Project C

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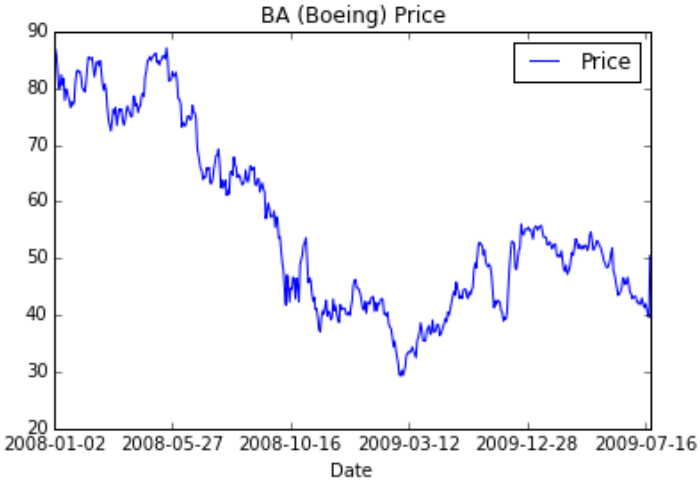
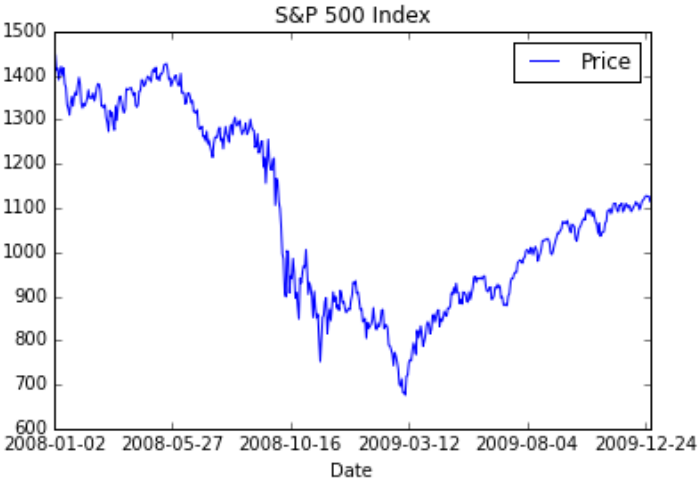
November 8, 2015

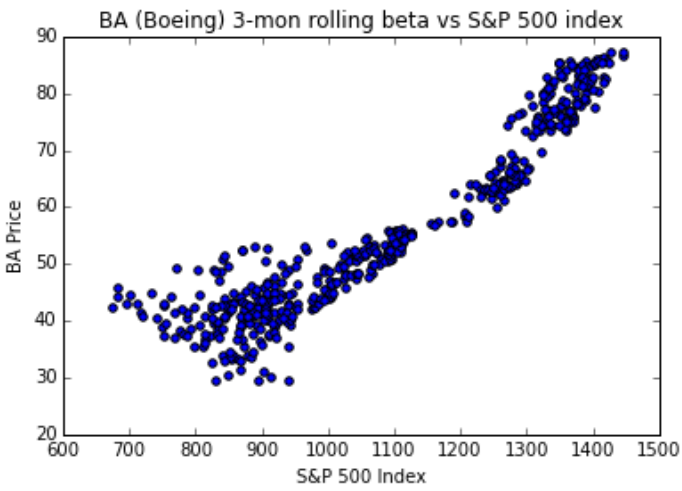
1 Beta

I chose BA (Boeing company) to do this analysis. Data range: 2008-01-01 to 2009-12-31, during which the financial crisis happened and the market was highly volatile.

