

# Quiz4 Report

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1. Explore alternative fundamental factors, and extend the original program with your new fundamental factors.

The original program uses:

- Dividend Yield
- Price to Book Value
- Price to Trailing 12-Month Sales
- Price to Trainling 12-Month Cash Flows

Those 4 factors are used to form the strategy. I keep the original factors and add 4 more factors to form a new set.

- Original 4 factors above
- Price/Earnings-to-Growth (PEG) ratio
- Price-to-Earnings ratio (PE) ratio
- Return on Equity (Quality)
- Volatility

Those 8 factors are used to form a new set of factors. Also, in the strategy, I form a new mask which chooses the securities with  $ROE > 0.1$  combining with the original mask.

- PE measures a company's current share price relative to its per-share earnings. A high PE ratio could mean that a company's stock is over-valued, or else that investors are expecting high growth rates in the future.
- PEG =  $ForwardPERatio / Long-term Average Earning Growth Rate$ , which measures the relationship between the price/earnings ratio and earnings growth.
- ROE =  $Net\ income / Average\ Shareholders'\ Equity$ , which measures how effectively management is using a company's assets to create profits, demonstrating the company's potential and strength.
- Volatility shows the how stable the security is and since I rank largest is best, so I invert this number added to the score.  
Here I use  $Volatility = 1 / np.log(closeprice).diff().std()$ .

2. Evaluate your factors and the original factors of the lecture using Alphalen's full tear sheet based on return, information analysis, and turnover. Analyze your results (you do not have to explain every graph and every indicator. It is enough if you discuss your results in about half page).

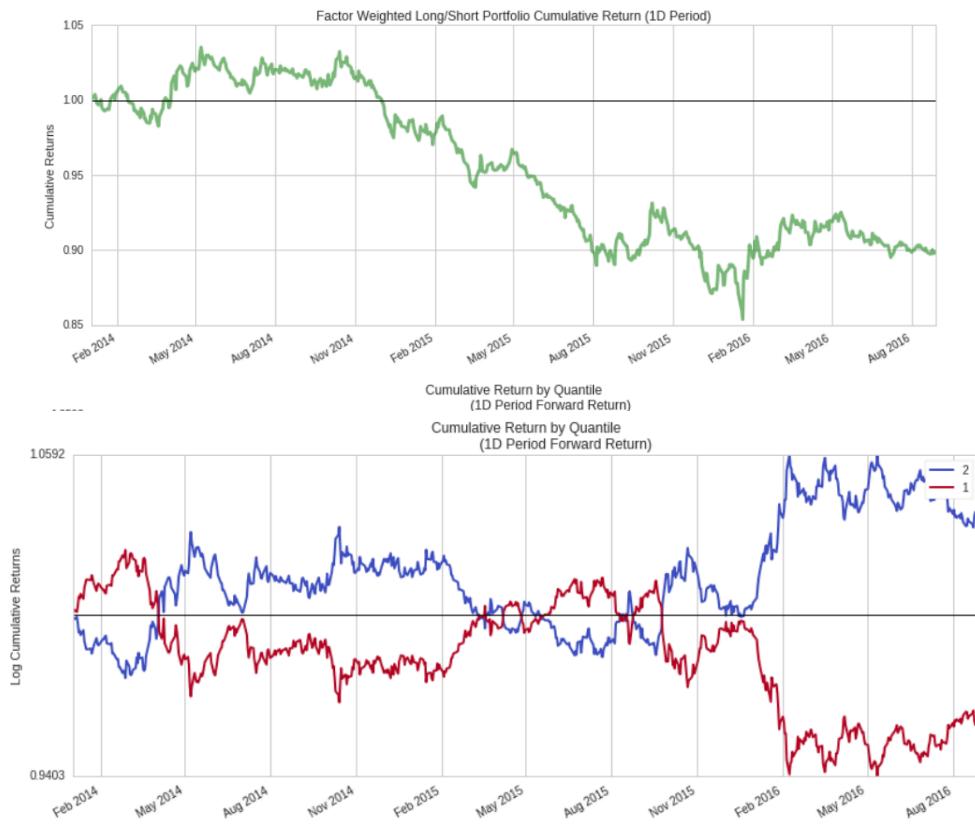
Part one: Analysis factors one by one:

The original factors:

### a). Price to Trailing 12 Month Sales

				Information Analysis		
				1D	5D	10D
Returns Analysis				IC Mean	0.007	0.009
				IC Std.	0.148	0.141
				Risk-Adjusted IC	0.046	0.062
				t-stat(IC)	1.191	1.598
				p-value(IC)	0.234	0.111
				IC Skew	0.218	0.377
				IC Kurtosis	-0.296	-0.231
						-0.338
Mean Period Wise Return Top Quantile (bps)				0.568	0.616	0.672
Mean Period Wise Return Bottom Quantile (bps)				-0.567	-0.612	-0.669
Mean Period Wise Spread (bps)				1.135	1.227	1.341

Ann.alpha shows that the Price to Trailing 12 Month Sales are not an idea factor for risk adjusted return and the exceed return. IC mean is positive showing that it has predictive ability.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.03 and then goes down below 1. The trend goes down as the curve showed above. The quantile 2 is higher than quantile 1 which drive more in return.

### Turnover Analysis

	1D	5D	10D
Quantile 1 Mean Turnover	0.005	0.016	0.027
Quantile 2 Mean Turnover	0.004	0.010	0.016
Mean Factor Rank Autocorrelation	1.0	0.999	0.998

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent.

### b). Dividend Yield

Information Analysis				
Returns Analysis	1D 5D 10D			
	IC Mean	-0.005	-0.010	-0.008
Ann. alpha	0.012	0.013	0.017	IC Std. 0.124 0.124 0.125
beta	-0.035	-0.021	0.009	Risk-Adjusted IC -0.040 -0.077 -0.062
Mean Period Wise Return Top Quantile (bps)	-0.364	-0.302	-0.232	t-stat(IC) -1.035 -2.004 -1.613
Mean Period Wise Return Bottom Quantile (bps)	0.365	0.302	0.232	p-value(IC) 0.301 0.046 0.107
Mean Period Wise Spread (bps)	-0.729	-0.604	-0.463	IC Skew 0.224 0.452 0.395
				IC Kurtosis -0.138 -0.112 -0.284

Ann.alpha shows that the Dividend Yield is an idea factor compared to Price to Trailing 12 Month Sales for risk adjusted return and the exceed return. While IC mean is negative showing that it has poor predictive ability.





