Quantitative Portfolio Management

Assignment #6

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Instructions for each assignment . . . I

- Assignment #1 should be done individually.
- The other assignments are to be done in groups of 4 or 5 students.
  - This means that groups of 1, 2, 3, 6, etc. are not allowed.
  - Diversity in groups is strongly encouraged
    (people from different countries, different genders, different finance knowledge, and different coding ability, etc.)

Instructions for each assignment . . . II

- Each assignment should be emailed as a Jupyter file
  - To Raman.Uppal@edhec.edu
  - The subject line of the email should be: "QPM: Assignment n," where $n = \{1, 2, \ldots, 8\}$.
  - Assignment n is due before Lecture n, where $n = \{1, 2, \ldots, 8\}$.
  - Assignments submitted late will not be accepted (grade $= 0$), so please do not email me assignments after the deadline.

Instructions for each assignment . . . III

- The Jupyter file should include the following (use Markdown):
  - Section "0" with information about your submission:
    - Line 1: QPM: Assignment *n*
    - Line 2: Group members: listed alphabetically by last name, where the last name is written in CAPITAL letters
    - Line 3: Any comments/challenges about the assignment
  - Section "*k*" where $k = \{1, 2, \ldots\}$.
    - First type Question *k* of Assignment *n*.
    - Then, below the question, provide your answer.
    - Your code should include any packages that need to be imported.

Questions for Assignment 6 . . . I

- In this question, we use the Black-Litterman model to determine the optimal portfolio weights for an investor who is considering investing in AAPL, MSFT, AMZN, NVDA, TESLA, and META.
- Please download prices for these 6 stocks and compute their monthly excess returns starting January 2015 and ending December 2022, assuming that the risk-free rate is 0.
- Use the "Index Weighting" reported in this article from Investopedia to assign the market weights for these assets (you may also be able to get the weights from Yahoo Finance).

Questions for Assignment 6 . . . II

Q6.1 Based on the sample data, compute the Markowitz portfolio weights.

Q6.2 Then, using the market-capitalization weights, obtain the CAPM-implied expected returns.

Q6.3 Then, specify the pick matrix P and the view vector q that captures the following views for each of the assets:

- AAPL: its absolute excess return is expected to be 10% per year.
- MSFT: its absolute excess return is expected to be 5% per year.
- AMZN: no views
- NVDA will outperform TSLA by 2% per year.
- TSLA will underperform META by 1% per year.

Finally, explain your choice for the matrix Ω, which captures the uncertainty about these views.

Questions for Assignment 6 ...III

Q6.4 Use these views to compute the conditional expected excess return and conditional covariance matrix of excess returns μ_{BL} and Σ_{BL}.

Q6.5 Use μ_{BL} and Σ_{BL} to compute the mean-variance weights and compare them with the weights from the CAPM and the weights based on sample moments.

End of questions