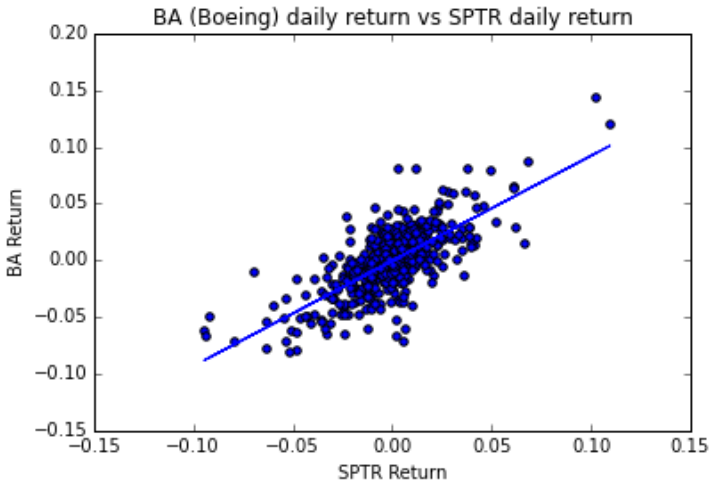
(a). Time series plots of the 3-month rolling beta, S&P 500 and scatter plot of beta vs S&P500.







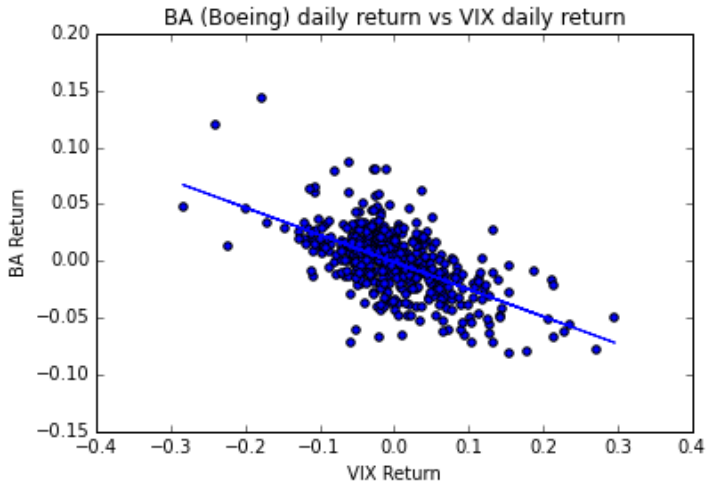
(b). A scatter plot of 1-day stock returns vs. the SPTR 1-day return and linear regression line.



Equation for linear regression:

- (With intercept): $\hat{y} = -0.00041234 + 0.92471118\hat{x}$
- (Intercept = 0): $\hat{y} = 0.92509641\hat{x}$

(c). A scatter plot of 1-day stock returns vs. the VIX 1-day return and the linear regression line.

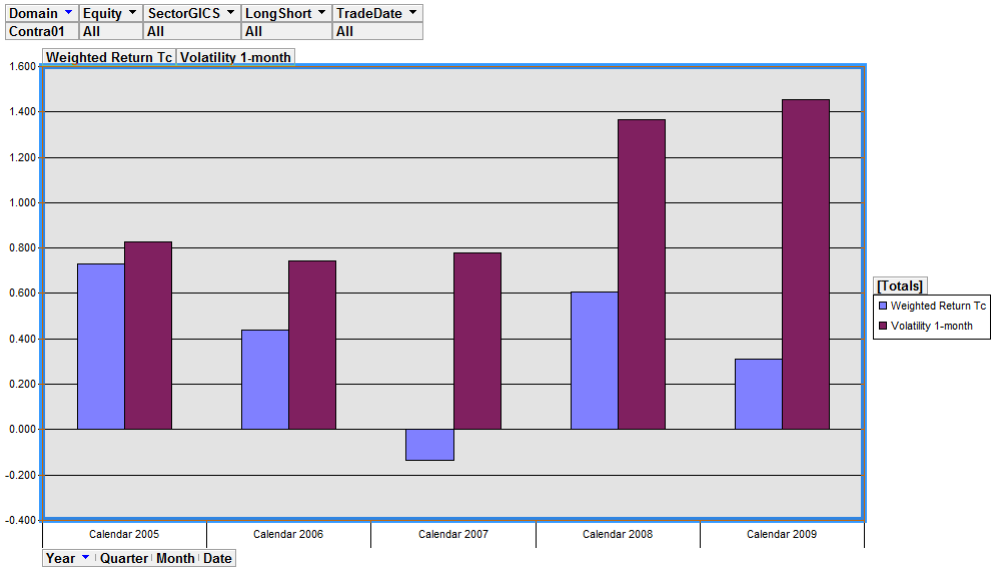


- (With intercept): $\hat{y} = -0.00084599 - 0.23941314\hat{x}$
- (Intercept = 0): $\hat{y} = -0.23939968\hat{x}$