The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.06 and the trend goes up as the curve showed above. The quantile 1 is higher than quantile 2 which drive more in return.

#### Turnover Analysis

	1D	5D	10D
Quantile 1 Mean Turnover	0.006	0.015	0.024
Quantile 2 Mean Turnover	0.005	0.015	0.024
	1D	5D	10D
Mean Factor Rank Autocorrelation	1.0	0.998	0.997

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent.

#### c). Price to Book

#### Information Analysis

Returns Analysis		1D			5D			10D		
		IC Mean	-0.004	-0.009	-0.009	IC Std.	0.096	0.099	0.103	
	Ann. alpha	0.036	0.046	0.042						
	beta	-0.159	-0.163	-0.155						
	Mean Period Wise Return Top Quantile (bps)	-0.532	-0.582	-0.564						
	Mean Period Wise Return Bottom Quantile (bps)	0.533	0.584	0.565						
	Mean Period Wise Spread (bps)	-1.064	-1.166	-1.129						
					IC Skew	0.181	0.425	0.455		
					IC Kurtosis	-0.444	-0.311	-0.367		

Ann.alpha shows that the price to book is an idea factor for risk adjusted return and the exceed return. While IC mean is negative showing that it has poor predictive ability.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.15 and the trend goes up as the curve showed above. The quantile 1 is higher than quantile 2 which drive more in return.

### Turnover Analysis

	1D	5D	10D
Quantile 1 Mean Turnover	0.007	0.022	0.036
Quantile 2 Mean Turnover	0.008	0.023	0.038
Mean Factor Rank Autocorrelation	0.999	0.993	0.986

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 0.999 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent.

#### d). SPY Proxy

Information Analysis							
	1D	5D	10D				
Returns Analysis							
	IC Mean	0.007	0.009	0.013			
	IC Std.	0.148	0.141	0.143			
Ann. alpha	-0.035	-0.030	-0.030	Risk-Adjusted IC	0.046	0.062	0.090
beta	-0.061	0.015	0.013	t-stat(IC)	1.191	1.598	2.334
Mean Period Wise Return Top Quantile (bps)	0.568	0.616	0.672	p-value(IC)	0.234	0.111	0.020
Mean Period Wise Return Bottom Quantile (bps)	-0.567	-0.612	-0.669	IC Skew	0.218	0.377	0.351
Mean Period Wise Spread (bps)	1.135	1.227	1.341	IC Kurtosis	-0.296	-0.231	-0.338

Ann.alpha shows that the SPY Proxy is not an idea factor for risk adjusted return and the exceed return. While IC mean is positive showing that it has predictive ability.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.03 and the trend goes down as the curve showed above. The quantile 2 is higher than quantile 1 which drive more in return.

This factor behaves very similar to the Price to Trailing 12 Month Sales according to the result.

#### Turnover Analysis

	1D	5D	10D
Quantile 1 Mean Turnover	0.004	0.011	0.019
Quantile 2 Mean Turnover	0.003	0.008	0.012
	1D	5D	10D
Mean Factor Rank Autocorrelation	1.0	0.999	0.999

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent.

#### e). Price to Trailing 12 Month Cashflow

Information Analysis				
Returns Analysis	1D 5D 10D			
	IC Mean	-0.005	-0.008	-0.009
Ann. alpha	0.023	0.068	0.076	IC Std. 0.110 0.118 0.121
beta	-0.485	-0.400	-0.421	Risk-Adjusted IC -0.050 -0.068 -0.071
Mean Period Wise Return Top Quantile (bps)	-0.514	-0.499	-0.468	t-stat(IC) -1.288 -1.768 -1.844
Mean Period Wise Return Bottom Quantile (bps)	0.514	0.499	0.468	p-value(IC) 0.198 0.078 0.066
Mean Period Wise Spread (bps)	-1.028	-0.998	-0.936	IC Skew 0.226 0.094 0.134
				IC Kurtosis -0.077 -0.410 -0.574

Ann.alpha shows that the Price to Trailing 12 Month Cashflow is an idea factor for risk adjusted return and the exceed return. While IC mean is negative showing that it doesn't have a strong predictive ability.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.2 (the highest among all the factors) and the trend goes up and down around the baseline 1 as the curve showed above. The quantile 1 is higher than quantile 2 which drive more in return.

### Turnover Analysis

	1D	5D	10D
<b>Quantile 1 Mean Turnover</b>	0.006	0.015	0.024
<b>Quantile 2 Mean Turnover</b>	0.005	0.015	0.024
	1D	5D	10D
<b>Mean Factor Rank Autocorrelation</b>	1.0	0.998	0.997

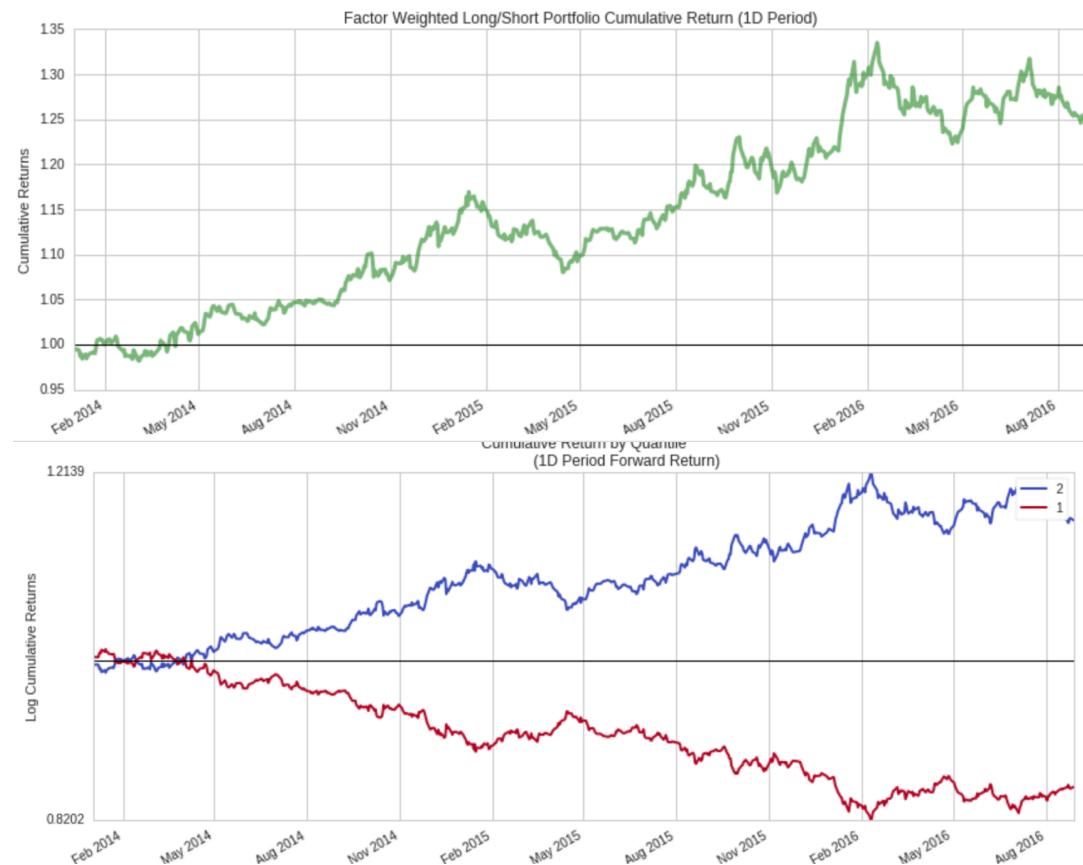
The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent.

