



AAPL Trade Idea

November 2014

Passion to Perform

Equities Structuring Group
[REDACTED]

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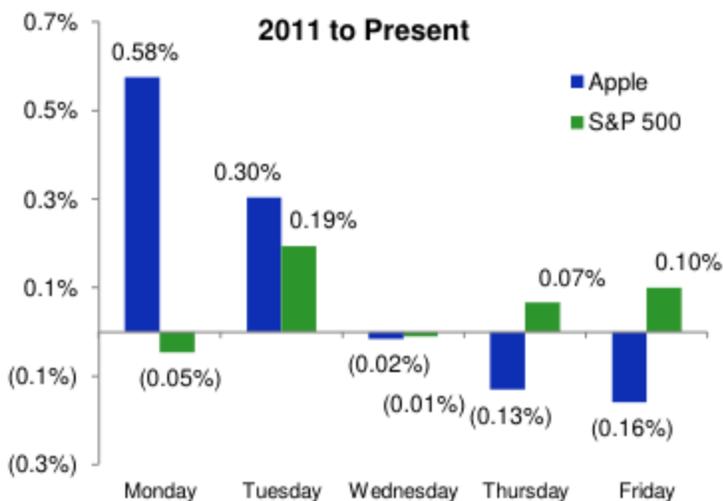
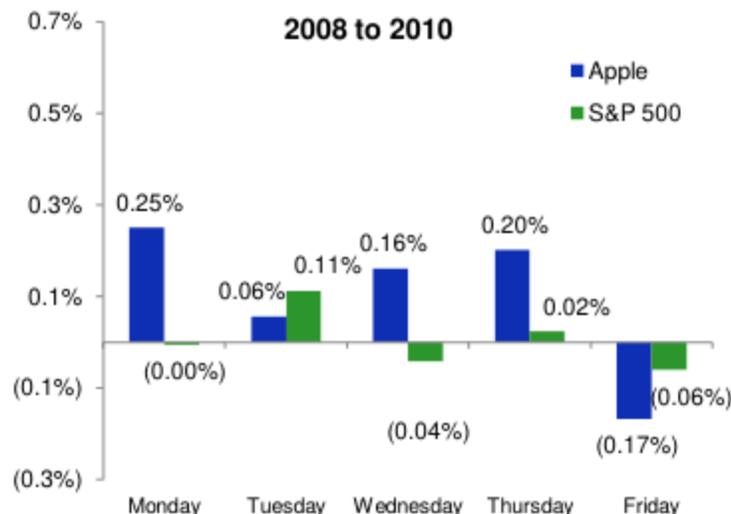
Apple stock price performance



AAPL's daily stock return has exhibited statistically significant correlation to the day of the week since 2011

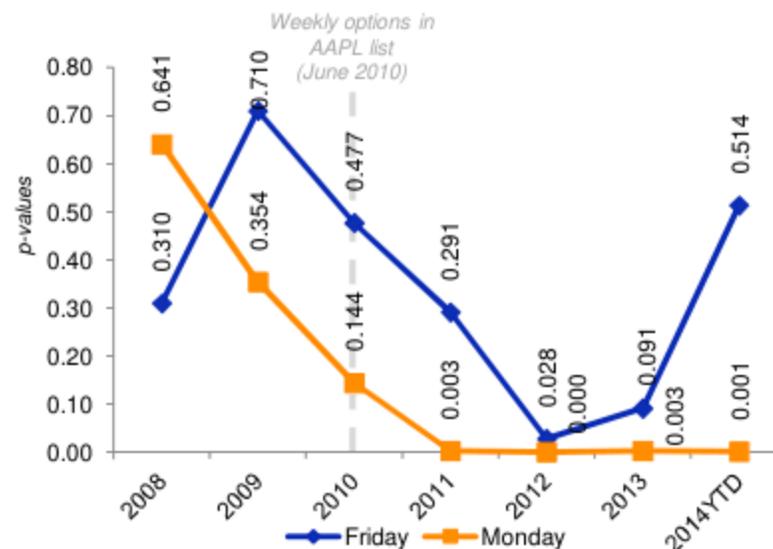
Monday's outperformance is greater and more statistically significant than Friday's underperformance

