Exercise 5D: CAPM Alpha and Information Ratio

BUSI 722: Data-Driven Finance II

Using the portfolio return series from Exercises 5A–5C, evaluate risk-adjusted performance using the CAPM. Download the market return and risk-free rate (Mkt-RF and RF) from Kenneth French's data library.

Submission

Submit a **Jupyter notebook** (`.ipynb`) containing all code, output, and charts. Use markdown cells for any written discussion.

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1. For each long-short portfolio from Exercise 5B (linear, power, exponential), run the **CAPM regression**: $r_{p,t} - r_{f,t} = \alpha + \beta(r_{m,t} - r_{f,t}) + \varepsilon_t$. Report α, β, their t-statistics, and R^2.
2. Compute the **information ratio** for each: $\text{IR} = \hat{\alpha}/\sigma(\varepsilon)$ and annualize it.
3. Also run the CAPM regression and compute the information ratio for the long-short D10 − D1 sort-based portfolio from Exercise 5A and the score-tilted portfolio from Exercise 5C.
4. Create a summary table comparing CAPM alpha, alpha t-stat, and annualized IR across all portfolios. In a markdown cell, discuss which portfolio construction method produces the best risk-adjusted performance.