



Analyzing Short-Term Underperformance

Introduction

The saying "past behaviour is the best predictor of future behaviour" is the bedrock of all momentum trading systems. Anyone looking at an extremely bullish daily chart will tend to assume that prices will continue to rise along the trend line. Likewise, when looking at a sharply bearish daily chart, most people will assume that prices will continue to drop.

Long-term momentum and trend-following systems function on the premise that investors, large and small, like to buy winners and like to sell (or short) losers. The aggregation of all this buying power can in itself fulfil the prophecy: investors buy winners, so prices of these stocks continue to rise. And investors sell losers, so prices of these stocks continue to fall.

So "momo" stocks, as they are commonly known, spiral upwards (or downwards) thanks to forces generated by the collective buying (or selling) power of the masses. Momentum can continue for many years and it often ends abruptly when some piece of news, such as a disappointing earnings announcement, ends this game of musical chairs.

The cycle described above tends to unravel over relatively long timeframes: quarters or years. But what about short-term strengths and weaknesses? Is short-term outperformance a good predictor of more strength to follow? And is short-term underperformance a good predictor of more short-term weakness? In this paper we will look at the latter: whether short-term underperformance in a stock's price is usually followed by more underperformance (momentum), no measurable change, or a contrarian form of outperformance (mean-reversion).

Analysis

The data set used is comprised of all the components of the S&P500 Index, as of July 1st 2014, from 2000 to 2013. We will define "short-term underperformance" as more than 2% underperformance versus the S&P500 for 3 days in a row. The system's rules are:

- Entry: enter long at the close after 3 days of >2% underperformance relative to the SPY (S&P500 ETF). Hedge the trade with a corresponding short in the SPY;
- Exit: close trade pair at the close after X days;

Below are the results in tabular form:

Sell X days later	# Trade Pairs	% Avg Win	% Avg Loss	% Win Rate	Profit Factor
1	4394	3.65%	-3.54%	57.01%	1.37
2	4166	4.83%	-4.50%	58.21%	1.50
3	4126	5.94%	-5.22%	57.68%	1.55
4	4059	6.79%	-5.95%	57.38%	1.53
5	4018	7.43%	-6.50%	57.07%	1.52
10	3713	9.91%	-8.51%	56.72%	1.53

As we can see, the strategy was profitable from all exit scenarios: 1 day through 10 days. Win rates were above 50% in all instances and average winners were marginally bigger than average losses. The last column shows the system's profit factor (total profits / total losses). This appears to peak at day 3, suggesting that the strategy's edge has run its course.

So the data shows that after having performed poorly (relative to the index) for 3 days in a row, the price of a stock is more likely to bounce than to continue to drop. There is no negative momentum present after 3 days of weaknesses. On the contrary: rather than "follow-through", investors should expect mean-reversion to kick in and for prices to correct back upwards.

Below are two equity curves for the system using the 3-day exit scenario:



Fig 1: S&P500 components - All trade pairs

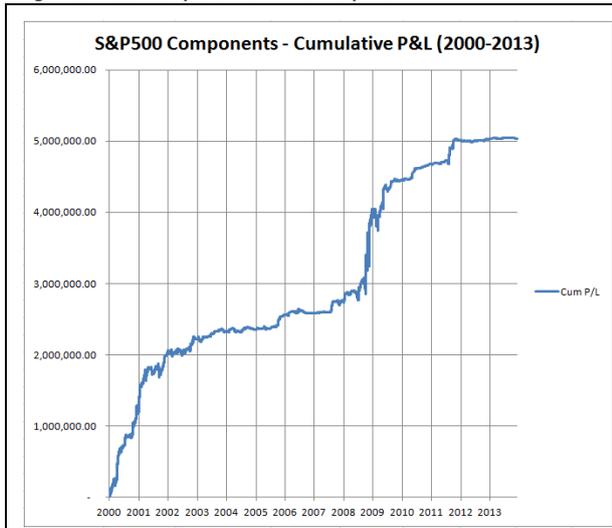
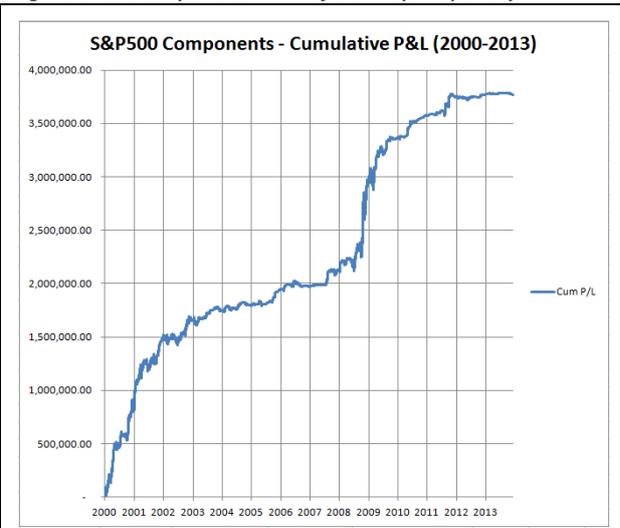