Average stock price performance by day of week



Statistical significance over time

- To test for statistical significance, we ran yearly regressions of AAPL's daily stock returns versus whether the day was a Friday or Monday
- We calculated the p-value for the day variable
 - The p-value is a measure of the probability that the return is not correlated with the variable
 - For example, a p-value of 0.01 means there's only a 1% chance that the return is not correlated with the variable
 - A lower p-value means more statistical significance
- Monday's p-values declined since 2008 and the variable showed very strong statistical significance since 2011
- Friday's p-values also declined, but to a lesser extent and have increased again in 2013 and 2014



Apple stock price performance (continued)



Trading this pattern would have resulted in significant gains with limited downside risk

This analysis looks at trading AAPL stock and an equivalent value of the S&P 500 beginning in 2008

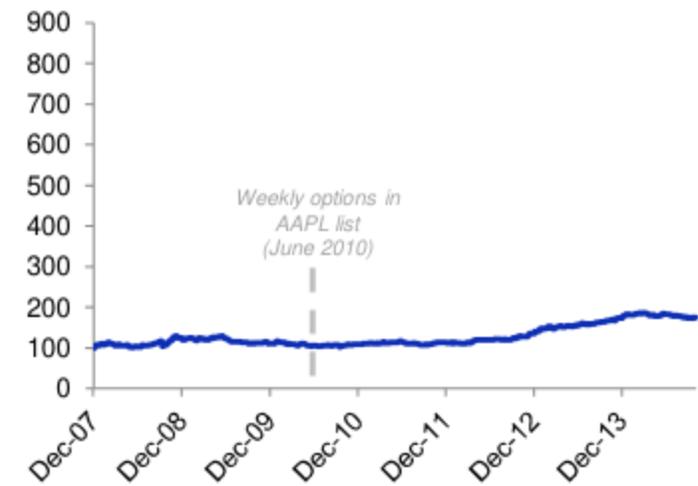
Going long AAPL / short S&P 500 only on Mondays produces the largest gain – over 2x a long/short strategy held over all days and over 3x a short AAPL/long S&P 500 strategy on Fridays

Combining the two strategies (Monday and Friday) results in even greater returns

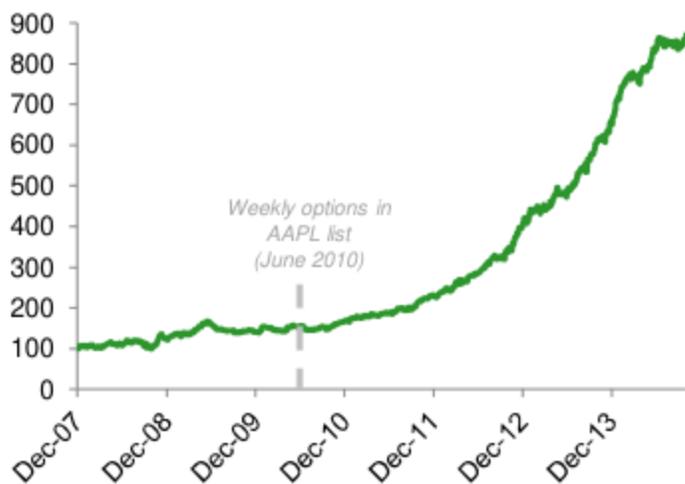
Value of Monday's outperformance vs S&P 500



