Exercise 5B: Smooth Weight Functions

BUSI 722: Data-Driven Finance II

Using the same monthly out-of-sample predictions from Exercise 4A, implement smooth weight functions as an alternative to sort-based portfolios.

Submission

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

Implement the following weight functions, mapping each stock's normalized rank $u_i = \text{rank}_i/n$ (from predicted scores) to portfolio weights:

1. **Linear:** $w_i \propto u_i - 0.5$ (dollar-neutral, long-short).
2. **Power:** $w_i \propto u_i^3 - c$ where c is chosen so weights sum to zero.
3. **Exponential:** $w_i \propto e^{2u_i} - c$ where c is chosen so weights sum to zero.
4. **Softmax (long-only):** $w_i = e^{u_i/T} / \sum_j e^{u_j/T}$ with temperature $T = 0.5$.

For each weight function, compute monthly portfolio returns. Report mean return, volatility, and Sharpe ratio. Plot all four cumulative return series.