2 Performance attribution

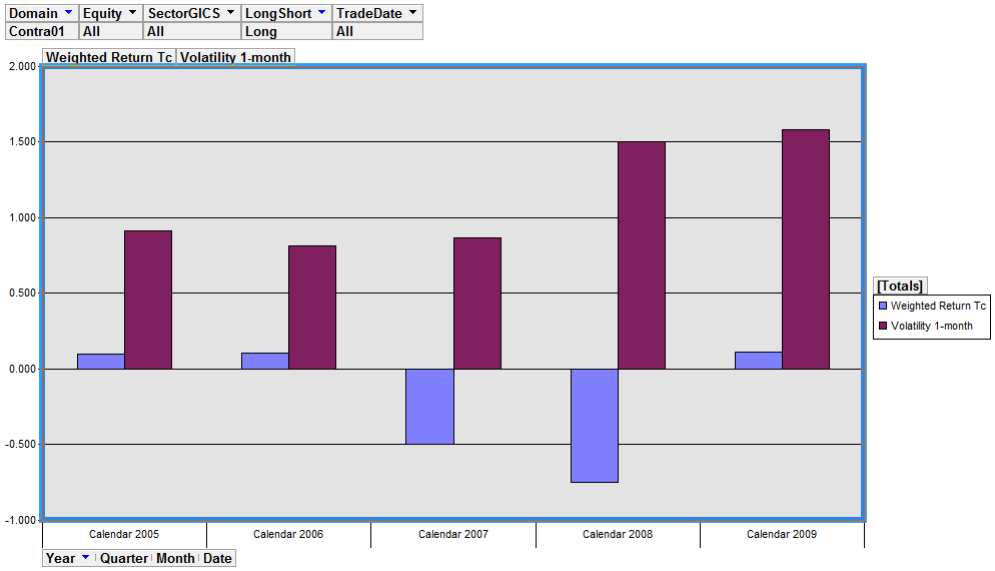
(a). Using data from strategy "Contra01" from OLAP database for 2005-2009, analyze the performance. I plotted the "Weighted Return Tc" and "1 month Volatility" for this period. To note, "1 month Volatility" and "3 month Volatility" have exactly the same values. Given these large volatility measures, I think the these values are already annualized. Otherwise, volatility should multiply by square root of number of the months and Sharpe ratio divide. With risk free rate 0, I make table for the annualized return, volatility and Sharpe ratio.

Case 1: *Overall*



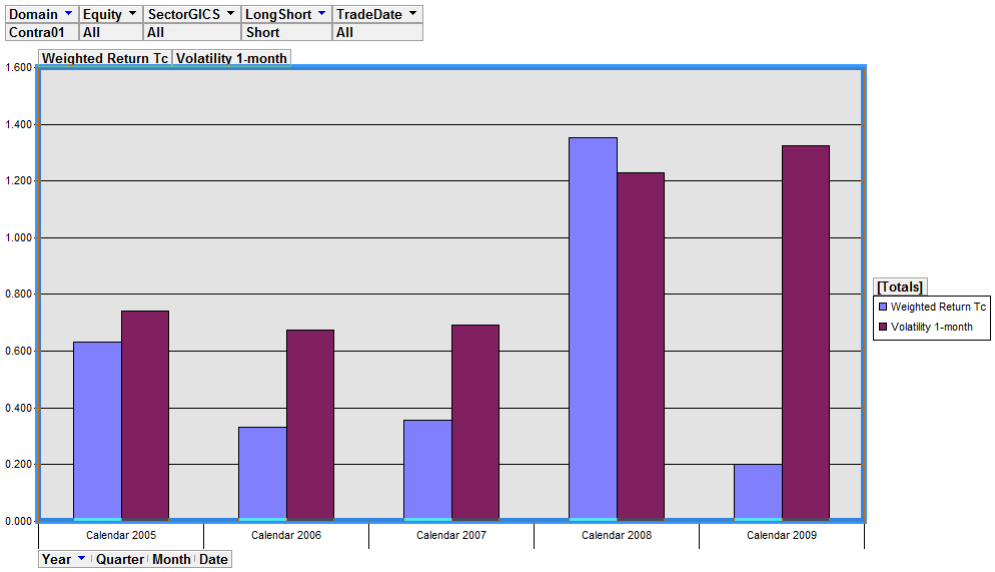
Year	Return	Volatility	Sharpe Ratio
2005	73.18%	82.85%	0.8833
2006	43.86%	74.49%	0.5888
2007	-13.61%	77.76%	-0.1750
2008	60.68%	136.51%	0.4445
2009	31.09%	145.30%	0.2140
Total	195.20%	100.36%	1.9450