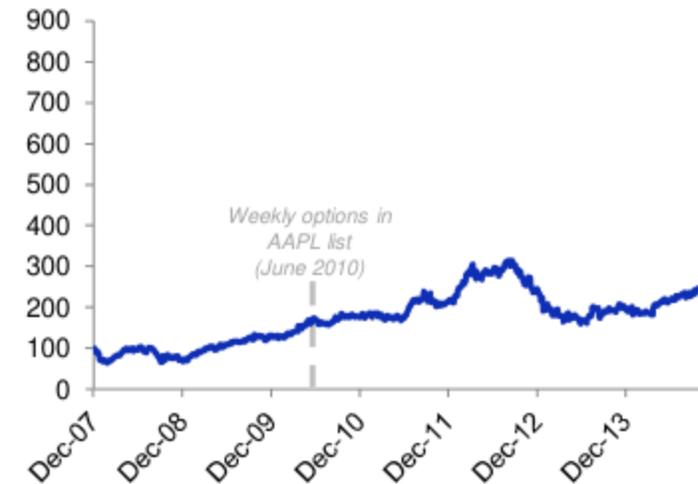
Value of Friday's underperformance vs S&P 500



Combined Friday / Monday performance vs S&P 500



Long AAPL and short S&P 500



Overview of Weekly options



Weekly options in AAPL stock began to be listed in June 2010

This coincides roughly with the development of the Friday / Monday trading pattern

History

- The CBOE launched Weekly options in October 2005. These were originally only on the S&P500
- The CBOE expanded the product in June 2010 to include more underlyings

Listing

- Since June 2010, Weekly options are listed before the open on Thursdays
- Currently, the AAPL Weeklys are part of the “expanded” program and have 6 expirations. A new expiration is added every week

Purpose

- When the CBOE introduced Weeklys, it stated that they would provide an “efficient way to trade options specifically around certain news or events – such as economic data or earnings announcements”
- Trading options instead of stock is a convenient way to lever positions around events
- Unlike the broader market, trading in AAPL options is much more skewed towards calls than puts

Trading

- We have found little evidence of institutional trading in these options
- This means the majority of trading is done by:
 - High frequency traders
 - Retail investors

Analysis of CBOE AAPL option trading data^(a)

Summary activity of directional market participants (i.e., retail investors)



The CBOE has data on each option trade and designates the buyer and seller of options as either “customer” or “firm”. We attribute “customer” transactions to directional retail investors, and “firm” transactions to hedged market participants

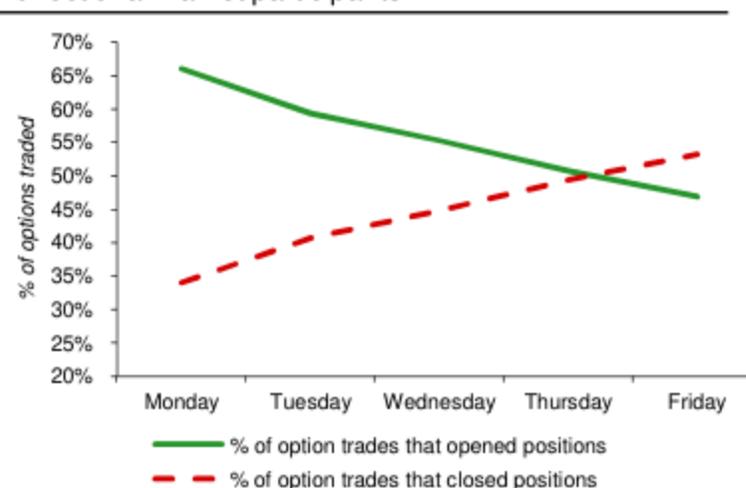
- Since the Monday / Friday phenomenon coincides with the listing of weekly options, we focused on options with the shortest expiry
- Consistent with a hypothesis that Monday’s outperformance is due, at least in part, to retail investors initiating option positions, the vast majority of directional option trades on Mondays were opening transactions

The dataset has certain limitations:

