

Exercises – Week 45

Introduction to Financial Engineering

Note: You may choose to work in R or Matlab. Sometimes solutions will be available in one language, sometimes in both.

1. (Two-fund separation) Using the data from Week 40, Exercise 3b).
 - (a) Calculate the portfolio weights for the global minimum variance portfolio
 - (b) Calculate the portfolio weights for the tangent portfolio
 - (c) Pick a point μ_C between μ_{GMV} and μ_{tan} and calculate the portfolio weights for this portfolio
 - (d) Find a fraction α such that *alpha* invested in the GMV-portfolio and $1 - \alpha$ invested in the tangent portfolio matches the portfolio in the previous question
 - (e) Confirm that for each asset, the ratio of excess return to its' covariance with the tangent portfolio is identical. Hint: The covariance of asset with the tangent portfolio is easily obtained by multiplying portfolio weights with the covariance matrix.

2. (SML) Using the numbers from above.
 - (a) Find the β s of each stock relative to the tangent portfolio
 - (b) Compute the β for the tangent portfolio, the portfolio found in 1(c) and the gmv portfolio
 - (c) Illustrate gmv portfolio, the portfolio found in 1(c) and the tangent portfolio on the Security Markets Line

(d) Are the three assets on the SML? Should they be?

3. (Empirical testing of CAPM) Use the data from Week 43, 1)

(a) Plot historical average returns as a function of β

(b) Does the stock data look consistent with CAPM?