



Exploiting End of Day Weakness

Introduction

In this paper we will look at whether a weak finish in the stock market's daily session can be used as a predictor for the following day's performance.

Analysis

To best define strong vs. weak end-of-day closes, we will rank closing values by deciles, with Decile 1 representing a close in the lowest 10% of the day's trading range (high-low), Decile 2 a close within the second lowest 10% tranche, etc. The instrument we will use in this study is the SPY (S&P500 ETF), from Jan 1 1995 to Dec 31st 2014. Table 1 shows, by decile, the results of buying the SPY at the close and selling on the next day's close:

Table 1

Decile	Trades	% Win Rate	PF
All	5035	53.51	1.09
1	553	61.12	1.69
2	441	54.42	1.22
3	399	54.14	1.17
4	407	55.53	0.93
5	398	51.51	1.08
6	449	56.12	1.14
7	456	51.54	0.94
8	500	52.60	1.10
9	643	53.81	1.16
10	652	48.47	0.77

The two deciles whose numbers stand out are # 1 (very weak close) and # 10 (very strong close). In this paper we will focus on the former. And as we can see a 24hr long position after a very weak close produces win rate and profit factor statistics that are significantly better than average (the "All" row).

It appears that a very weak end-of-day close is often followed by a bounce the following day. This is another demonstration of the "contrarian" short-term mean-reverting nature of the US stock market, where overreaction and panic-selling is more often followed by reversal than continuation. The equity curve below shows that this weak close effect has manifested itself fairly consistent throughout the 1995-2014 period under study.





We will now further explore Decile 1 closes to determine whether they are all made the same. The variables we will look at are short-term market condition, long-term market condition, volume and daily range. For ease of analysis, these will be defined as follows:

- Short Term Market Condition: a close above or below the 10 day moving average;
- Long Term Market Condition: a close above or below the 200 day moving average;
- Volume: daily volume above or below the average daily volume of the past 10 days;
- Range: daily range (H-L) above or below the average daily range of the past 10 days;

Table 2 below shows the results of holding a 24hr long position in the SPY following a Decile 1 close under the conditions above:

Table 2

Variable	Condition	Trades	% Win Rate	PF
All Decile 1	All	553	61.12	1.69
ST Market Condition	Above 10 DMA	124	56.45	1.29
ST Market Condition	Below 10 DMA	429	62.47	1.80
LT Market Condition	Above 200 DMA	332	61.75	1.75
LT Market Condition	Below 200 DMA	221	60.18	1.64
Volume	Above 10 day avg	316	64.87	2.03
Volume	Below 10 day avg	237	56.12	1.37
Range	Above 10 day avg	374	62.03	1.79
Range	Below 10 day avg	179	59.22	1.51

The results generated by applying the above filters make intuitive sense. As we can see, buying into an already short-term oversold market ($C < 10$ DMA) improves the system's edge. Similarly, going long during long-term bullish conditions ($C > 200$ DMA) offers better expectancy than during long-term bearish conditions. High volume, which reflects a larger consensus move, also adds to the system's edge. And finally, a larger daily range also improves the strategy's results, albeit only marginally.

We now look at whether specific days of the week exhibit stronger or weaker Decile 1 returns:

Table 3

Day of week	Trades	% Win Rate	PF
All Decile 1	553	61.12	1.69
Mon	103	68.93	3.72
Tue	127	70.08	2.48
Wed	117	58.12	1.22
Thu	99	53.54	1.18
Fri	107	53.27	1.11

Table 3 above show results by day of week. As we can see, the results of 24hr long positions taken on Mondays and Tuesdays are markedly better than those taken on other days of the week. In fact, results for Wednesday, Thursday and Friday appear to offer little or no edge at all. This finding, however strange, is well-documented in financial literature. "Turnaround Tuesday", which suggests that Tuesdays are the most likely days for a market reversal, is a maxim that's well grounded in fact. And if Tuesdays do not offer a turnaround to Monday's weakness, then Wednesdays often offer it for Tuesday's weakness. The reasons behind this day of week bias are unclear, but its existence is undeniable.

Using the information above, we can construct a simple systematic trading strategy with the following rules:

- Go long if the SPY closes within the lower 10% of its daily range. Exit at next day's close;
- Filter 1: only on Monday and Tuesdays;
- Filter 2: only if the close is below the 10 day moving average;
- Filter 3: only if the day's volume is greater than the average daily volume of the past 10 days;