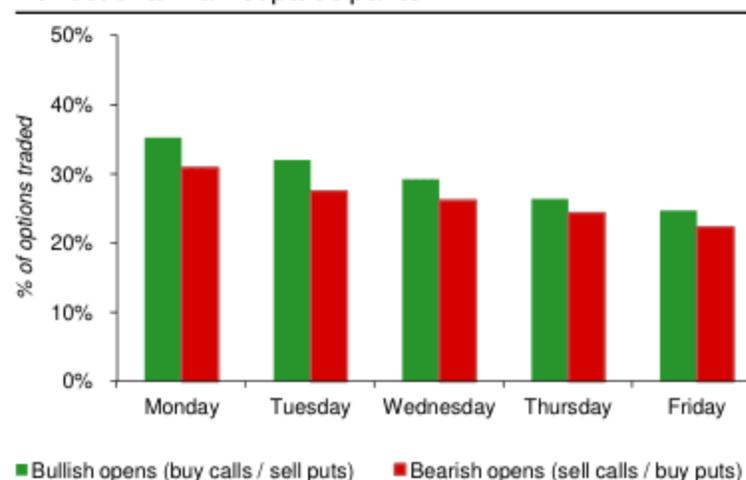
- The CBOE is only one of several exchanges that list options (with ~20% of total volume)
- Market maker trades are excluded
- The data does not have time stamps (which would have allowed us to see whether trading is clustered during a certain part of the day and compare this to the stock’s intraday behavior)

- In addition, the majority of the positions that were opened were bullish transactions, which would have caused a hedged market participant to buy shares
- By Friday, the majority of option trades were closing transactions
- Since the majority of option trades were bullish positions, closing these positions would have caused a hedged market participant to sell shares

Opening versus closing transactions for directional market participants^(b)



Bullish opens versus bearish opens for directional market participants^(b)



Net “delta” in AAPL listed option market



DB analyzed every AAPL listed option trade that occurred from January 2013 to February 2014

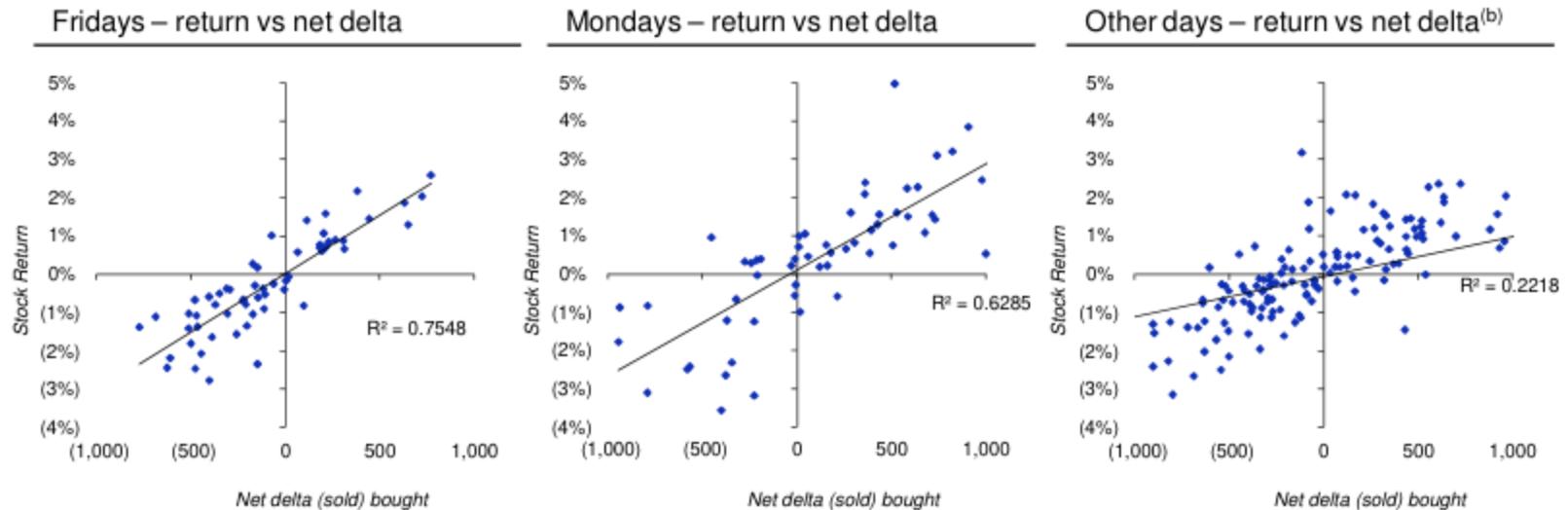
These trades were classified as bullish or bearish depending on whether they traded at the bid or the offer. So, for example, a call that traded on the offer side was deemed a bullish trade. We ignored transactions that traded at mid market