Case 2: *Long*



Year	Return	Volatility	Sharpe Ratio
2005	10.02%	91.67%	0.1093
2006	10.70%	81.66%	0.1310
2007	-49.36%	86.45%	-0.5710
2008	-74.63%	150.30%	-0.4965
2009	11.09%	158.36%	0.0700
Total	-92.18%	110.41%	-0.8349

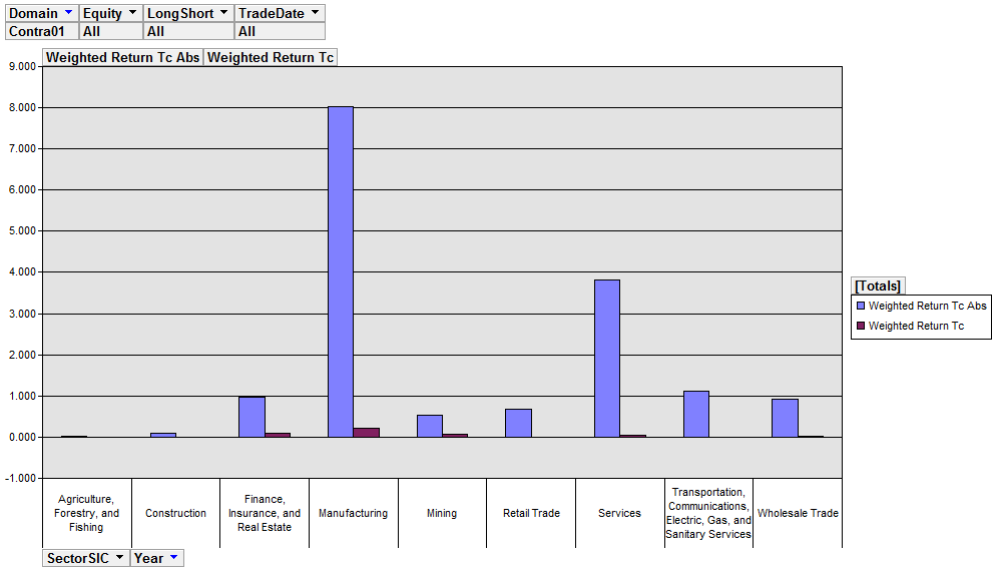
Case 3: *Short*



Year	Return	Volatility	Sharpe Ratio
2005	63.16%	74.07%	0.8527
2006	33.15%	67.33%	0.4924
2007	35.75%	69.09%	0.5174
2008	135.31%	122.76%	1.1022
2009	20.00%	132.30%	0.1512
Total	287.38%	90.34%	3.1811

(b). Regrouping the data by SIC sector and filter only the 2006. Manufacturing contributes the most to the absolute overall return. It contributes 801.83% to the overall 1617.46%, i.e. 49.57%.

