

## FE-312: Homework 5

1. Here, we will construct a portfolio that, at least on paper, should beat the market.

Open the file `SizeBMportfolios.dta` that we saw in the Lecture Notes. It contains returns on 25 portfolios sorted on size (ME) and book-to-market (BM). The naming convention is: `meXbmY` is the return to the portfolio that contains stocks in the X-th quintile in terms of ME and in the Y-th quintile in terms of BM. In addition, you have returns to the market portfolio (`mkt`) and on the risk-free rate.

For parts (a)-(e) below, use data up until Dec 2007.

- (a) First, let's decide on the optimal portfolio that mixes optimally among these 25 + 1 portfolios (ME/BM sort + market). Estimate the means, standard deviations and correlations among these portfolios, and plug them into Markowitz. Report the Sharpe Ratio of the tangency portfolio.
- (b) Now, let's restrict the set of portfolios that we are choosing over to the 4 'corner' portfolios, i.e. `me1bm1`, `me1bm5`, `me5bm1`, and `me5bm5`, and the market. Repeat the step above. Compare the Sharpe Ratio of this portfolio to the one above. Discuss.
- (c) Now, open the file `MomReturns.dta` that we also saw in class. We will combine the Size/Value strategy with the momentum strategy. That is, the set of assets you are considering is now the 5 portfolios in the previous step plus `dec1` and `dec10`, that is, the extreme winner and loser portfolio. Repeat the exercise above and compare your Sharpe Ratio to the one from the previous steps.
- (d) Open the file `BetaSortedPortfolios`. Add to the 7 portfolios from the previous step the 2 extreme beta portfolios (`Dec1` and `dec10`). Repeat the exercise above and compare your Sharpe Ratio to the one from the previous steps.

- (e) Using the 9 portfolios from the previous step, compute the sharpe ratio of an equal-weighted portfolio. Do the same for a ‘risk-parity’ portfolio. Compare the Sharpe ratios of these portfolios to the ones above.
- (f) Plot the returns of the 5 MVE portfolios above for the 2008-2016 period. Compute their ‘out-of-sample’ Sharpe ratios. Discuss.