ST7: Modélisation Des Risques Financiers

Risk Based Portfolios

Romain Perchet
BNP Paribas Asset Management
Quant Research Group
romain.perchet@centralesupelec.fr

27 février 2024

Exercice 1. *Equally Weighted portfolio (EW)*

$$w_{EW} = \frac{\mathbb{I}\mathbf{1}}{\mathbf{1}^t\mathbb{I}\mathbf{1}} \tag{1}$$

with :
- $\mathbf{1}$: the vector of one (with the stocks available at the date of the optimization)
- $\mathbb{I}$: Identity matrix

Exercice 2. *Equally Risk Budget portfolio (ERB)*

$$w_{ERB} = \frac{\Lambda^{-1}\mathbf{1}}{\mathbf{1}^t\Lambda^{-1}\mathbf{1}} \tag{2}$$

with :
- $\mathbf{1}$: the vector of one (with the stocks available at the date of the optimization)
- Λ : diagonal matrix with **standard deviation (i.e. volatility) on the diagonal**

Exercice 3. *Inverse-variance portfolio (IV)*

$$w_{IV} = \frac{(\Lambda^2)^{-1}\mathbf{1}}{\mathbf{1}^t(\Lambda^2)^{-1}\mathbf{1}} \tag{3}$$

with :
- $\mathbf{1}$: the vector of one (with the stocks available at the date of the optimization)
- Λ : diagonal matrix with **standard deviation (i.e. volatility) on the diagonal**

Exercice 4. *Minimum Variance portfolio (MV)*

$$w_{MV} = \frac{\Sigma^{-1}\mathbf{1}}{\mathbf{1}^t\Sigma^{-1}\mathbf{1}} \tag{4}$$

with :
- $\mathbf{1}$: the vector of one (with the stocks available at the date of the optimization)
- Σ : the covariance matrix