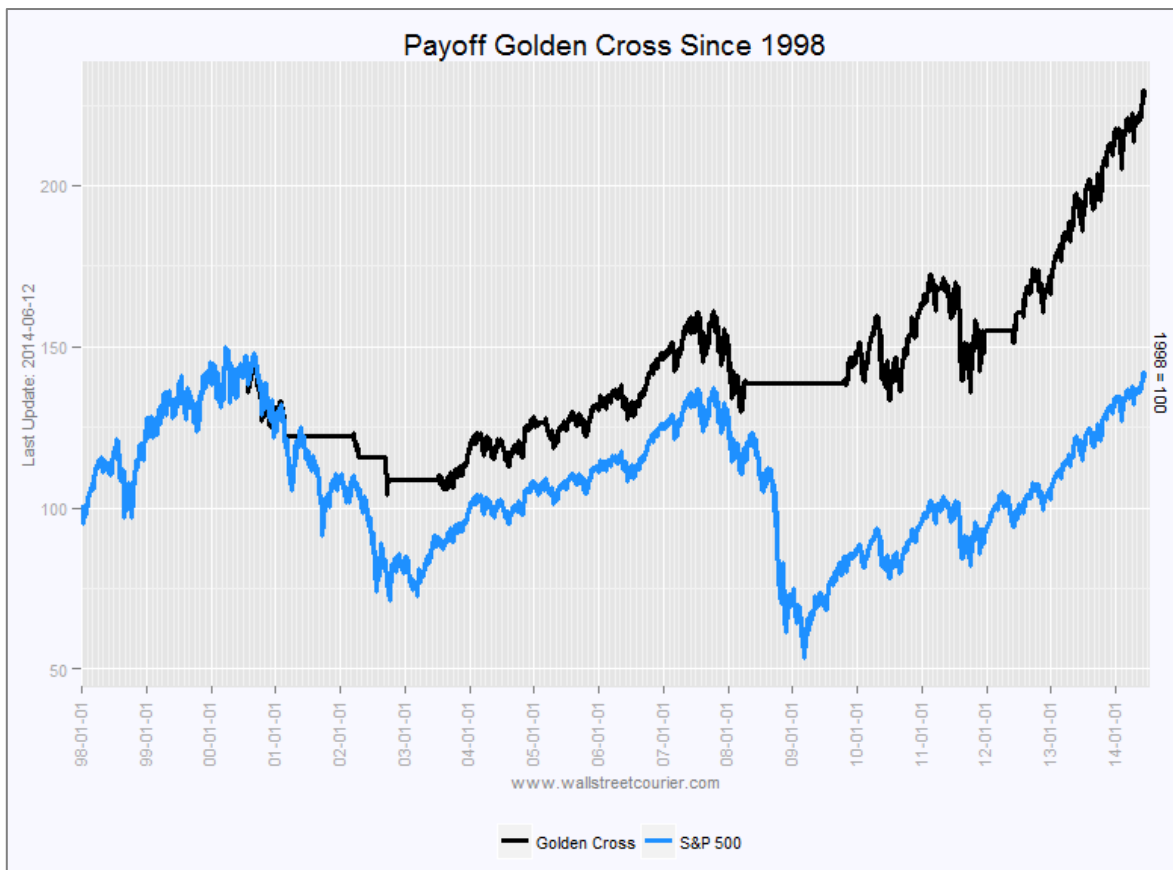
- Within the last decade most moving average crossover strategies have worked out very well for their followers as they prevented them from being invested in equities during the Tech Bubble and the Financial Crisis, respectively.
- Nevertheless, most of those crossover strategies have underperformed the broad equity market since 2009.
- In this article, we will analyze all possible moving average crossover signals for the S&P 500 (IVV) from 1928-12-31 until 2014-06-11, to get an insight if such strategies provide any (additional) value for investors!