My new factor:  
a). PEG factor

Information Analysis

Returns Analysis	1D	5D	10D	1D	5D	10D	
				IC Mean	0.015	0.026	0.038
Ann. alpha	0.107	0.108	0.107	IC Std.	0.212	0.210	0.206
beta	-0.339	-0.381	-0.403	Risk-Adjusted IC	0.072	0.122	0.184
Mean Period Wise Return Top Quantile (bps)	2.259	2.202	2.181	t-stat(IC)	1.856	3.156	4.753
Mean Period Wise Return Bottom Quantile (bps)	-2.233	-2.193	-2.172	p-value(IC)	0.064	0.002	0.000
Mean Period Wise Spread (bps)	4.493	4.394	4.353	IC Skew	0.142	0.049	-0.082
				IC Kurtosis	-0.407	-0.566	-0.537

Ann.alpha shows that the PEG is an idea factor for risk adjusted return and the exceed return. While IC mean is positive showing that it has a predictive ability. Compared to the original factors, this one both return analysis and information analysis are better.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.35 (higher than that of any original factors) and the trend goes up as the curve showed above. The quantile 2 is higher than quantile 1 which drive more in return.

### Turnover Analysis

	1D	5D	10D
Quantile 1 Mean Turnover	0.015	0.058	0.108
Quantile 2 Mean Turnover	0.012	0.043	0.078
	1D	5D	10D
Mean Factor Rank Autocorrelation	1.0	0.998	0.995

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent. This is similar to the original factors.

### b). PE ratio

Information Analysis			
1D	5D	10D	
IC Mean	0.009	0.014	0.020
IC Std.	0.128	0.136	0.133
Risk-Adjusted IC	0.069	0.105	0.152
t-stat(IC)	1.644	2.509	3.620
p-value(IC)	0.101	0.012	0.000
IC Skew	0.080	0.093	0.048
IC Kurtosis	-0.296	-0.622	-0.789

Returns Analysis			
	1D	5D	10D
Ann. alpha	-0.014	-0.033	-0.045
beta	-0.031	-0.003	0.054
Mean Period Wise Return Top Quantile (bps)	1.924	2.004	2.054
Mean Period Wise Return Bottom Quantile (bps)	-1.905	-1.995	-2.045
Mean Period Wise Spread (bps)	3.829	3.999	4.099

Ann.alpha shows that the PE ratio is not an idea factor for risk adjusted return and the exceed return. IC mean is positive showing that it has predictive ability. This is similar to the Price to Trailing 12 Month Sales.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.20 (higher than that of any original factors) and the trend goes down at the end as the curve showed above. The quantile 2 is higher than quantile 1 which drive more in return.

### Turnover Analysis

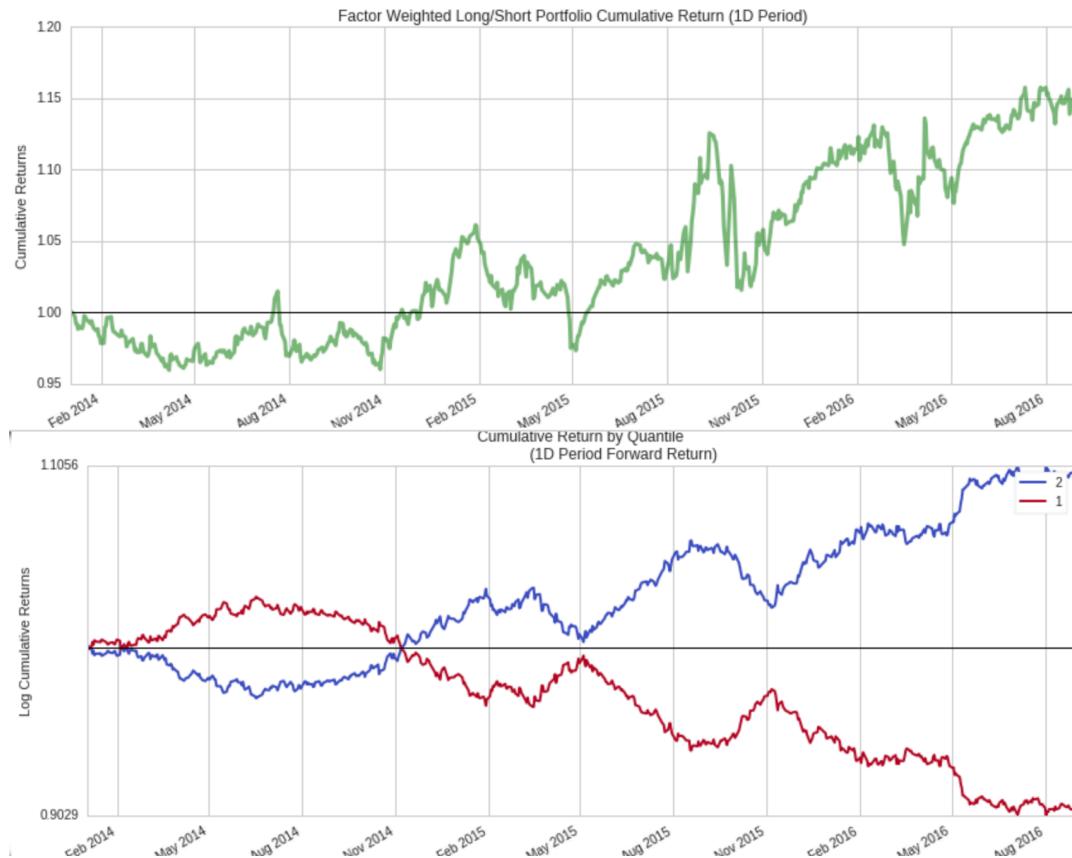
	1D	5D	10D
Quantile 1.0 Mean Turnover	0.016	0.059	0.107
Quantile 2.0 Mean Turnover	0.014	0.049	0.087
	1D	5D	10D
Mean Factor Rank Autocorrelation	0.998	0.992	0.985