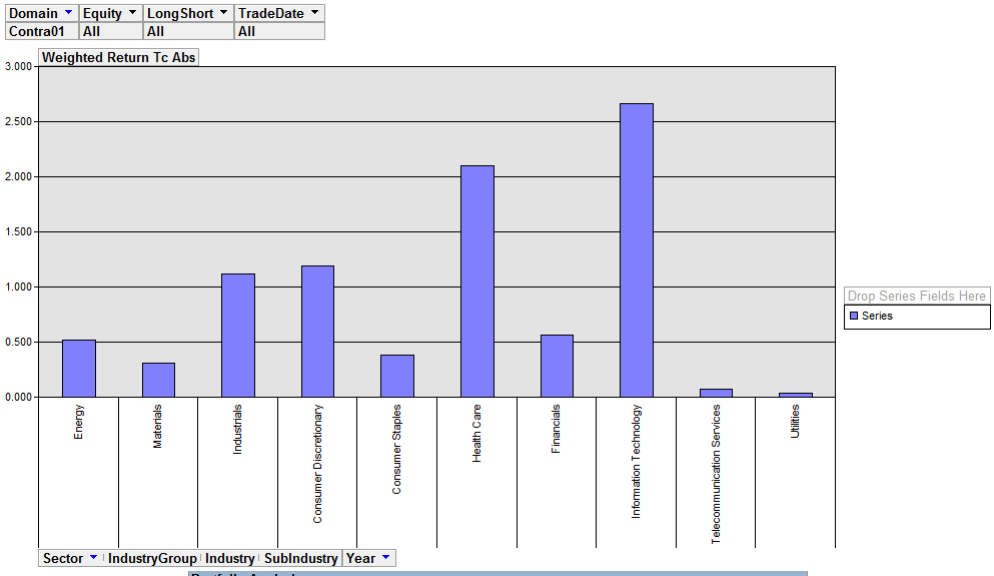
Plot and table:



Portfolio Analysis					
Domain	Equity	LongShort	TradeDate		
Contra01	All	All	All		
				Drop Column Fields Here	
SectorSIC			Year	Weighted Return Tc Abs	Weighted Return Tc
⊞ Agriculture, Forestry, and Fishing				2.77%	0.27%
⊞ Construction				10.09%	-0.49%
⊞ Finance, Insurance, and Real Estate				96.87%	9.34%
⊞ Manufacturing				801.83%	21.15%
⊞ Mining				53.73%	6.28%
⊞ Retail Trade				66.70%	-1.14%
⊞ Services				381.31%	5.61%
⊞ Transportation, Communications, Electric, Gas, and Sanitary Services				112.31%	0.80%
⊞ Wholesale Trade				91.86%	2.04%
Grand Total				1617.46%	43.86%

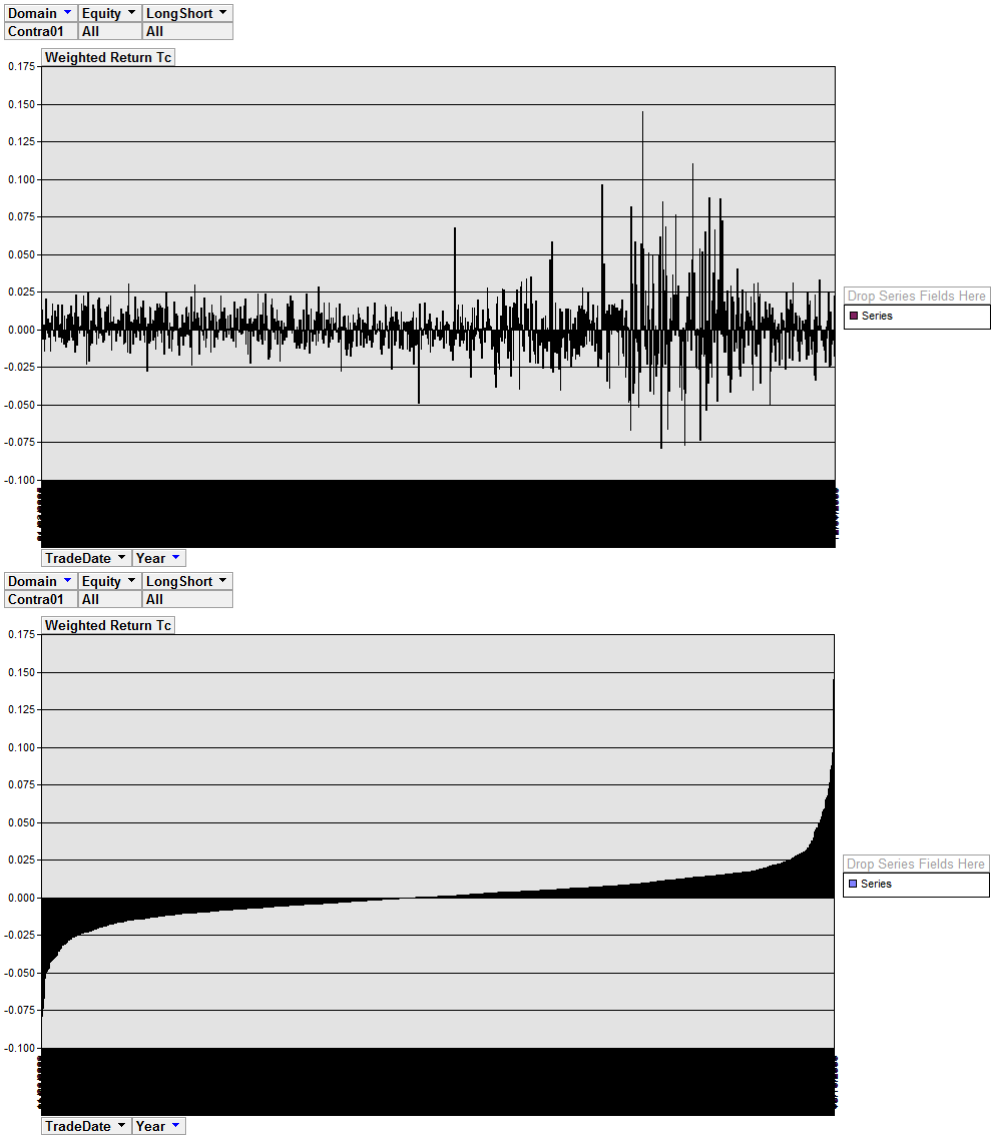
(c). Regrouping the data by GICS sector and filter only the 2006. Information technology contributes the most to the absolute overall return. It contributes 266.69% to the overall 895.52%, i.e. 29.78%.

