Portfolio Theory

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Seminar 7

Content:

- Initial settings and inputs estimation
- Portfolio optimization

Initial settings and inputs estimation

For the inputs estimation we use a rolling window of 120 periods. The portfolio performance will therefore be computed starting from the 121th period.

In addition to the sample mean and covariance matrix, we also estimate the **shrunk covariance matrix** introduced by Ledoit and Wolf (2004) using the function "linshrink_cov".

We also compute a **naïve 1/N portfolio** to be used as benchmark.

Portfolio optimization

We compute the following optimal portfolios:

- Mean-variance with sample estimates

- Mean-variance with sample mean and shrunk covariance

- Minimum variance with sample covariance

- Minimum variance with shrunk covariance

- Long-only minimum variance with sample covariance

- Long-only minimum variance with shrunk covariance

Portfolio optimization

- **Shrinkage portfolio** that combines the mean-variance with the naïve 1/N portfolio, whose weights are given by:

$$\boldsymbol{w}^* = \delta \boldsymbol{w}_{NAIVE} + (1 - \delta)\boldsymbol{w}$$

We simply set δ=0.2

- **Grouping strategy** that optimizes between groups of assets and uses equal weights within groups. We naively group assets in groups of 3 by alphabetical order.

We do this by computing the average return of each group, then we estimate the inputs and use them for optimization. We then repeat each weight 3 times, and use them for the single assets.