

# PMP - Technical Meeting 2

## Exercise: Performance Evaluation

Deadline: Monday, March 10 (09:00)

**Instructions:** Solve the following exercise using R. Note that the TM2 is divided in two parts. Each task can be solved in smaller groups of students. By March 10 (09:00) send your solutions as a single zip file named `TM2_GroupName.zip` to [giorgia.simion@wu.ac.at](mailto:giorgia.simion@wu.ac.at).

The zip should include the following files:

1. A pdf presentation including numerical results, comments, references, charts etc. It is very important to interpret your results and include comments in your presentation.
2. Your reproducible code (Rnw or R script)
3. The dataset used for the exercise

## Data

I provide a data set `tm2.RData` that contains

- `assetdes`. Source Bloomberg. Tickers, names, abbreviations.
- `DT`. Source Bloomberg. Total return indices and prices.

## 1 Performance Measurement

Evaluate the performance of your own portfolio and the given AQR fund, Berkshire stock, and the given S&P 500 ETF.

1. First describe your portfolio, the funds and Berkshire. How do you deal with missing data?
2. Download factors data from Ken French's website (use `Rm-Rf`, `SMB`, `HML` and `WML` as factors).
3. Choose appropriate frequencies and time frames over which you analyze performance.

4. Calculate the beta, Jensen's alpha, Multifactor alphas, Sharpe ratio, Treynor index, Tracking Error, and information ratio for the funds and Berkshire.
5. Discuss the results. To interpret the results for Berkshire, read the paper Buffett's Alpha (Frazzini, Kabiller, Pedersen, 2018, Financial Analysts Journal 74(4), pp 35–55).

## 2 Style Analysis

Perform style analysis for your portfolio and the given target funds.

1. Use as benchmark asset classes: U.S. equity (SPX Index), the MSCI World ex U.S. (MXWOU Index), U.S. T-bills, U.S. government bonds (LUAT-TRUU Index). Download the relevant data from Bloomberg using the tickers provided. For the T-bills rates, use data from FRED and calculate returns.
2. Choose appropriate frequencies and time frames over which you analyze performance.
3. In the return-based style analysis we try to fit the returns of the fund analyzed by combination of returns of indices. We minimize the variance of the difference

$$r_t^{fund} - (\alpha + \beta_1 F_{1,t} + \cdots \beta_n F_{n,t})$$

given the set of constraints ( $\sum \beta_i = 1$  and  $\beta_i \geq 0$ ). This can be viewed as a problem of quadratic optimization, for which you can use the function `solve.QP` from the package `quadprog`.

4. Plot the estimated asset allocations over time.
5. Discuss your results. For details on the method, see the paper Asset Allocation: Management style and performance measurement (Sharpe, 1992, Journal of Portfolio Management, Winter 1992, pp 7–19).