Plot and table:



Portfolio Analysis							
Domain	Equity	LongShort	TradeDate				
Contra01	All	All	All				
					Drop Column Fields Here		
Sector	IndustryGroup	Industry	SubIndustry	Year	Weighted Return Tc Abs	Weighted Return Tc
⊞ Energy					51.47%	4.17%
⊞ Materials					30.99%	-1.31%
⊞ Industrials					112.12%	7.94%
⊞ Consumer Discretionary					119.05%	0.59%
⊞ Consumer Staples					38.22%	1.71%
⊞ Health Care					209.81%	-0.16%
⊞ Financials					56.37%	5.83%
⊞ Information Technology					266.69%	5.93%
⊞ Telecommunication Services					7.45%	-1.36%
⊞ Utilities					3.34%	1.09%
Grand Total					895.52%	24.44%

(d). The time series plot of strategy one-day return and plot reorganized into ascending order:



This returns 1260 observations. The last one is total, so altogether 1259 observations in this 5-year range. 673 of them are positive, 6 returns are 0, and 580 are negative, corresponding 53.46% winners and 46.07 % losers. Of all the winners, median return is 0.85%. Of all the losers, median return is -0.82%.

3 Risk measurement

(a). I extracted daily weight data for each sector over the period 2005-2009 in the pivot table. The following shows a table of max (highest), min (lowest) and mean of the 1259 days.

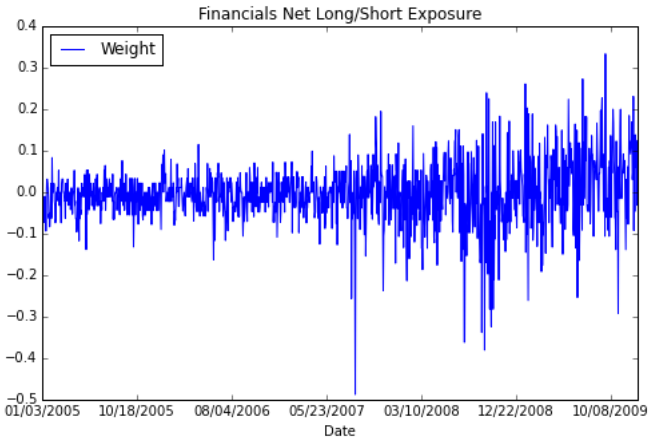
	Max	Min	Mean
NA	30.99%	-22.22%	5.22%
Energy	30.99%	-23.26%	-0.42%
Materials	16.90%	-12.68%	-0.51%
Industrials	16.28%	-18.99%	-0.98%
Consumer Discretionary	19.40%	-24.00%	-0.78%
Consumer Staples	9.23%	-8.00%	-0.08%
Health Care	24.14%	-22.22%	-1.04%
Financials	33.33%	-48.72%	-0.33%
Information Technology	24.10%	-23.60%	-1.35%
Telecommunication Services	4.21%	-5.13%	-0.10%
Utilities	3.53%	-4.76%	-0.14%
Grand Total	2.99%	-5.41%	-0.33%

Among these sectors, *Comsumer Staples, Telecommunication Services, Utilities* are ones stayed within $\pm 10\%$ of the portfolio weight throughout.