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 0.998 (slightly lower than the original factors) which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent. This is similar to the original factors.

### c). Quality

				Information Analysis		
				1D	5D	10D
Ann. alpha	0.056	0.055	0.063	IC Mean	0.009	0.019
beta	0.068	-0.024	-0.057	IC Std.	0.113	0.117
Mean Period Wise Return Top Quantile (bps)	1.461	1.336	1.322	Risk-Adjusted IC	0.081	0.164
Mean Period Wise Return Bottom Quantile (bps)	-1.451	-1.334	-1.318	t-stat(IC)	2.085	4.253
Mean Period Wise Spread (bps)	2.913	2.671	2.640	p-value(IC)	0.037	0.000
				IC Skew	0.043	-0.154
				IC Kurtosis	-0.136	-0.148
						-0.113

Ann.alpha shows that the Quality is an idea factor for risk adjusted return and the exceed return. While IC mean is positive showing that it has a predictive ability. Compared to the original factors, this one both return analysis and information analysis are better.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.15 and the trend goes up as the curve showed above. The quantile 2 is higher than quantile 1 which drive more in return.

## Turnover Analysis

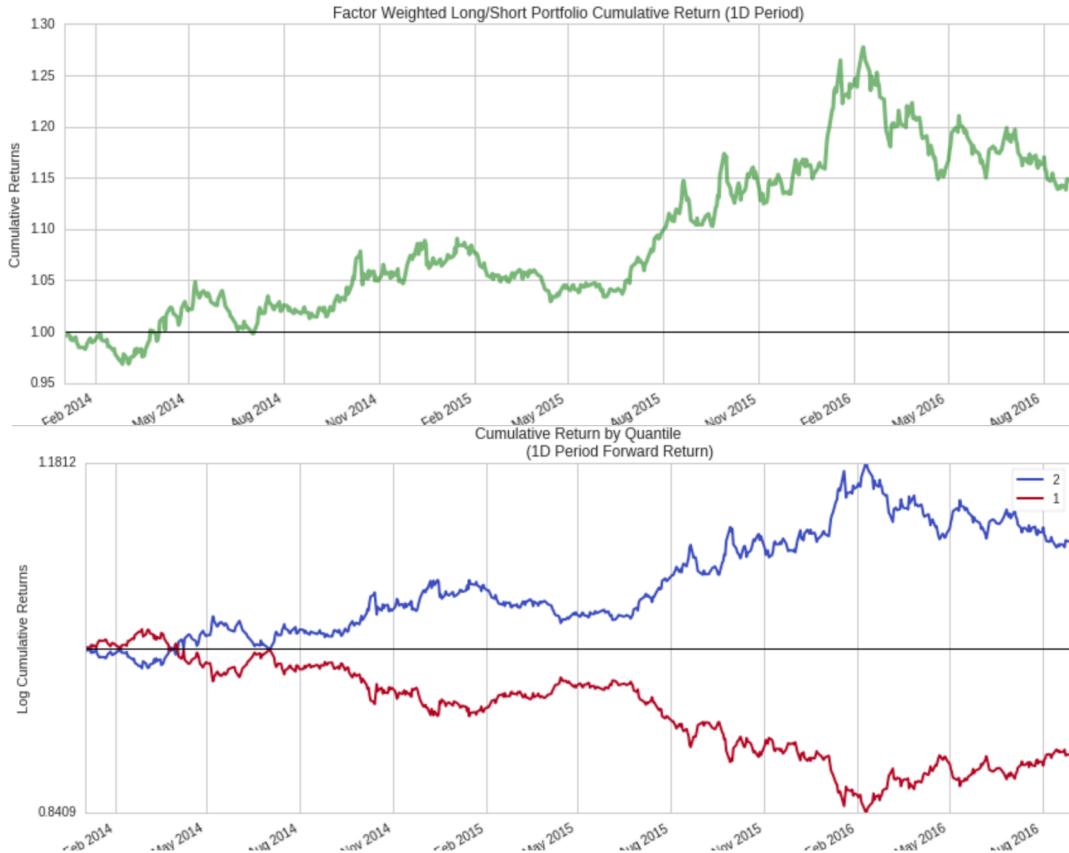
	1D	5D	10D
Quantile 1 Mean Turnover	0.018	0.063	0.113
Quantile 2 Mean Turnover	0.016	0.056	0.098
Mean Factor Rank Autocorrelation	0.998	0.992	0.984

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 0.998 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent. This is similar to the original factors.

## d). Volatility

Returns Analysis				Information Analysis			
	1D	5D	10D		1D	5D	10D
Ann. alpha	0.079	0.082	0.081	IC Mean	0.019	0.031	0.039
beta	-0.398	-0.419	-0.431	IC Std.	0.213	0.206	0.203
Mean Period Wise Return Top Quantile (bps)	1.545	1.558	1.517	Risk-Adjusted IC	0.089	0.150	0.191
Mean Period Wise Return Bottom Quantile (bps)	-1.545	-1.558	-1.519	t-stat(IC)	2.308	3.870	4.947
Mean Period Wise Spread (bps)	3.091	3.116	3.037	p-value(IC)	0.021	0.000	0.000
				IC Skew	0.148	0.097	0.054
				IC Kurtosis	-0.389	-0.490	-0.461

Ann.alpha shows that the Volatility is an idea factor for risk adjusted return and the exceed return. While IC mean is positive showing that it has a predictive ability. Compared to the original factors, this one both return analysis and information analysis are better.



