# Investments and Portfolio Management

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COMPUTER ASSIGNEMENT 1

Consider two risky assets, stocks $S$ and bonds $B$, for which we know:

$$\bar{R}_S = 10.3\%,$$
$$\bar{R}_B = 6.2\%,$$
$$\sigma_S = 12.2\%,$$
$$\sigma_B = 5.5\%.$$

1. Represent in the mean-variance space $(\sigma, \bar{R})$:

   (i) the two basic assets,

   (ii) the investment opportunity set (IOS),

   (iii) the efficient frontier (EF),

   for various correlations across the two assets returns. Use $\rho_{SC} \in \{-1, -0.5, -0.25, 0, 0.5, 0.75, 1\}$. Highlight the non-shortselling areas of IOS and EF. Interpret your results.

2. Assume now a fixed correlation value: $\rho_{SC} = 0.34$.

   (a) Consider combinations of $S$ and $B$ and that shortselling is allowed.

       (i) Write down the mean-variance inputs.

       (ii) Find the combination of $S$ and $B$ with the lowest possible risk. Determine its expected return and volatility.

       (iii) Can an investment of 100% in any of the basic assets be considered efficient? Why ir why not?

       (iv) How could an expected return level of 12% be attained? Is that efficient?

       (v) How could a volatility of 10% be attained? What is the efficient combination?

       (vi) What would you recommend an investor, Mr. Low, that wishes to efficiently invest 10 000 euros and bear the exact same risk as the risk of asset $B$? Explain.

       (vii) How would your answers to (i)-(v) change if shortselling is not allowed.

   (b) Suppose now there is in addition a riskless asset that can be used to both lending and borrowing with an $R_f = 5\%$.

       (i) Find the efficient frontier.

       (ii) What would you now recommend to an investor that wishes a risk level equal to the risk level of asset $B$.

       (iii) Consider another investor, Mr. High, whose optimal risk level is 15%. How should he invest? Which return should he expect?

   (c) Represent all answers to questions in (a)-(b) in the the mean-variance space $(\sigma, \bar{R})$.