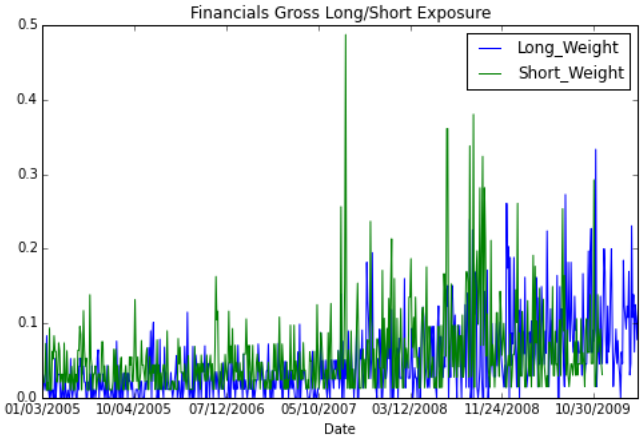
(b).On 9/15/2008, the GICS sector weights are: NA 11.27%; Energy -7.04%; Materials 0.00%; Industrials -2.82%; Consumer Discretionary -8.45% Consumer Staples -1.41%; Health Care 7.04%; Financials -2.82%; Information Technology 5.63%; Grand Total 1.41%.
The most unbalanced position is NA 11.27%, which are investments cannot be categorized in the sectors. The long positions sum up to be 23.94%. Total short is 22.54%. The portfolio return on that day is -8.06%.

(c). On 2/27/2007, the GICS sector weights are: NA 6.10%; Energy -1.22%; Materials 0.00%; Industrials 4.88%; Consumer Discretionary 1.22%; Consumer Staples 2.44%; Health Care 0.00%; Financials 1.22%; Information Technology -14.63%; Telecommunication Services 1.22%; Grand Total 1.22%.
The most unbalanced position is Information Technology -14.63%. The long positions sum up to be 17.08%. Total short is 15.85%. The portfolio return on that day is -4.41%.

(d). Such strategy will not be market neutral on its own. Unlike the original strategy of looking at all universe of the securities tradable and developing weights that can be made market-neutral, the sub-strategy will be correlated with other sectors and will not be market neutral standing on its own. As Prof. Mende pointed out in the forum: The signals depend only on the individual stock returns relative to the market without any other references or inputs. Therefore there is no reason to expect a priori that the sectors would be neutral.
Plots of the *net* long/short exposure:



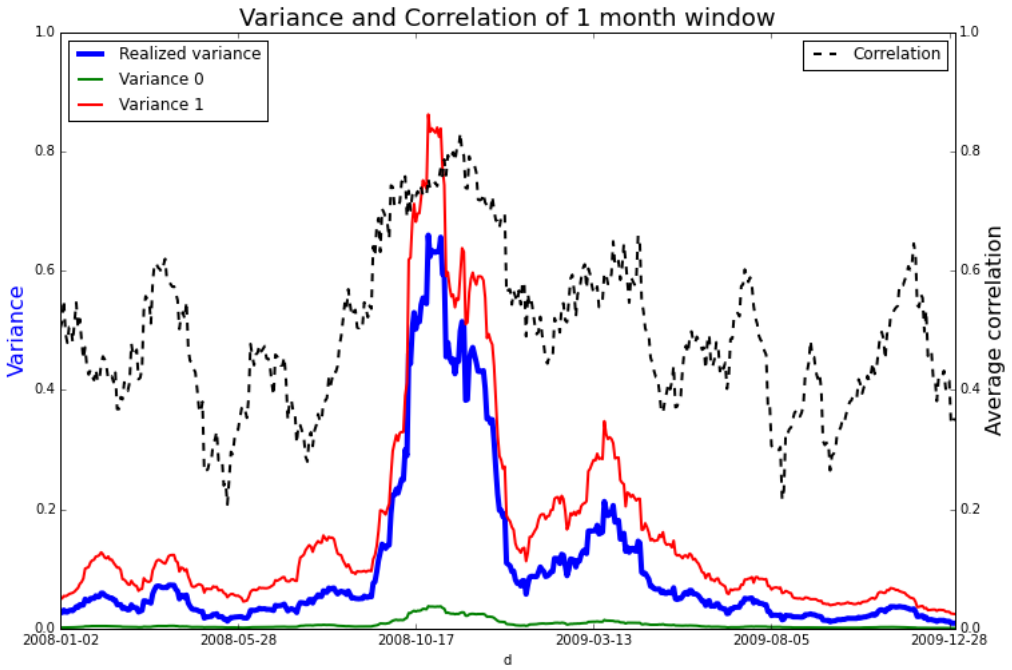
Plots of the *gross* long/short exposure, where blue stands for the long positions, and green short:

