ADVANCED ASSET MANAGEMENT – GROUP PROJECT

DATABASE: Monthly returns of 47 European stocks from August 2005 to March 2022

OBJECTIVE: Backtesting of a cluster-based long/short momentum strategy

GENERAL NOTES

- Computations must be made using **Python**.

- Expected output:
  - ✓ Working, clean, and well-organized Python code
  - ✓ A "commercial" 2-pager presenting the backtest of the investment strategy, including
    - A brief description of the strategy
    - The backtested performances
    - Summary statistics
    - Meaningful charts …
  - ✓ A short report containing
    - Part I
      - Step 1: a chart showing the historical evolution of the number of stocks in the 2 clusters
    - Part II
      - The description of the detailed methodology used for the statistical test for "luck"
      - The confidence intervals of the various statistics under the null hypothesis of luck

- **Deadline: the report and the python code must be send by email (ZIP file preferred) the 02 MAY 2022 at the latest.**

GUIDELINES

Part I – Simulate the monthly performances of a cluster-based long/short momentum strategy, from August 2008 to March 2022

- **Initial in-sample estimation window:** August 2005 to July 2008

At each date t, from July 2008 to February 2022:

- **Step 1:** Using the full data available, from time 0 up to time *t*, identity the 2 main European stock clusters, through a hierarchical clustering approach.
  - ✓ Stock features are their monthly returns
  - ✓ Distance metric: correlation
  - ✓ Linkage methodology: Ward

- **Step 2:** Within each cluster, rank each stock *s* according to its **momentum score** ($MOM_{s,t}$), defined as the average of its **12-months return momentum score** ($R\_MOM_{s,t}$) and of its **12-months specific momentum score** ($S\_MOM_{s,t}$)

  - ✓ $MOM_{s,t} = (R\_MOM_{s,t} + S\_MOM_{s,t})/2$

  - ✓ The 12-months return momentum score is defined as the within-cluster cross sectional z-score of the 12-month return momentum defined as:

$$r\_mom_{s,t} = \frac{\sum_{i=1}^{11} r_{t-i}}{11}$$

  - ✓ The 12-months specific momentum score is defined as the within-cluster cross sectional z-score of the 12-month specific momentum defined as:

$$s\_mom_{s,t} = \frac{\sum_{i=0}^{11}(\alpha_{s,t} + \varepsilon_{s,t-i})}{12}$$

with $\alpha_{s,t} + \varepsilon_{s,t-i}$ estimated from the following model (over the last 36 months): $r_{s,\tau} = \alpha_{s,t} + \beta_{s,t} Rm_{\tau} +$  for τ: $t - 35 \rightarrow t$

- **Step 3:** Build a long/short momentum portfolio within each of the 2 clusters
  - ✓ The long portfolio is invested in stocks that display above (or equal) the cluster median of the momentum scores
  - ✓ The short portfolio is invested in stocks that display below the cluster median of the momentum scores
  - ✓ The allocation methodology for both long and short portfolios follows an inverse volatility weighting scheme, with no leverage.
  - ✓ The long/short portfolio is invested at 100% in the long portfolio and -100% in the short one.

- **Step 4:** Build the global cluster-based long/short momentum portfolio

$$Global\ portfolio = \frac{N_1 P_1 + N_2 P_2}{N_1 + N_2}$$

where P_1 and P_2 are the long/short portfolios of clusters 1 and 2 respectively, N_1 and N_2 the number of stocks in clusters 1 and 2 at time t.

- **Step 5:** Compute the out-of-sample performance at time *t+1* of the global cluster-based long/short momentum portfolio

Part II – Assess the performance of this cluster-based long/short momentum investment strategy

- **Step 1:** Compute the following risk and performance metrics from the simulated track record of the investment strategy
  - ✓ Average return
  - ✓ Volatility
  - ✓ CVaR (95%, 1 month)
  - ✓ Maximum drawdown

- **Step 2: C**heck the significancy of these risk and performance statistics against the null hypothesis of luck. Comment your results.