I. Introduction

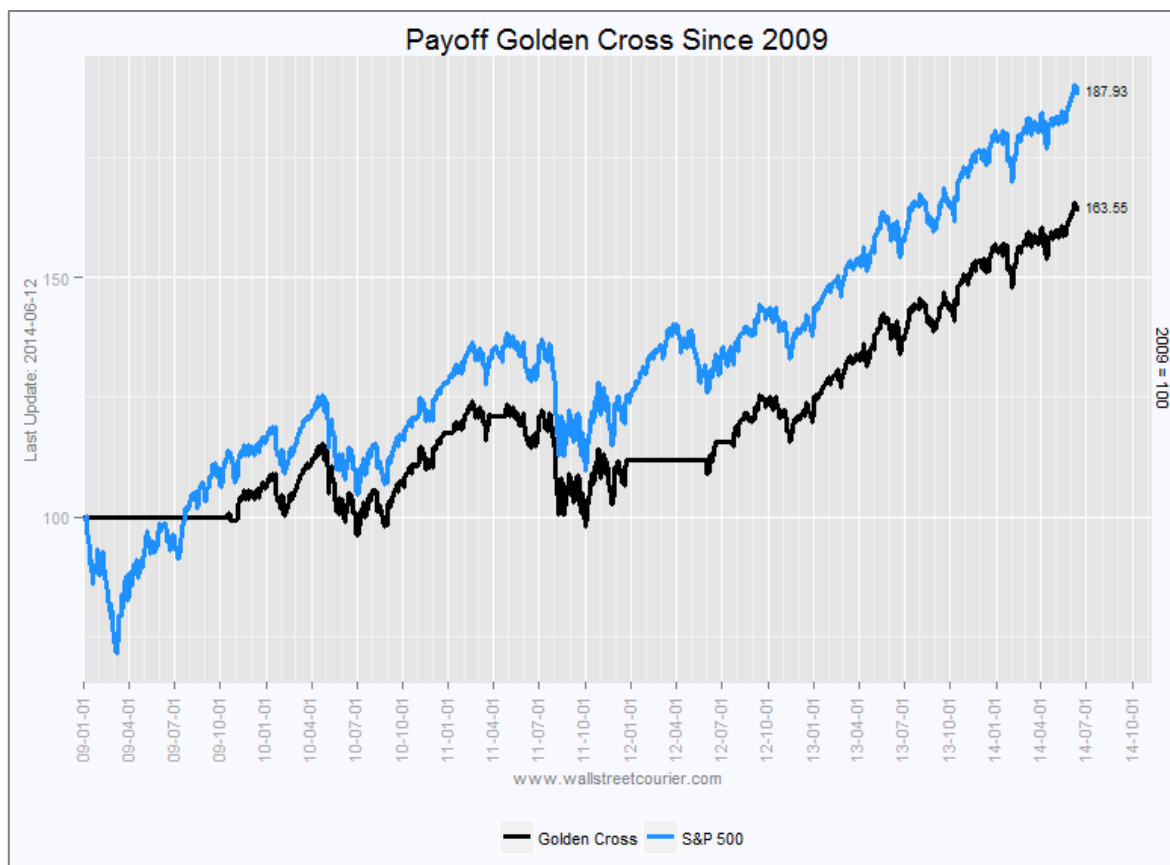
Mebane Faber's published a paper in 2007 [['A Quantitative Approach to Tactical Asset Allocation'](#)]¹, which has become quite popular among the investment community. In this paper, he demonstrated that a very simple 10 month moving average could be used as an effective investment strategy. To be more precise, Faber used a simple 10 month moving average to determine if an investor should enter or exit a position within a specific asset class. In other words, a buy/sell signal is generated, when the closing price of any given underlying closes above/below its 10 month moving average (equals 200 days). As this strategy has worked out very well in the past and as it is very easy to follow, many investors have adopted similar moving average crossover strategies for their personal portfolios. Furthermore, a lot of articles have been published about how to apply or even improve Mebane Faber ideas.

Another famous moving average crossover pattern is called the "Golden Cross". It occurs, when the 50 day moving average of a specific underlying security crosses above its respective 200 day moving average. The claim is that this signal quantifies an improvement in the underlying trend structure of any given security. Anyhow, the idea is quite similar to Mebane Faber's work, as investors should move into cash if the "Golden Cross" turns into a so called "Death Cross". Within the last decade, most of those moving average crossover strategies have worked out very well, as shown in the chart below. This was mainly due to the fact that those moving average strategies prevented their followers from being invested in equities during the Tech Bubble and the Financial Crisis, respectively.

¹ <http://ssrn.com/abstract=962461>



Nevertheless, most of those crossover strategies have underperformed the broad equity market since 2009 as shown in the chart below, where the payoff from the "Golden Cross" since 2009 is depicted. This was mainly due to the fact that we have not seen any longer lasting downturn since then. The recent underperformance of such strategies is not a big surprise at all, as all trend following strategies are facing the typical late in - late out effect. Therefore such an approach can only outperform a simple buy and hold strategy during longer lasting bear markets. However, many investors try to avoid the typical late in – late out effect by choosing shorter moving average combinations, which has of course the negative effect of increased trading activities.