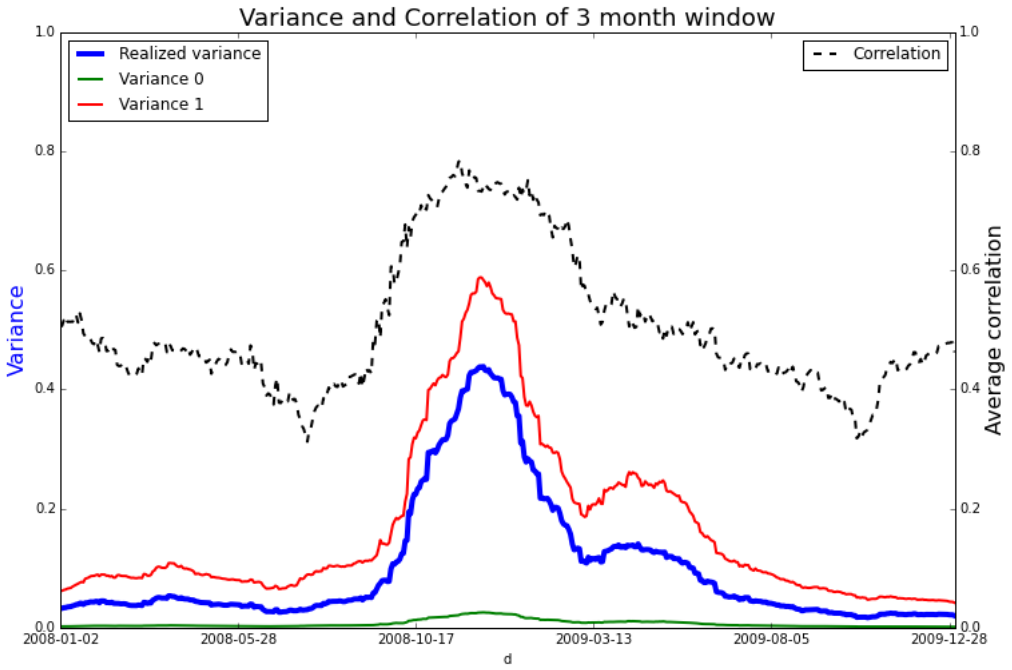


The substrategy became more volatile (larger variance) throughout this time frame, due to the highly volatile market.

4 Correlation dynamics

(a,b,c,d). Two plots: average correlation, index realized variance, variance 0, variance 1, for 1-month and 3-month correlation window. I extracted data from indexmember, fact_equity, view_fact_index, view_fact_indexmember.





(e). For both 1-month window and 3-month window, the maximum correlation happened on 2008-11-21. For 1-month window, it's 0.8310979. For 3-month window, it's 0.7840061.

(f). Constraints for the four values and whether they hold in this period:

1. index realized variance, variance 0, variance 1 larger than 0. Hold.
2. variance 0 (zero correlation) $<$ index realized variance $<$ variance 1 (one correlation). Hold.
3. Correlation between -1 and 1. Under this specific condition, it's supposed to be positive because every stock is a component of and contributes to the index. Thus the sum should be positive correlated. Hold.

(g). The positive correlation constraint will be violated if the weights are not positive.