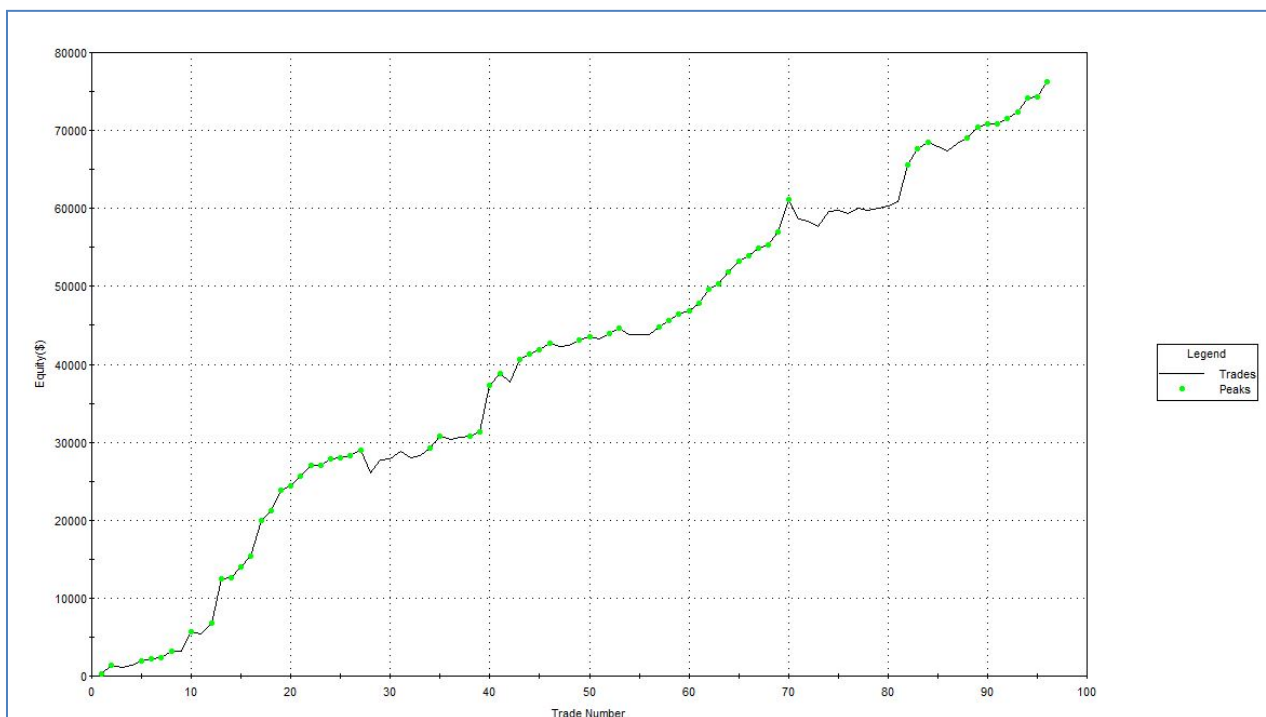
To keep the number of trades as high as possible and to avoid further "curve-fitting" our results post-facto, we will not use the long-term market condition and range filters.



The Mechanical Trader

The results of our strategy are shown below. They assume a US\$100,000 bet/trade, and exclude allowances for transaction costs and slippage.

All Trades			
Total Net Profit	\$76,285.90	Profit Factor	7.03
Gross Profit	\$88,939.50	Gross Loss	(\$12,653.60)
Total Number of Trades	96	Percent Profitable	81.25%
Winning Trades	78	Losing Trades	18
Even Trades	0		
Avg. Trade Net Profit	\$794.64	Ratio Avg. Win:Avg. Loss	1.62
Avg. Winning Trade	\$1,140.25	Avg. Losing Trade	(\$702.98)
Largest Winning Trade	\$5,962.50	Largest Losing Trade	(\$2,910.00)
Max. Consecutive Winning Trades	16	Max. Consecutive Losing Trades	3
Avg. Bars in Winning Trades	2.00	Avg. Bars in Losing Trades	2.00
Avg. Bars in Total Trades	2.00		
Max. Shares/Contracts Held	1710	Account Size Required	\$3,512.00
Return on Initial Capital	76.29%	Annual Rate of Return	2.63%
Return Retracement Ratio	0.24	RINA Index	7045.74
Trading Period	21 Yrs, 6 Mths, 29 Dys	Percent of Time in the Market	1.24%
Max. Equity Run-up	\$79,125.00		
Max. Drawdown (Intra-day Peak to Valley)		Max. Drawdown (Trade Close to Trade Close)	
Value	(\$6,559.30)	Value	(\$3,512.00)
Net Profit as % of Drawdown	1163.02%	Net Profit as % of Drawdown	2172.15%
Max. Trade Drawdown	(\$3,648.00)		



A strong average winner vs. average loser ratio, coupled with a 81% win rate, result in an impressive profit factor of 7. Moreover, the smooth upward-sloping equity curve shows that the system's edge has been consistent over time.



It should be noted that this strategy assumes a 24hr holding period and hence has a relatively low risk profile. Traders with a greater risk tolerance could possibly consider changing the exit rule to try to maximize the strategy's profit expectancy. This could be done by either holding the position longer, or by waiting for mean-reversion, such as a close above the 10 day moving average.

Summary

As we have seen, very weak daily closes are more likely to be followed by rebounds than by continued moves downwards. This is particularly true during a weak short-term market, during a bullish long-term market, on high volume or when the daily range is above average. The day of the week is also a major deciding factor: when a poor close occurs on Mondays or Tuesdays the chances of an immediate recovery are considerably greater than when the poor close occurs later on in the week. Other factors may also impact the system's profitability, and could be further investigated.

The basis to this "weak-close" edge is etched in mean-reversion: the market's tendency to bounce back after an overreaction. And the stronger the overreaction (close very close to day's low, very high volume, oversold environment, etc), the greater the bounce.

Understanding this effect can be useful when constructing short-term mechanical systems, such as the one shown in this paper. It can also be helpful to guide traders wishing to manage or time their trades. For example, a trader holding a short position is probably better off closing it on a Monday or a Tuesday that closes down strongly on volume. The trader could then, if desired, go short again on the close of the following day. Similarly, a trader wanting to enter a long position is likely to improve the expectancy of his trade if he opens his position during a start-of-week pullback.