Fig 2: S&P500 components - Max of 5 trade pairs per day



The curve to the left shows the results for all trades. Since the data-set showed some periods with no trade triggers and others with a great number of triggers (upwards of 50), the chart to the right was generated. It limits the number of trade pairs to a maximum of 5 per day, thereby lessening the effects of unusually large data clusters.

The equity curves shown above are far from linear. In some years, the edge seems to have been very strong, and in others, rather weak. Upon closer inspection it would seem that the edge was particularly strong during periods of high volatility, such as in 2000 and in 2008/2009. In order to determine whether data-clustering or some other force was behind the shapes of the charts, two more equity curves were created using *instance count* rather than *date* on the x axis.

Fig 3: S&P500 components - All trade pairs (trade instances)

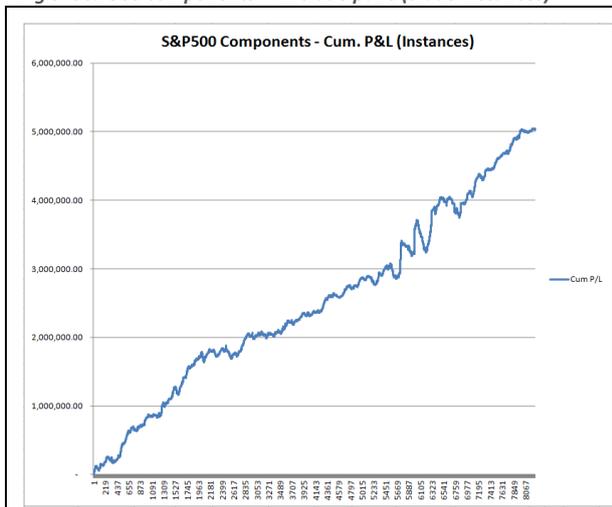
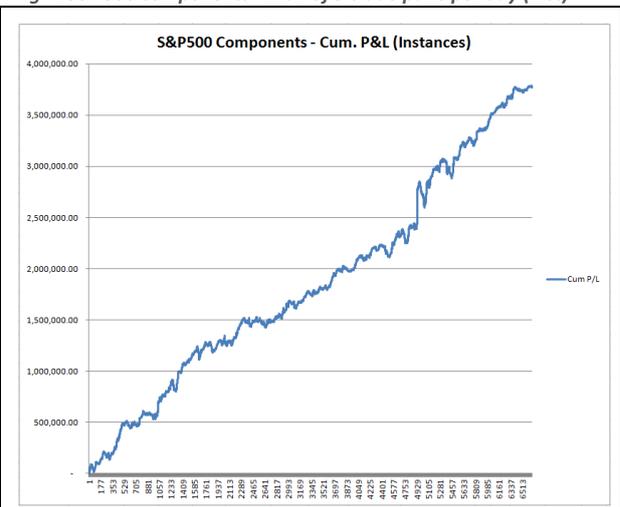


Fig 4: S&P500 components - Max of 5 trade pairs per day (inst)



The straight equity curves shown in Fig. 3 and Fig. 4 confirm that the edge was indeed consistent throughout the 2000-2013 period.