The cumulative return shows that by using this factor, the peak cumulative return point can reach around 1.28 and the trend goes up as the curve showed above. The quantile 2 is higher than quantile 1 which drive more in return.

### Turnover Analysis

	1D	5D	10D
Quantile 1 Mean Turnover	0.004	0.015	0.027
Quantile 2 Mean Turnover	0.003	0.011	0.018
	1D	5D	10D
Mean Factor Rank Autocorrelation	1.0	0.998	0.996

The turnover chart shows a fairly low turnover which means that the changing of position might not affect us too much. The mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent. This is similar to the original factors.

In short, if we analyze the factor one by one, we can see that my new factor overall gives more cumulative return. As for the return and informatic analysis, my new factors give better result and predictive ability.

## Part Two: Analysis factors as a single combined factor

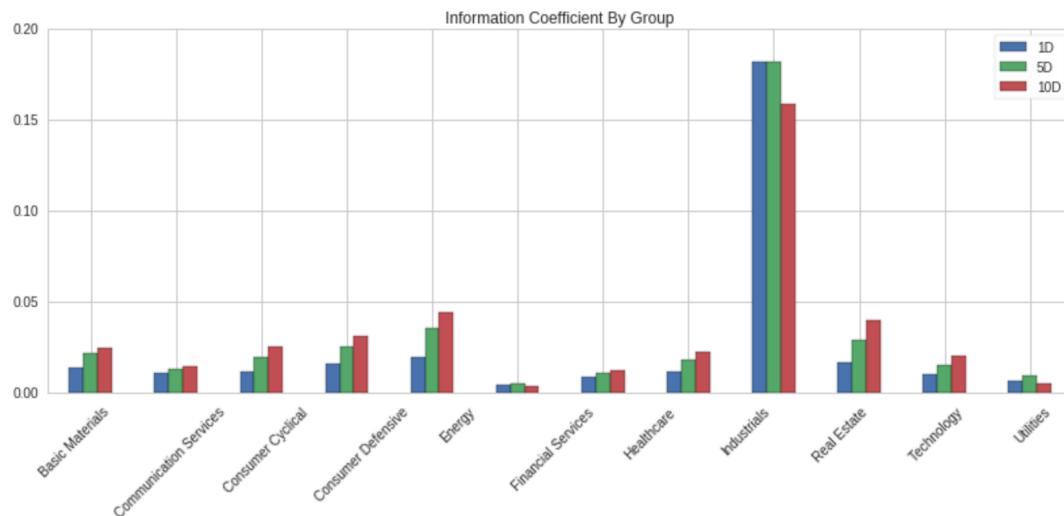
The cumulative return charts are included in question 3 and will be discussed there.

### The original factors analysis:

#### Returns Analysis

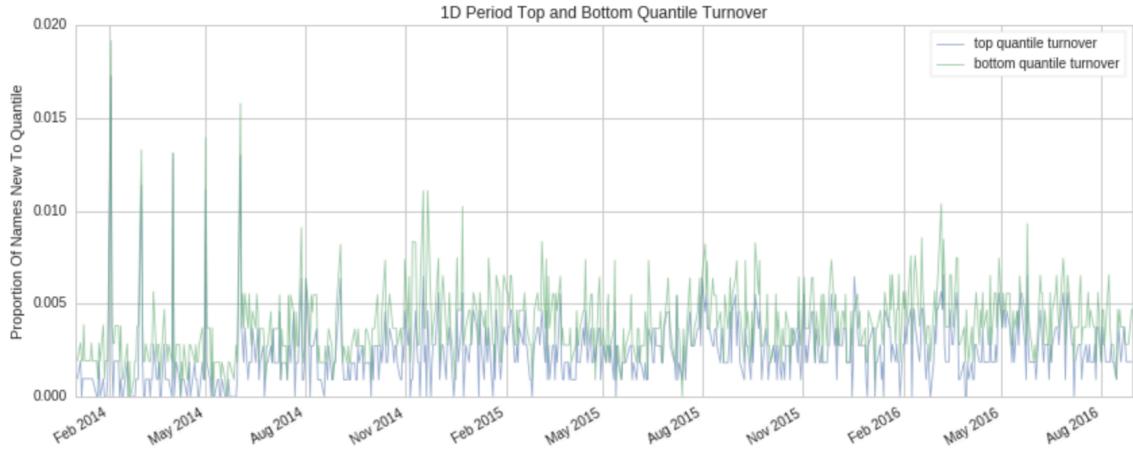
Information Analysis							
	1D	5D	10D		1D	5D	10D
Ann. alpha	0.026	0.027	0.027	IC Mean	0.009	0.013	0.016
beta	-0.172	-0.205	-0.220	IC Std.	0.152	0.143	0.142
Mean Period Wise Return Top Quantile (bps)	0.860	0.797	0.767	Risk-Adjusted IC	0.058	0.088	0.116
Mean Period Wise Return Bottom Quantile (bps)	-0.860	-0.797	-0.767	t-stat(IC)	1.502	2.274	2.998
Mean Period Wise Spread (bps)	1.720	1.593	1.534	p-value(IC)	0.134	0.023	0.003
				IC Skew	0.063	0.246	0.253
				IC Kurtosis	-0.363	-0.323	-0.402

As for the original factors, the Ann.alpha (1D) is 0.026. The IC mean (1D) is 0.009. According to tutorial, we hope IC mean to be positive since it gives us indication of the predictive ability of our factors. We can see that the 1D, 5D and 10D IC mean are all positive numbers for the original factors which are good because we know that the original factors have predictive ability.



The information coefficient by group chart tells that the returns by quantile for each individual sector, which gives us information about which industry helps to drive the bulk

of our returns. In the above chart, we can see the Industrials has the highest information coefficient indicating that it may contribute the most in our return.