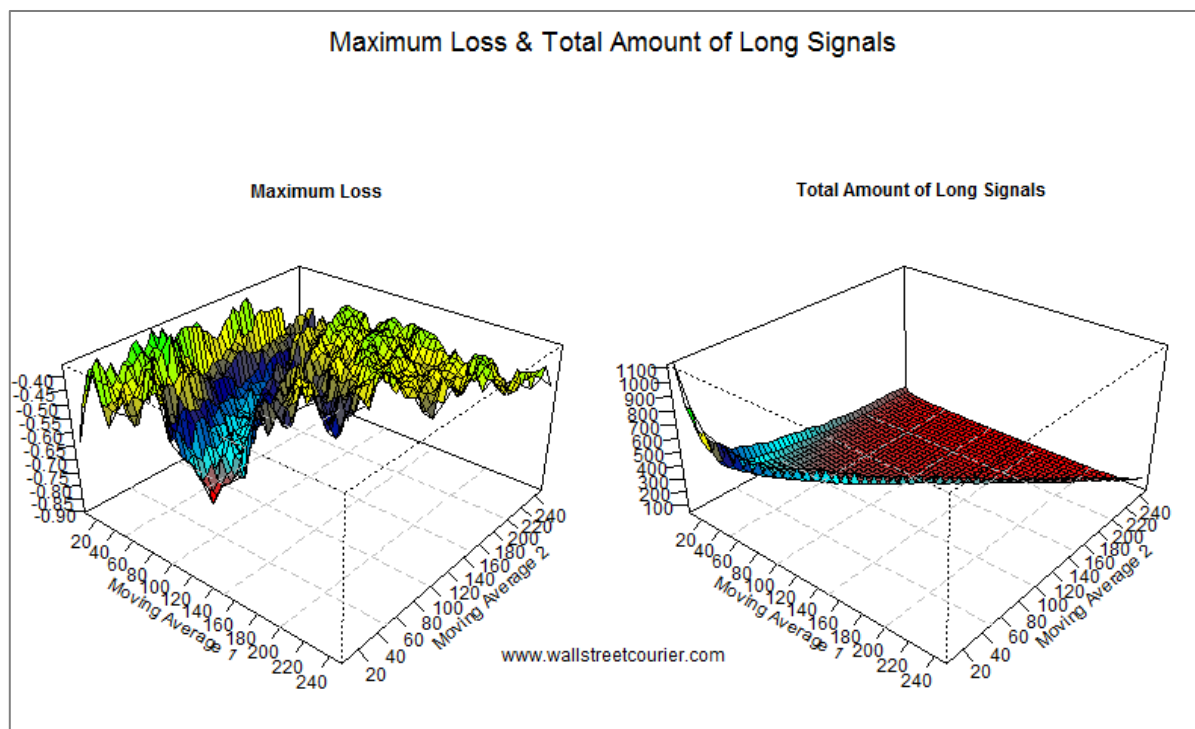
Despite the fact that those moving average crossover signals are quite popular, we have not found any research paper so far which evaluates all possible moving average crossover combinations to get an insight if such strategies provide any (additional) value for investors!

II. Methodology

Therefore, we would like to analyze all possible moving average crossover signals for the S&P 500 (IVV) from 1928-12-31 until 2014-06-11, in order to get an unbiased view of the pros and cons of such crossover signals. In addition, we would like to answer the question, if the recent underperformance of those crossover signals compared to a simple buy and hold is a typical or just a temporary phenomenon. Moreover, we would like to find out if the outcome of a specific crossover strategy tends to be stable or more random in its nature. For reason of simplicity, we have taken a zero nominal rate of return if a specific strategy was invested in cash. Moreover, in our example there is no allowance for transaction costs or brokerage fees, whereas no slippage was taken into consideration.

III. Results

Below you can see that all moving crossover strategies provide some form of maximum loss reduction. Especially, if we consider the fact that the biggest decline from the S&P 500 (IVV) was 86 percent during the thirties, the main advantage of such strategies become quite obvious.