We then delta-weight this activity to capture a directional view of the overall options market

- Option traders will hedge their positions by trading in the underlying stock to maintain a “delta” neutral position to stock price performance (i.e., sell calls and buy stock such that they are indifferent to changes in the stock price)
- Looking at the net deltas of actual option activity shows that Fridays are more likely to see selling activity, while Mondays are more likely to see buying activity

	Average net delta		
	(in shares)	% of days negative	% of days positive
Friday	(99,292)	63.8%	36.2%
Monday	131,618	39.7%	60.3%
Other	(373,363)	56.0%	44.0%

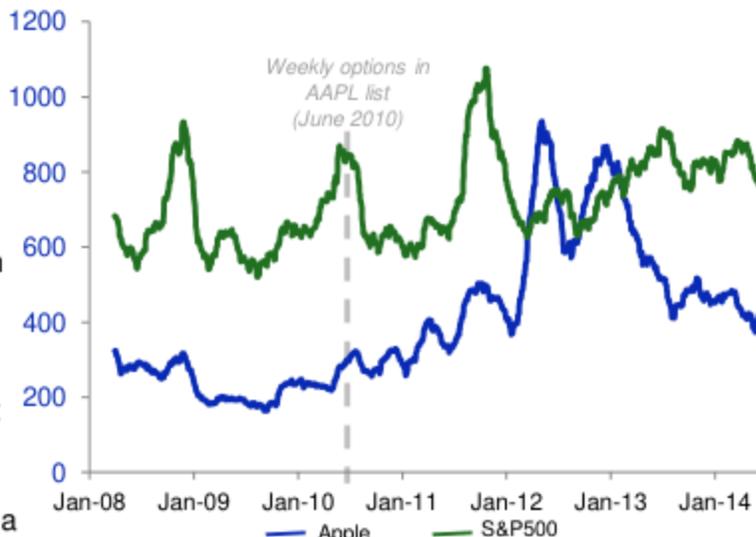
- Even though the amount of stock is small relative to Apple’s ADTV of 10 – 15mm shares, there is a strong correlation between this activity and the stock return on the relevant day of the week^(a)



AAPL option volume analysis^(a)



60-day moving average volume in options (in 000s)

