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Financial Markets and Investments

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COMPUTER ASSIGNEMENT 3

Consider the assumptions of a single factor model (SFM), where for the common factor we have $\bar{R}_m = 15\%$, $\sigma_m = 20\%$. Furthermore, assume there exists a riskless asset that can be used to both lend and borrow with $R_f = 5\%$ and the following information about 6 risky assets.

	$\bar{R}_i$	β_i	σ^2_{ei}
1	25,1%	2	0,002
2	19,8%	1,5	0,003
3	17,0%	1,2	0,004
4	14,8%	1	0,005
5	12,8%	0,8	0,006
6	12,0%	0,7	0,007

1. Using the SFM parameters, find out the mean-variance theory (MVT) inputs – vector of expected returns and the variance-covariance matrix.

2. Consider shortselling is allowed without bounds.
   (a) Represent in the mean-variance space $\left(\sigma, \bar{R}\right)$ the efficient frontier:
      (i) when we consider just combinations of risky assets.
      (ii) when we consider, in addition, the riskless asset.
   (b) What can you conclude about the efficient of the 6 original risky assets?

3. Assume stock returns are approximately Gaussian.
   (a) Estimate the probability that the only combination of risky assets that is efficient has negative returns.
   (b) Determine the combination of the 6 risky assets, that has the lowest possible probability of negative returns.
   (c) Consider, in addition to risky assets, also the riskless asset. Identify all efficient portfolios that have at most 25% probability of negative returns. Represent it graphically.

4. Consider the single factor used for the SFM model is a good proxy to the market portfolio of CAPM.

   (a) Verify which of the 6 basic risky assets are in equilibrium.

   (b) Suppose Mr. Capm would like to invest in a portfolio:

      * That uses only risky assets that are in equilibrium or underpriced, plus the riskless asset.
      * That is efficient.
      * That has a $\beta_p \leq 1.5$.
      * That verifies $\Pr[R_{Mr.Capm} \leq 0\%] \leq 25\%$.

   What is your recommendation? Represent it in mean-varinace space $(\sigma, \bar{R})$.

5. Suppose now short-selling is forbidden.

   (a) Find the maximum and minimum risk combination of the 6 basic risky assets.

   (b) Determine the envelop hyperbola in this setup and graphically compare it with the unrestricted envelop hyperbola in Question 2.

6. Recover the results in Question 2 and 5 using the so-called cut-off method.