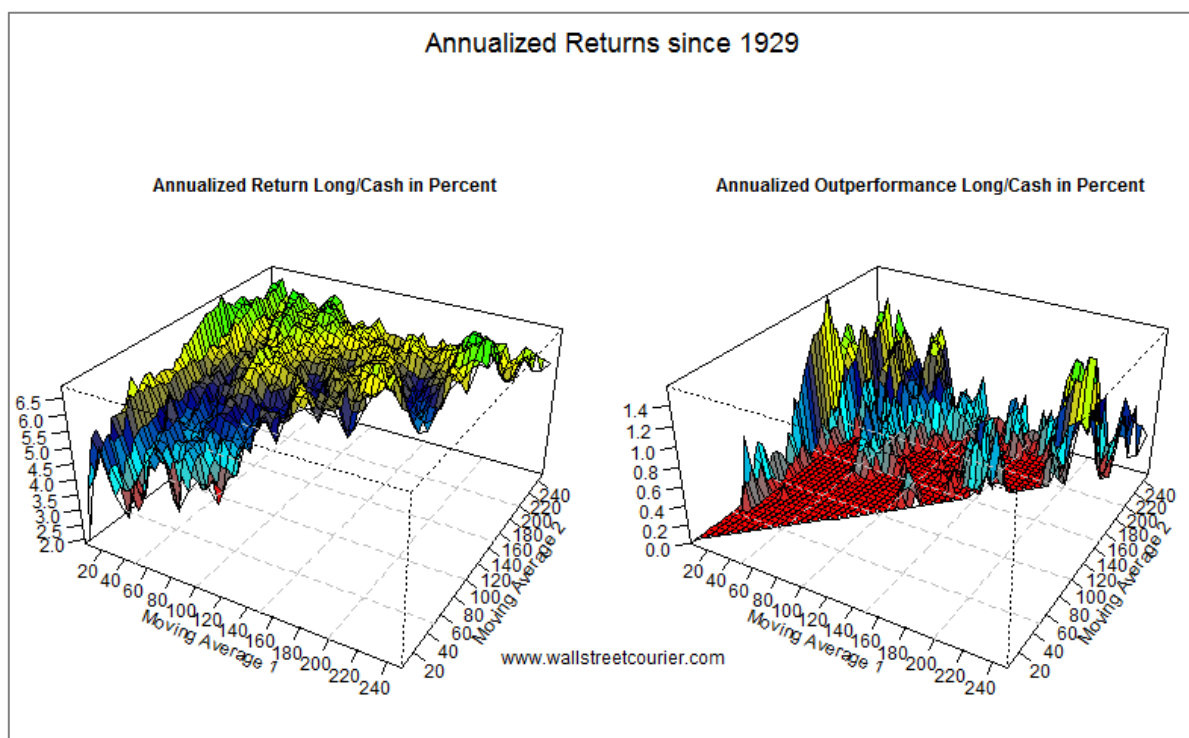
In total, there were only three combinations in the past, (70/75, 65/80 and 70/80) which faced a maximum loss succeeding the maximum loss from the S&P 500. All other combinations faced losses less than a typical buy and hold strategy. Especially in the range of 50 to 240 versus 220 to 240 the maximum loss was ranging between minus 40 and minus 60 percent, which is a quite encouraging ratio if we consider the 86.1 percent from the S&P 500. Moreover, we can see that in that region, this drawdown reduction was or tends to be quite stable over time as this area can be described as a plateau. If this effect was a random variable within that specific time range, there would have been much more spikes in that area. Therefore small adjustments within the time frames of any moving average are likely to have not a big impact at all, regarding to this ratio. The case is quite different if we analyze all the area around 1:100/1:200. In that area, small adjustments within the time frame of each moving average could lead to quite different results and are therefore highly likely to be random!

Another typical relationship is that the amount of trades increases, the shorter both moving averages are. This of course involves transaction costs. For that reason, most followers of such a strategy prefer a combination between a short-term and long-term oriented moving average to reduce the total amount of trades.

If we focus on the annualized performance of those moving average crossover signals since 1929, we can see that all combinations delivered a positive return since then. This outcome is not a big surprise at all, as the S&P 500 (IVV) rose by nearly 8,000 percent since then. Therefore, any continuous participation within the market should have led to a positive performance.

