Financial Trading and Investing

MGMT 6240

Fall 2020

**Assignment 3 – Data Exercise (50 pts)**

On December 31st, 2016, you are given fiduciary responsibilities over $10 million that is to be fully invested in an equity portfolio that is benchmarked by the Russell 3000 index. Your portfolio construction is subject to the following constraints:

1. You must construct the portfolio with no less than 50 and no more than 1000 of the Russell 3000 components:
2. No leverage or short sales are allowed and each selected component must have a positive weight wi that cannot exceed 2.5 times an equal weighting at the time of portfolio construction:
3. For simplicity, you can only invest in stocks that are in the Russell 3000 as of October 27th, 2017.
4. No portfolio adjustments are permitted. Assume that you can purchase fractional shares of each security (i.e. you do not need to be concerned about rounding weights to reflect whole share amounts) and that there are no transactions costs.

In the accompanying Excel spreadsheet, you are provided with the following worksheets:

1. ***Firm Characteristics***: A number of firm characteristics obtained from Capital IQ. Should you be so inclined, you may obtain additional characteristics from the Capital IQ terminals on the 1st floor of the Pittsburgh building.
2. ***Aggregates***: Index level summary statistics for the firm characteristics noted above.
3. ***Stock Prices***: Daily (dividend adjusted) prices from January 1st 2012 through October 27th, 2017 for each stock in the Russell 3000 as of October 27th along with daily prices for IWV, a Russell 3000 value weighted ETF. You will notice that some of the securities do not have prices throughout the time series (i.e. they were added after January 1st, 2013): you may omit these securities from your portfolios. You may assume that all dividends are reinvested and that adjusted prices of securities reflect the reinvestment of these dividends.

Using the data above and any supplemental (non-pricing) data of your choice (i.e. Capital IQ, Bloomberg, etc.) to complete the following within a single Microsoft Word document (You may attach supplemental documents but all relevant content must be in this document):

1. Using only stock price data on or prior to December 31st, 2016, construct a mean-variance efficient portfolio that maximizes Sharpe ratio over the estimation period. Report performance statistics of the portfolio including but not limited to Treynor Ratio, CAPM beta (using IWV as the market portfolio), and CAPM alpha. Provide component weights (only those securities with non-zero weights), documented code, and any relevant analysis for portfolio construction.
2. Next, construct a portfolio that uses only firm characteristics (e.g. Price/Book, P/E, ROE, etc.) to determine portfolio weights. You may consider a multi-dimensional quantitative screening approach or a smart beta (non-rebalanced) approach: the choice is yours, but you may not use prior return time series as in part 1. Again, report portfolio performance statistics, provide component weights, documented code, and any relevant analysis for portfolio construction.
3. Run both of these portfolios out of sample (from January 1st, 2017 through October 27th, 2017) and recalculate portfolio performance statistics. Plot the growth and contrast the performance of a $10 million initial investment in each portfolio and the Russell 3000 index for the within sample and out of sample time periods in a single chart. Which portfolio performed better? How did they compare to the Russell 3000 Index? What might explain the differences in performance? How could you have improved the construction of your portfolios in part 1 and 2?