A key concern when using S&P500 data in long-only strategy tests is that the presence of *survivorship bias* can skew the results quite markedly and create the illusion of long edge. This is particularly true when long data series are being studied. Given that we are using the *current* S&P500 Index membership rather than the *time-of-trade* S&P500 Index membership, and given the length of the data being studied (13 years), we must assume some level of survivorship bias in the results.



The Mechanical Trader

In order to validate the S&P500 results, the same system was applied to both the S&P400 MidCap Index components (as of July 1st 2014) and the Russell1000 SmallCap Index components (also as of July 1st 2014). Here again hedged trades were limited to a maximum of 5 per day to avoid distortions due to data-clustering. The table below summarizes the results for a 3-day holding period:

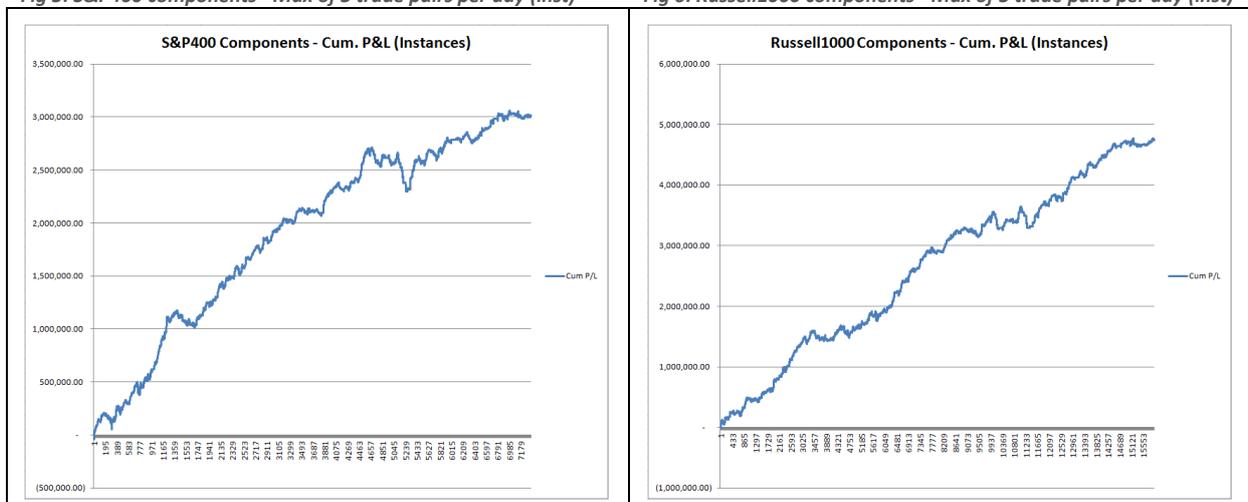
Index Components	# Trade Pairs	% Avg Win	% Avg Loss	% Win Rate	Profit Factor
S&P400	3184	5.69%	-4.88%	55.12 %	1.43
Russell1000	5529	5.45%	-4.95%	55.85%	1.39

The results were slightly less marked than those for the S&P500 data set. But the 55% win rate and ~1.4 profit factor nevertheless confirm the existence of a positive edge.

Below are the two equity curves:

Fig 5: S&P400 components - Max of 5 trade pairs per day (inst)

Fig 6: Russell1000 components - Max of 5 trade pairs per day (inst)



Here too, the edge seems to be present fairly consistently throughout the 2000-2013 period despite some dips during the high volatility periods of 2000 and 2008.

Summary

It is the temptation of all traders to speculate in the direction of recent movement, be it upward or downward. Indeed, it seems intuitive to sell or short a stock that has had a poor run recently. But when underperformance is only measured in days, mean reversion appears to be a considerably stronger force than momentum.

The most likely reason for this is that the major forces that drive momentum – namely “consensus” buying/shorting, coupled sometimes but not always by real earnings growth – require many quarters to build and are more evident in monthly bars than daily bars. Mean-reversion forces, on the other hand, tend to be quick and short lived. And their cycles, based on short-rallies and opportunistic buying, are usually measured in only a handful of days.

Thus when speculating over short periods of time (2 weeks or less) it would appear that trading systems based on mean-reversion algorithms are more likely to provide an exploitable edge than short-term follow-through or breakout systems.