Final Project: Quantitative Finance portfolio module 2024

You are given a dataset of monthly total returns of 5 US stocks of the S&P 500 index. Use only the stocks assigned to your group in the analysis.

1. Provide a brief description of each of the stock included in your dataset (maximum 2 lines per stock). E.g., sector, company structure, and balance sheet data (use information available online).
2. Estimate historical mean and variance covariance matrix of the stocks in your dataset with the methods described below. Estimate the variance covariance matrix with a Shrinkage toward Constant Correlation Approach (consider k=0.35). Estimate the vector of averages with an exponential average (lambda=0.02). Comment on the correlations among the stocks observed in your dataset.
3. Plot the efficient portfolio frontier (in the standard deviation-mean space) with a risk-free asset (with annual return Rf=0.03). Comment on the obtained tangent portfolio (or risky asset portfolio).
4. Plot the efficient portfolio frontier (in the standard deviation-mean space) with the same risky and risk-free assets but imposing two different constraints:
   o the sum of portfolios weights of the first and second stock in your dataset is equal to 50%.
   o the portfolio weights are above 10% for each stocks.
   Comment on the differences on the frontier portfolio with 0.5% monthly expected return with and without the two constraints (you should consider three different frontiers: no constraint, constraint 1 and constraint 2).
5. Estimate CAPM alpha and beta for your stocks, use the returns of the S&P 500 (you should obtain returns from S&P 500 prices) as proxy for the market returns. Comment on the results, which of the stocks has generated alpha in the previous years? Assume Rf=0.02.
6. Compute market implicit returns Π in a Black Litterman framework and compute the market portfolio (assuming that the market comprises only of your 6 stocks).
7. Formulate at least two Black Litterman views for the returns of the stocks in your portfolio for January 2025 (for formulating the views you can use historical averages, news and or public balance sheet data). Comment on the Black Litterman portfolio obtained when considering your views.
8. Facultative: design a similar way to incorporate the views based on the tracking error variance frontier.

You should deliver a library (suggested MATLAB) and a report in Word or latex of **_maximum_** 5 pages all included. The quality and efficiency of your code will be evaluated.

Delivery date: 12th of January 2025