

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 $R_f=0.03$). 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:
 - **the sum of portfolios weights of the first and second stock in your dataset is equal to 50%.**
 - **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 $R_f=0.02$.
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