Another interesting point is the historical ability of those crossover signals to outperform a simple buy and hold strategy. In the second graph, we only highlighted those moving average crossover combinations which have been able to outperform a buy and hold strategy. There we can see that the best combination (5/186) was able to generate a yearly outperformance of 1.4 percent on average, whereas no transaction costs were included. Nevertheless, we can see

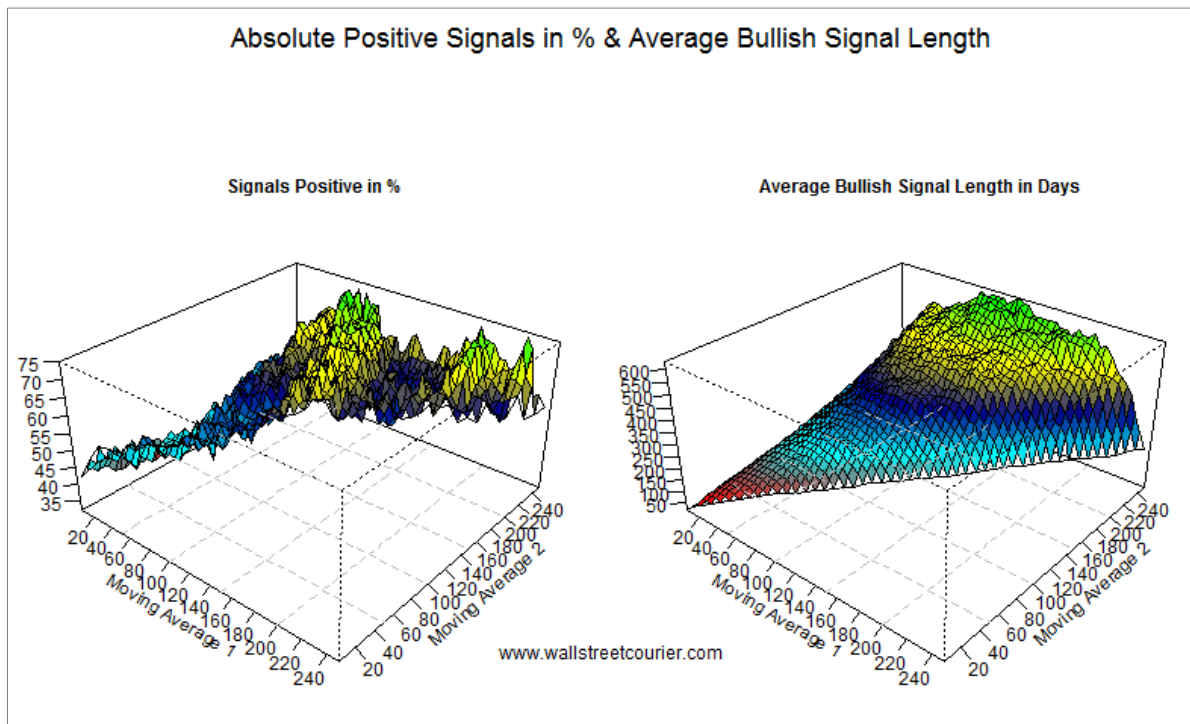
a lot of spikes in that graph and therefore most outcomes are highly likely to be random by their nature. For example, the 5/175 combination delivered a yearly outperformance of 1.3 percent on average, whereas the 10/175 crossover outperformance was only 0.3 percent and the 20/175 underperformed the market by almost 0.5 percent on average. Therefore it looks quite obvious that the outperformance of most crossover signals depends on pure luck. The case is slightly different if we focus on the area between 1:100/ 200:240 as all combinations managed to outperform the S&P 500. Therefore the outperformance was quite stable over time, as small adjustments within the timeframe of each moving average did not lead to big differences in terms of outperformance. Nevertheless, the yearly outperformance in that region was only 0.58 percent on average. Please bear in mind that we have not included any transaction costs in our example.



