

Download monthly data on 48 "Industry Portfolios" from Ken French's website at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. Choose 5 industries from the 48 and use data from the last 5 years for the 5 industries you have chosen to answer the questions in Part A.

PART A

- 1) Graph the "mean-variance locus" (without the risk-free asset) of the 5 industries. Specify each industry in the chart.
- 2) Graph the "mean-variance locus" (with the risk-free asset) of the 5 industries. Specify each industry in the chart. Explain how the mean-variance locus has changed with the risk-free asset.
- 3) Describe the tangent portfolio and its characteristics such as its mean and variance and the weights of each asset. Verify numerically that the tangent portfolio is the portfolio that maximizes the Sharpe ratio. Present and discuss these results.
- 4) Graph the "mean-variance locus" (without the risk-free asset) with the short-sale constraints on each industry. Specify each industry in the chart.
- 5) Graph the "mean-variance locus" (with the risk-free asset) with the short-sale constraints on each industry. Specify each industry in the chart. Explain how the mean-variance locus has changed with the risk-free asset.
- 6) Describe the tangent portfolio and its characteristics such as its mean and variance and the weights of each asset. Verify numerically that the tangent portfolio is the portfolio that maximizes the Sharpe ratio.

PART B

- 1) Resample (with replacement) from your original data of 5 industries you have chosen and create a new bootstrap sample of 60 months. Repeat this 1000 times, i.e. create 1000 bootstrap samples and carry out the analysis of points 1 to 6 in Part A to demonstrate the effect of estimation uncertainty on your results in Part A.
- 2) You want to invest in a maximum of 3 of these 5 industries. Repeat the same calculations in 1-6 with this constraint on the maximum number of assets. Present and discuss these results.
- 3) Instead of choosing sectors at random, as you did in Part A, you must now use data on all 48 sectors. The investment policy requires a maximum number of 5 assets. You want to find the portfolio that maximizes the Sharpe ratio with and without discovery selling constraints, using data from the last 5 years on 48 industries and respecting the constraint on the maximum number of 5 assets in your final portfolio. Propose and implement methods to identify the industries and their weights.
- 4) Use the last 10 years of data on the 48 industries and implement the MAXSER approach to portfolio allocation for the 48 industries. Explain your approach and empirical choices in detail.