INSTRUCTIONS
1. All your coding steps must be clear;
2. You must answer the questions in English;
3. You may use Python or C#;
4. Answers must be committed on your personal GitHub page.

PROBLEM 1: Funds Analysis

In this question you must use data from "funds.csv" (sent by email). Assume that the risk-free rate (CDI) is equal to zero. You should provide the best approach to unstack data, calculate returns, and then elaborate a short report containing the following information:

(a) Annualized descriptive statistics (return, volatility Sharpe ratio)
(b) Annualized performance graphs (return, rolling volatility, rolling Sharpe ratio)

PROBLEM 2: Portfolio Rebalance

Consider a portfolio composed of 10 stocks. Consider that, on day 0, the portfolio composition weights ("deltas") are according to Table 1. Consider that the portfolio will not be rebalanced (i.e.: no trades will be done) until the day 10. Consider that, on day 10, the portfolio logic demands that the portfolio be rebalanced according to Table 2. The daily logarithmic returns for the stocks are stored in the file "logreturns.csv" (sent by email). Create a system for portfolio composition and rebalancing that answers the following questions:

Table 1

Stock	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
Deltas at D=0	0.1	0.15	0.1	0.05	0.05	0.1	0.2	0.1	0.05	0.1

Table 2

Stock	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ
Desired Deltas at D=10	0.2	0.1	0.1	0.1	0.05	0.1	0.05	0.2	0.05	0.05

(a) What are the trades (in terms of deltas) necessary to rebalance the portfolio on day 10?
(b) What is the performance of the portfolio on the end of 15 days, supposing that the portfolio was rebalanced on day 10?

Hint: you must calculate portfolio weights for each day considering daily returns

PROBLEM 3: Web Scraping and Estimation

We want to analyze how Barrick Gold Corp (GOLD US Equity) prices change due to gold and copper price changes. Assuming a linear relationship between **GOLD US**, **Gold** futures and **Copper** futures, that is,

$$\Delta GOLD\ US\ = \alpha +\ \beta_1 \Delta Gold\ +\ \beta_2 \Delta Copper\ + \epsilon \qquad\qquad \text{(Eq. 1)}$$

where ϵ is an error term.

Steps:

1. Create a scraper that gets the last 12M daily prices from https://www.investing.com/commodities/gold (Current Date - 12M)
2. Create a scraper that gets the last 12M daily prices from https://www.investing.com/equities/barrick-gold-corp.-historical-data
3. Create a scraper that gets the last 12M daily prices from https://br.investing.com/commodities/copper-historical-data
4. Estimate the linear model between Barrick, Gold commodity and Copper commodity described in (Eq. 1). Evaluate the estimated coefficients and the residuals.

GOOD LUCK!

MAKING DIFFERENCE