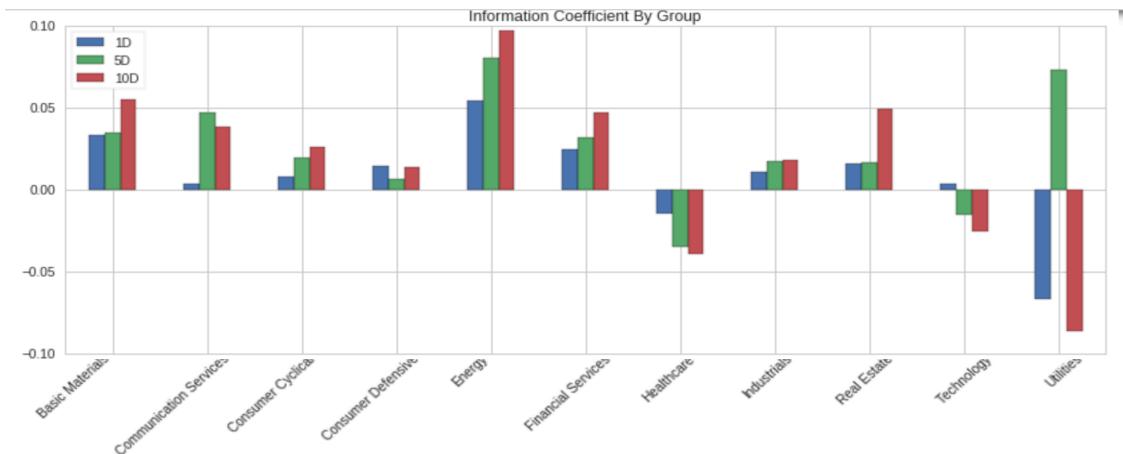


The turnover chart shows a fairly low turnover for the original factors which means that the changing of position might not affect us too much in this case. From the turnover analysis, it also gives us the autocorrelation for the factors. The mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent.

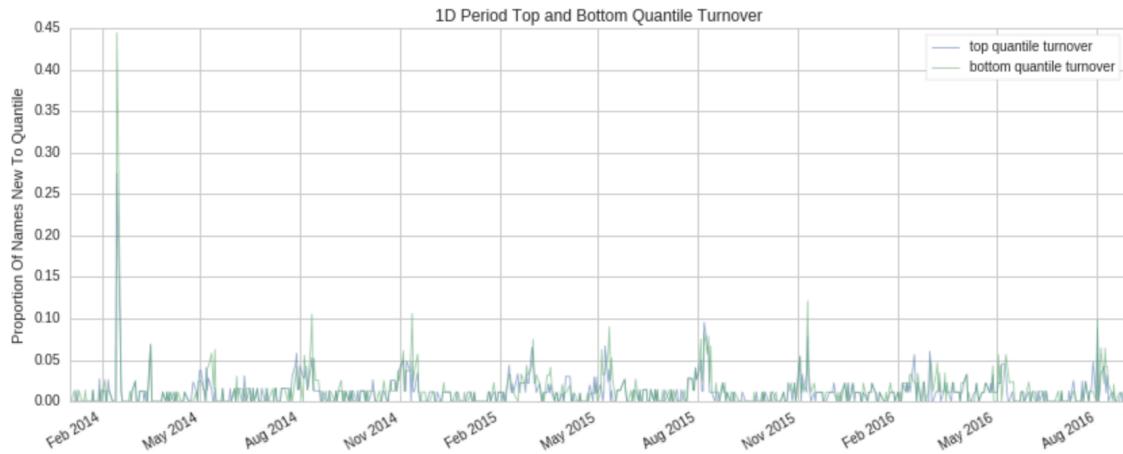
My factors analysis:

Returns Analysis				Information Analysis			
	1D	5D	10D		1D	5D	10D
Ann. alpha	0.040	0.041	0.036	IC Mean	0.007	0.011	0.014
beta	-0.173	-0.226	-0.245	IC Std.	0.157	0.157	0.158
Mean Period Wise Return Top Quantile (bps)	1.224	1.369	1.392	Risk-Adjusted IC	0.047	0.069	0.091
Mean Period Wise Return Bottom Quantile (bps)	-1.208	-1.365	-1.385	t-stat(IC)	1.214	1.788	2.344
Mean Period Wise Spread (bps)	2.433	2.734	2.777	p-value(IC)	0.225	0.074	0.019
				IC Skew	0.030	-0.016	-0.043
				IC Kurtosis	-0.319	-0.367	-0.283

As for my factors, the Ann.alpha (1D) is 0.040. The IC mean (1D) is 0.007. We can see that the 1D, 5D and 10D IC mean are all positive numbers for the original factors which are good as well because we know that my factors have predictive ability.



In the above chart, we can see the Energy has the highest information coefficient indicating that it may contribute the most in our return. An interesting point is that for utilities, only 5D information coefficient is positive while the others are negative.



The turnover chart shows a fairly low turnover for my factors which means that the changing of position might not affect us too much in this case. But it is higher than the original factors which means that the changing of position affect my factors more than the original factors. From the turnover analysis, the mean factor rank autocorrelation is 1 which implies that the current value of the factor highly relates the previous value and that portfolio positions are relatively consistent which shows the same as the original factors.

In short, the alpha indicates the exceed return which are returns achieved above and beyond the return of a proxy. In general, higher alpha value indicate a higher chance to get the exceed return and all investors hope for positive excess return because it gives them more money than they can earn within the investment. In this case, my factors give a higher 1D Ann.alpha 0.040 compared to the original factors while the IC mean is relatively lower than that of the original factors. From the turnover analysis, the changing

of positions might affect my factors more than the original factors while the autocorrelation of the both factors are the same.