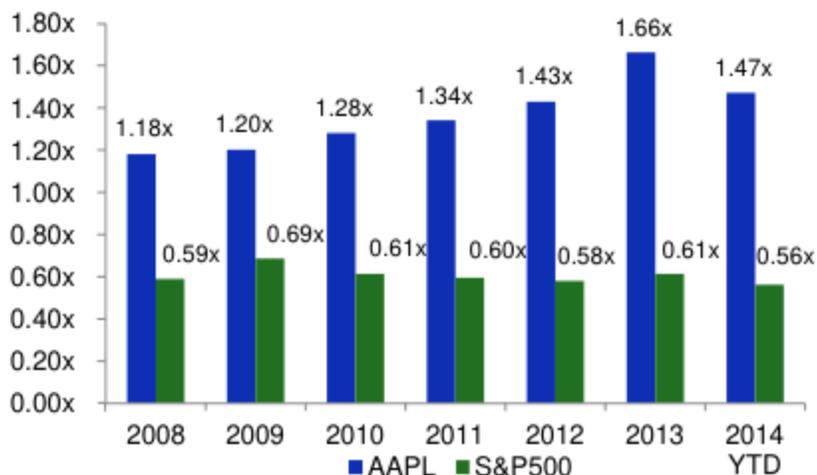


Trading in AAPL options (calls and puts) has doubled from 2010 to June 2014

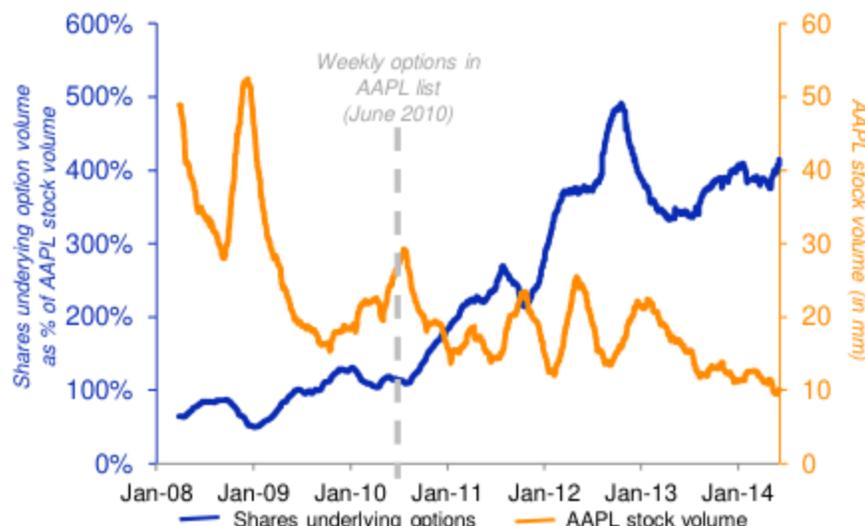
The underlying shares that these options represent are larger than the stock volume – delta adjusted, though, the volume would be about 25-50% based on recent data

Apple's open interest as a percent of its outstanding stock is higher than any other S&P 100 company and its ratio of calls to puts is higher than the broader market as well as the average S&P 100 company

Ratio of calls to puts



60-day moving average of Apple stock and option volume (based on underlying shares)



Top 10 S&P 100 companies by option open interest^(b)

Rank	OEX Index	Company	Market cap (\$bn)	Option open interest as % of shares	Ratio of calls to puts
1	AAPL UW Equity	Apple Inc	\$479	27.4%	1.49x
2	FB UW Equity	Facebook Inc	\$173	16.0%	1.61x
3	GOOG UW Equity	Google Inc	\$404	13.1%	1.08x
4	GM UN Equity	General Motors Co	\$57	11.9%	1.22x
5	CAT UN Equity	Caterpillar Inc	\$61	11.5%	1.00x
6	APC UN Equity	Anadarko Petroleum Corp	\$42	10.3%	2.16x
7	AMZN UW Equity	Amazon.com Inc	\$160	9.2%	0.99x
8	FCX UN Equity	Freeport-McMoRan Copper & Gold Inc	\$34	8.7%	1.01x
9	HAL UN Equity	Halliburton Co	\$46	7.9%	1.28x
10	EBAY UW Equity	eBay Inc	\$71	7.6%	1.81x
Average -- top 10				12.4%	1.37x
Average -- all 100				3.7%	1.33x

Summary



- Apple’s stock price does exhibit an abnormal trading pattern on Monday and Friday
 - Monday’s outperformance is more significant, and more consistent, than Friday’s underperformance
 - The pattern developed around 2011 coinciding with the listing of Weekly options on AAPL stock

- AAPL option trading is more significant than the option trading for other large companies
 - Weekly options increased the amount of AAPL option trading volume
 - The net “delta” of the options market (limited to what we classify as directional transactions), while small relative to total liquidity, does correlate to the stock price performance

- Given all the above, along with the ratio of calls to puts, and the significant retail element to the listed option market, we suspect the abnormal trading pattern could be explained by the following activity:
 - Investors selling puts and strangles (a combination of out-of-the-money puts and calls) to generate income
 - Investors buying calls as a levered long equity investment

- Assuming this is the case, hedged market participants will be short calls on a net basis. Such participants will need to purchase stock to hedge their stock price risk
 - This may result in hedged investors purchasing stock on Mondays as positions are initiated, while selling stock as their delta erodes on Fridays
 - The change in open interest supports this as the open interest increases the most on Mondays and decreases the most on Fridays