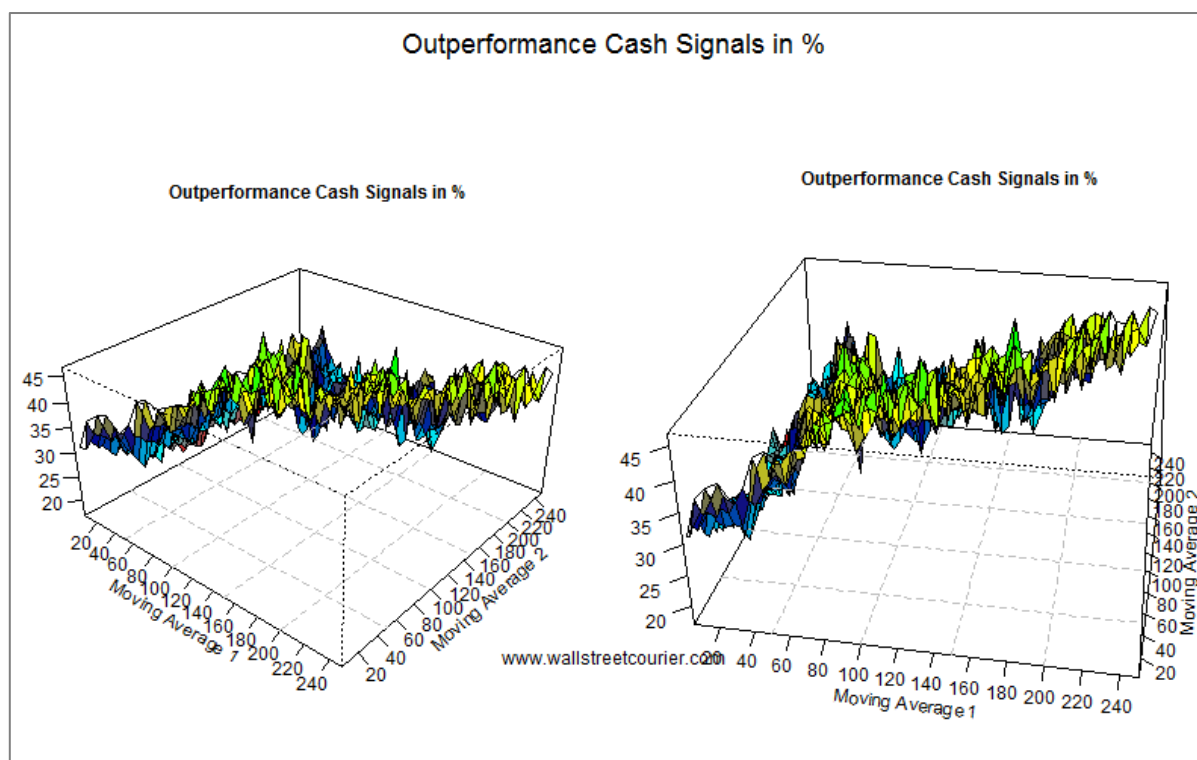
Anyhow, outperformance is just one side of the story as investors might be also interested in generating absolute rather than relative positive returns. As a matter of fact, we looked at the ability of any moving average crossover combination to generate absolute positive returns. Therefore we analyzed how many signals of each moving average crossover combination were profitable in the past, expressed in percentage terms. There we can see that a lot of combinations delivered long signals which have been profitable in more than 50 percent of all cases. Especially, the area around 50:120/200:240 tends to be pretty stable, as the percentage of absolute positive signal is slowly increasing to the top. Therefore it looks like that some moving average combinations have the ability to forecast rising markets.

Unfortunately this does not hold in most cases, as this ratio strongly depends on the amount of days each moving average combination was invested in the S&P 500. This becomes quite obvious, if we consider that the S&P 500 (IVV) has risen slightly less than 8,000 percent since 1929. As a matter of fact, any exposure to the market in that time period is highly likely to produce a positive return! This effect can be seen on the second graph below, which shows the average long signal length of each moving crossover combination, measured in days! If we compare both graphs we can see a strong relationship between the average signal length

and the percentage of positive performing signals. Nevertheless, some combinations tend to be better suitable for catching a positive trend than others.



As any moving average combination could only outperform the market during a longer-lasting downturn it was also interesting to examine how often a cash signal (negative crossover signal) was able to outperform the market. In such a case, the S&P 500 (IVV) must have performed negative during that specific time period. The ratio can be also seen as the probability of a longer lasting down-turn, if any moving average combination flashes a bearish crossover signal. As you can see in the graph below, the S&P 500 (IVV) was performing negative in less than 50 percent of all cases, when any moving average crossover combination flashed a bearish crossover signal. In addition, the graph is extremely spiked indicating that this (poor) outcome tends to be completely random.



IV. The bottom line

Despite the fact that most moving average crossover signals provide some form of maximum loss reduction in comparison to a simple buy and hold strategy, their ability to outperform the underlying market is limited. Furthermore, the recent underperformance of such crossover signals since 2009 are more a typical phenomenon rather than a temporarily one. This is mainly due to the fact that a negative crossover signal does not necessarily lead to significant and longer lasting downturns/bear markets within the underlying security. Nevertheless, if investors are more focused on maximum draw-down reduction, such crossover signals are worth looking at, although it should definitely not be the sole source of information.

V. References

Faber, Mebane T.: A Quantitative Approach to Tactical Asset Allocation (February 1, 2013). The Journal of Wealth Management, Spring 2007. Available at SSRN: <http://ssrn.com/abstract=962461>

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