3. Implement a trading algorithm using your selected factors, and backtest with Quantopian. Build the following table based on the performance tab of Quantopian's backtest facility:

Tutorial	Original factors	My model
Total Returns	24.90%	28.62%
Specific Returns	6.06%	6.49%
Common Returns	17.69%	20.74%
Sharpe	2.36	2.73
Max Drawdown	-5.44%	-6.57%
Volatility	0.13	0.15
Changes introduced in the simulations	Null	Keep the original factors and add ROE, PEG, PE and Volatility factors. Add a filter ROE > 0.1.

```

class PE(CustomFactor):
    inputs = [morningstar.valuation_ratios.pe_ratio]
    window_length = 1

    def compute(self, today, assets, out, p_e):
        out[:] = p_e[-1]

    # PEG factor
    class PEG(CustomFactor):
        inputs = [morningstar.valuation_ratios.peg_ratio]
        window_length = 1

        def compute(self, today, assets, out, peg):
            out[:] = peg[-1]
            out[:] = np.nan_to_num(out[:])

class Quality(CustomFactor):
    inputs = [morningstar.operation_ratios.roe]
    window_length = 1

    def compute(self, today, assets, out, roe):
        out[:] = roe[-1] > 0.08

    # Volatility
    class Volatility(CustomFactor):
        inputs = [USEquityPricing.close]
        window_length = 252

        def compute(self, today, assets, out, close):
            close = pd.DataFrame(data=close, columns=assets)
            # Since we are going to rank largest is best we need to invert
            out[:] = 1 / np.log(close).diff().std()

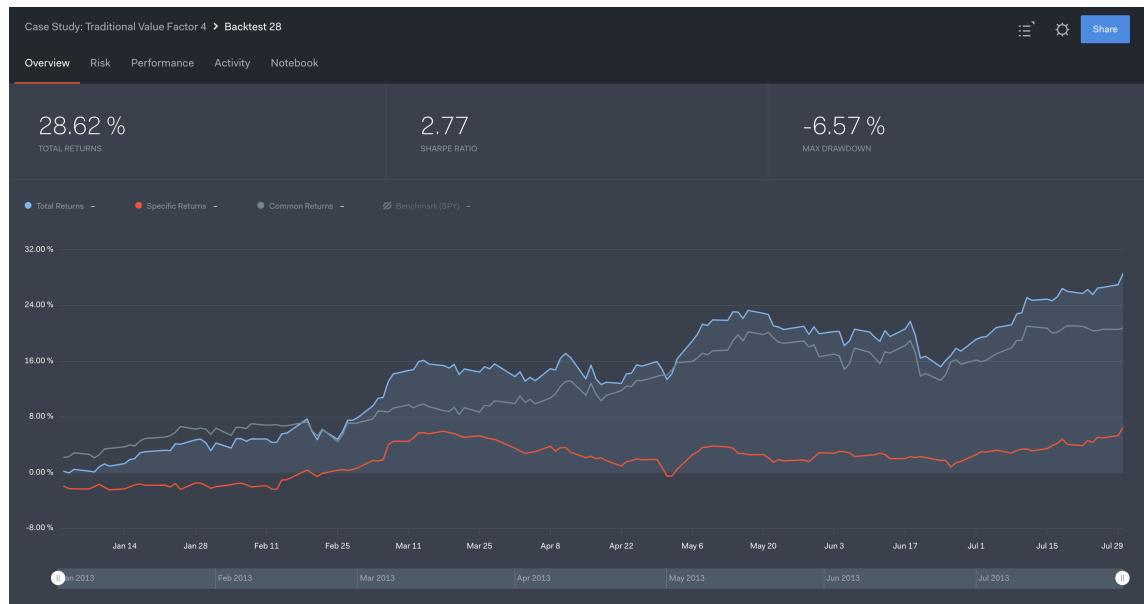
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4. Include a graph as the following for the two simulations:

Original Factors Backtesting simulation:



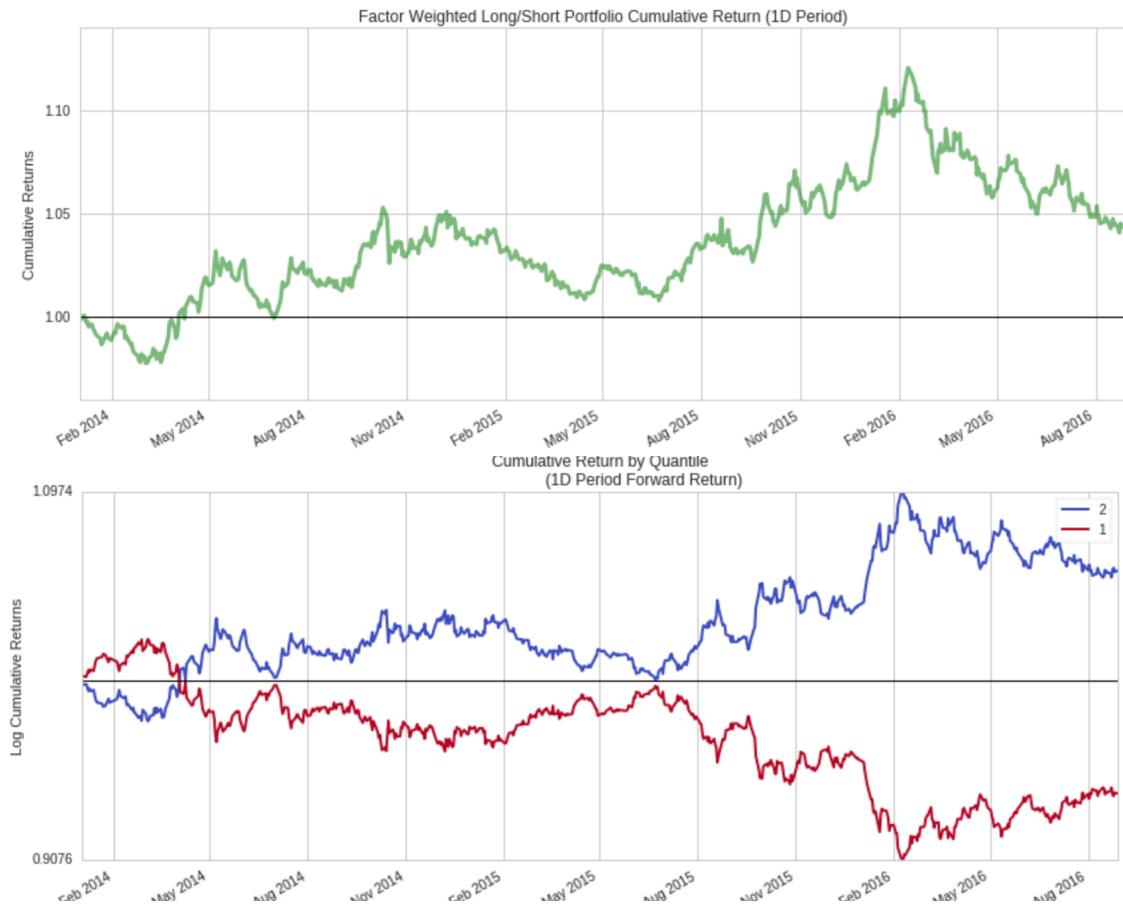
My Factors simulation:



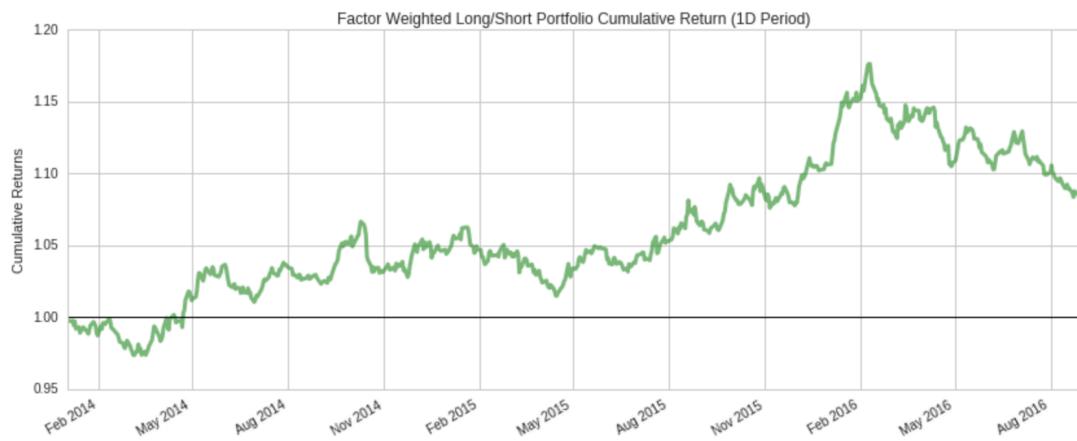
From the above 2 diagrams, we can see after adding these 4 factors, it gives us a higher total return which is 28.62%.

Note: Here I used combined factor analysis. The single factor analysis one by one charts is included in question 2.

Original factors Alphalens Analysis:



My factors Alphalens Analysis:





From the above cumulative return charts, we can see that the trends of both two algorithms are similar, the original factor cumulative return's highest point reaches around 1.10-1.12 while my factors cumulative return's highest point reaches around 1.15-1.17. The cumulative return by quantile charts shows us that in both cases, the quintile 2 drive the returns more

5. Discuss the results of your algorithm when you run it with the original factors and with your selected factors (about 1 page without including graphs or tables). Explain why your results are better, equal or worse than the simulation using the original factors.

After running the above two algorithms, I found that the total return for the original factor's algorithm is 24.90% while mine gives the 28.62%, which indicates that adding the 4 factors above indeed improve the algorithm's strategy and measurements. Common returns are how much of the total returns can be attributed to the common risk factors as modeled by Quantopian. If all total return comes from the common return, it indicates that the model is nothing unique. Hence, the specific return higher and the common lower is an idea model.

We can see that the common return for the original factors' algorithm is 17.69% while mine is 20.74%. But for the specific return, the original factors' algorithm is 6.06% and mine is 6.49% which is higher than the original one. The sharp ratio of the original one is 2.36 and the volatility is 0.13. The sharp ratio of mine is 2.73 and the volatility is 0.15. The sharp ratio gives us the average return earned in excess of the risk-free rate per unit of total risk. Volatility is a measure of the price fluctuations of a portfolio. In general, the greater the sharpe ratio, the more attractive the risk-adjusted return. In this case, my factors algorithm gives a higher sharp ratio which is more idea. Combining the analysis of the factors, the alpha of my algorithm is higher which is 0.040 while the original factors is 0.026, which indicates the same conclusion about the risk-adjusted return as indicating by the sharp ratio. Both of the algorithms have the positive IC mean value indicating that the factors all have the ability to predict. In addition, from the information coefficient analysis and turnover analysis, we can see that different industries contribute differently in the return. As for the original factors, the industrials contribute the most while the