Strategy Implementation



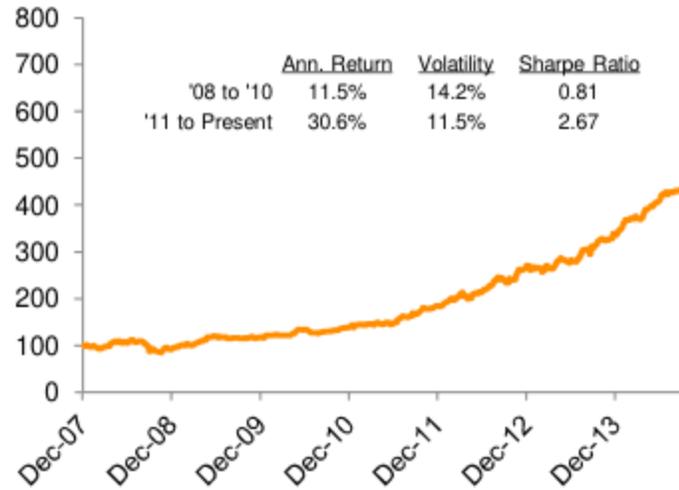
DB proposes a strategy referencing the combined return of the Friday and Monday trades with gains or losses reinvested in the strategy on a daily basis (alternatively, a strategy on Monday-only could also be implemented)

Strategy will use SPY, the SPDR S&P 500 ETF, to replicate the S&P 500 total return

Strategy assumes dividends are reinvested on the ex-date

Strategy incorporates a transaction cost of 0.002% per execution on notional amount executed

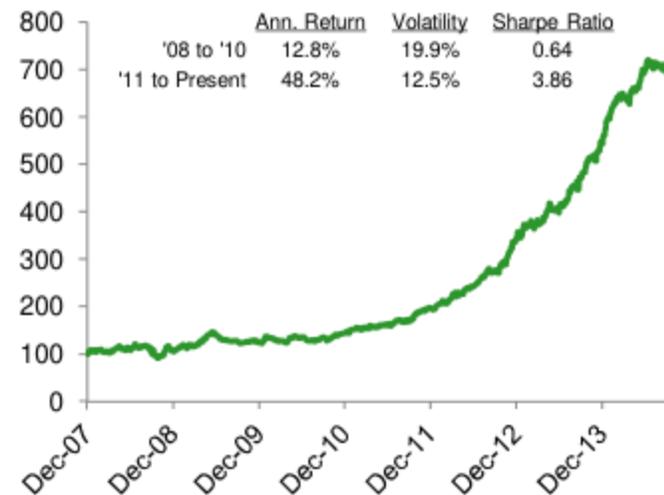
Monday outperformance vs SPY



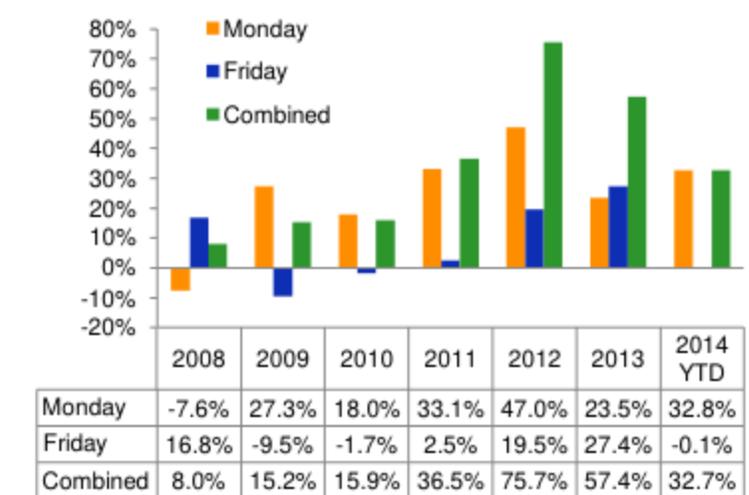
Friday underperformance vs SPY



Combined Friday / Monday performance vs SPY



Annual Returns



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