Exercise 1. Calculating portfolio betas. You own a stock portfolio that has invested 25 percent in stock Q, 20 percent in stock R, 15 percent in stock S, and 40 percent in stock T. The betas for these four stocks are 0.75, 1.90, 1.38 and 1.16, respectively. What is the portfolio beta?

Exercise 2. Calculating portfolio betas. You own a portfolio that has invested equally in a risk-free asset and two stocks. If one of the stocks has a beta of 1.85 and the total portfolio is equally as risky as the market, what must the beta be for the other stock in your portfolio?

Exercise 3. Using CAPM. A stock has a beta of 1.25. The expected return on the market is 12 percent and the risk-free rate is 5 percent. What must the expected return on this stock be?

Exercise 4. Using CAPM. A stock has an expected return of 14.2 percent. The risk-free rate is 4 percent and the market risk premium is 7 percent. What must the beta of this stock be?

Exercise 5. Using CAPM. A stock has an expected return of 16.2 percent and a beta of 1.75. The expected return on the market is 11 percent. What must the risk-free rate be?

Exercise 6. Using CAPM. A stock has a beta of 0.92 and an expected return of 10.3 percent. A risk-free asset currently earns 5 percent.

a. If a portfolio of the two assets has a beta of 0.50, what are the portfolio weights?

b. If a portfolio of the two assets has an expected return of 9 percent, what is its beta?

c. If a portfolio of the two assets has a beta of 1.84, what are the portfolio weights? How do you interpret the weights for the two assets in this case? Explain.

Exercise 7. Beta and CAPM. Suppose the risk-free rate is 4.8 percent and the market portfolio has an expected return of 11.4 percent. The market portfolio has a variance of 0.0429. Portfolio Z has a correlation coefficient with the market of 0.39 and a variance of 0.1783. According to the capital asset pricing model, what is the expected return on portfolio Z?

Exercise 8. A financial market has only two risky securities (X and Y) and one risk-free security (F), all of which can be combined with each other. Rational investors base their decisions on the criterion of average - variance in the scope of the CAPM and the following annual estimates (which are assumed to be accurate) made at the present time (the beginning of the year):

	Expected Return	Risk (SD)	Beta	Weight X	Weight Y
F (free-risk asset)	1,68%	0%	–	–	–
X	18,20%	13,69%	1,24	–	–
Y	11%	11,05%	0,7	–	–
Portfolio M (Market Portfolio)	15%	9,45%	–	55,56%	–
Portfolio P (Optimal Investor Portfolio A)	20,01%	13%	–	76,45%	61,16%
Portfolio K	17,12%	11,91%	–	–	–
Portfolio H	21,85%	18,79%	–	137,68%	-27,68%

It is also known that:

- the linear correlation of the returns of X and Y = 0.0979.
- A rational investor (investor A) identifies portfolio P as the optimal portfolio and has an initial investment budget of € 1,000,000.

In general terms:

a) All investors will be able to estimate the same values of expected return and risk of the Market Portfolio (M), so this will be unique and universal (due to the assumptions of general equilibrium and homogeneous expectations).

b) The efficient frontier is a straight line called SML (Security Market Line).

c) The expected return-risk binomial of absolutely all feasible financial assets is represented in the SML.

d) The expected return-risk binomial of absolutely all feasible financial assets is represented in the CML.

With regard to the GMV:

e) The budgetary weight of asset X in the GMV is 55.56% and that of asset Y is 44.44%.

f) The expected return of GMV is 1.68% and its risk (standard deviation) is 0%.

g) The GMV is an efficient portfolio; in fact, it is the least risky of all the efficient portfolios.

With regard to the Optimal Portfolio of investor A (Portfolio P) bearing in mind that its covariance with portfolio M is 0.01228:

h) The budgetary weight of asset F in the optimal portfolio P is -37.62% and that of M is 137.62%.

i) If the investment budget (own resources) is € 1,000,000, the design of the optimal portfolio P will require € 1,376,200.

j) The linear correlation between the returns of portfolios P and M would be perfect and positive. Also, the beta of portfolio P would be 1.38.
k) The systematic risk of the optimal portfolio P is 13% and the non-systematic risk is 0%.
l) The risk premium of the optimal portfolio P is 18.34%.
m) The unit risk premium offered by the market to any efficient portfolio is 141.04%.
n) The optimal portfolio P is designed by combining risk-free assets (F) and the market portfolio (M). P is therefore an efficient portfolio.
o) The linear correlation of the returns of P and M is equal to 1, so P is an efficient portfolio.
p) The non-systematic risk of P is zero, so P is an efficient portfolio.
q) The investment of € 1,376,200 in portfolio P involves the short selling of F securities and therefore a total collection of € 376,200 for this sale, which will increase the amount to be purchased in risky assets.
r) The expected return on the optimal portfolio of investor A (portfolio P) can be calculated from both the CML and the SML.

With regard to Portfolio K, bearing in mind that the correlation of this portfolio with the market portfolio is 0.919228:
s) In portfolio K, the budgetary weight of asset X would be 85% and that of asset Y would be 15%. This portfolio would therefore be made up of only risky assets.
t) Portfolio K does not completely eliminate the non-systematic (diversifiable) risk of 0.96%, which implies that it is inefficient.
u) Another portfolio, S, has the same risk as portfolio K but allows for a higher return, i.e. 18.48%. Portfolio S is therefore efficient.
v) Another portfolio, Z, has the same return on portfolio K but allows for a much lower risk, i.e. 10.95%. Portfolio Z is therefore efficient.

With regard to Portfolio H, bearing in mind that its covariance with Portfolio M is 0.01351:
w) Portfolio H is a portfolio that combines risky assets and risk-free asset F.
x) In order to invest in portfolio H, the asset X must be purchased in cash above the initial budget. Therefore, asset Y will have to be short selling (with a weight of -27.68%). Secondly, it will have to borrow at 1.68% (with a weight of -10%).
y) Portfolio H is efficient as its returns are perfectly and positively correlated with portfolio M. In addition, its beta will be unitary (just like the market beta).

Exercise 9. In a financial market the CAPM is met. The market portfolio has an expected return

of 5% and a standard deviation of 2.5%. The risk-free asset return is 3%.

- Express analytically and represent graphically the SML and the CML.
- Represent the following portfolios in the graphs and indicate whether they are feasible and efficient:
    - Portfolio X: beta equal to 0.5, expected return 4%, and standard deviation 1.25%.
    - Portfolio I: beta equal to 1, expected return 5%, and standard deviation 3%.
    - Z portfolio: beta equal to 1.5, expected return 6%, and standard deviation 4%.

a) The expression for the CML is $E(RP) = 0.03 + 0.8\sigma_P$.

b) The expression for the SML is $E(Ri) = 0.03 + 0.02\beta_i$.

c) The investment alternative X is efficient and is located in both the SML and the CML.

d) The investment alternative Y is not efficient and is below the SML.

e) The investment alternative Z is not efficient and is below the CML.

f) The profitability required for project C is obtained from the expression of the CML.