energy contributes the most in my factors. The turnover shows that the changing of position in both of the algorithm is consistent but the changing might affect my factors slightly more compared to the original one.

My new factors algorithm seems better than the original one. I select the factor by searching lots of information online and try to interpret the importance of each factor. The P/E ratio is important because it provides a measure when comparing whether a stock is overvalued or undervalued. In this case, we know which stock might have the potential price growth. The PEG ratio provides a more complete picture of whether a stock's price is overvalued or not by analyzing both today's earnings and the expected growth rate. Because we can not only rely on P/E ratio and it doesn't include future earnings growth, the PEG ratio provides a more complete picture of a stock's valuation, which I think can give us more concrete and complete metric. In addition, ROE demonstrates the company's potential and strength which can support us to rank the company's securities based on information about the company itself. Apart from that, the above result analysis shows the similar conclusion, which indicates that the new factors algorithm is better.

6. Conclusions. What did you learn from this exercise? How can you improve your algorithm for a future test? (you do not have to run an extra test; this is only a discussion). (about half page)

I learnt a lot in this exercise. First of all, I know how to use the Quantopian, specifically, how to use pipeline, how I can find dataset and use its property or factors, how to build my own factors and understand the strategy based on codes. I also learnt how to debug by using the forum and docs provided by the Quantopian and also, I learn about the data structure in Quantopian more, like the Bondcolumn. I met MaxLossExceed error during my exercise and I tuned my parameters such as the end\_date according to the tutorial many times and last for about 2 or 3 hours to fix this bug and finally I fixed it by adding quantile. All this experience gave me deeper understanding about the Quantopian and improve self-problem-solving ability. Apart from that, by calibrate the model and try to find a better factors or strategy, I need to search a lot of information about investment or trading strategy, since I have limited knowledge about finance, my knowledge about these financial factors and which might affect the trading strategy or return performance increased a lot while I was doing this exercise. I didn't know the P/E ratio or other terms before I started this exercise. Meanwhile, I also learn how to analysis a factor by using alpha lens and each indicators' meaning and how to interpret the tear sheet. As for the future test, I might include the debt on equity when select the securities and also, I might try to get rid of several factors since may have redundancy and also, I will try to find method to improve the specific return.

I affirm that I have not plagiarized, used unauthorized materials, or given or received illegitimate help on this evaluation. I also uphold equity and honesty in the evaluation of my work and the work of others. I do so to sustain a community built around this Code of Honor.

(You can write your name in the line below without writing your original signature as you will submit this evaluation from your account).

-----Minyue Liu----- 2020.7.30-----

Name

Date