CHAPTER 12

→ Appendix

↳ Information Efficient Portfolios

choose the minimum risk portfolio h_a subject to a set of constraints

$$\text{Minimize} \quad h^T \cdot V \cdot h \tag{12A.1}$$

$$\text{Subject to} \quad h^T \cdot a = 1 \tag{12A.2}$$

$$\text{and} \quad h^T \cdot Z = 0 \tag{12A.3}$$

Without the constraints Z, solution is a characteristic portfolio for a.

Common constraints:

$h^T \cdot \beta = 0$ (zero beta)

$h^T \cdot e = 0$ (zero net investment)

$h^T \cdot X = 0$ (zero exposure to risk model factors)

↳ Long and short portfolios

portfolio h_a will include long and short portfolio

$$h_{aL,n} = \text{Max}\{0, h_{a,n}\} \tag{12A.5}$$

$$h_{aS,n} = \text{Max}\{0, -h_{a,n}\} \tag{12A.6}$$

↳ Relation to regression

given excess returns r, information a, and exposures X, estimate factor returns:

$$r = Y \cdot b + \varepsilon \tag{12A.7}$$

where Y is an $N \times (J+1)$ matrix whose first J columns contain X and last column contains a. Estimating b with weights W (diagonal $N \times N$ matrix):

$$b = (Y^T \cdot W \cdot Y)^{-1} \cdot Y^T \cdot W \cdot r \tag{12A.8}$$

which minimizes $\varepsilon^T \cdot W \cdot \varepsilon$.

(12A.8) can be written as:

$$b = H^T \cdot r \tag{12A.9}$$

where

$$H^T = (Y^T \cdot W \cdot Y)^{-1} \cdot Y^T \cdot W \tag{12A.10}$$

↳ $(J+1) \times N$ of factor portfolios holdings

$$H^T \cdot Y = I \tag{12A.11}$$

↳ each factor portfolio has unit exposure to its factor and zero exposure to all other factors.