Design of Portfolio of Stocks to Track an Index

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Contents

This vignette illustrates the design of sparse portfolios that aim to track a financila index with the package `sparseIndexTracking` (with a comparison with other packages) and gives a description of the algorithms used.

1 Example of equation numbering and referencing with labels

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$$\begin{array}{ll} \underset{\mathbf{w}}{\text{minimize}} & \mathrm{TE}(\mathbf{w}) + \lambda\|\mathbf{w}\|_0 \\ \textsf{subject to} & \mathbf{w}^\top\mathbf{1} = 1 \\ & \mathbf{0} \le \mathbf{w} \le u\mathbf{1}, \end{array} \tag{1}$$

where $\mathrm{TE}(\mathbf{w})$ is a general tracking error (we will see specific tracking errors shortly), λ is a regularization parameter that controls the sparsity of the portfolio, and u is an upper bound on the weights of the portfolio. Example of referencing: (1)

2 Example of theorems

Proposition 1 The optimal solution of the optimization problem (3) with $u = 1$ is

$$\mathbf{w}^\star = \left(-\frac{1}{2}(\mu\mathbf{1} + \mathbf{q})\right)^+,$$

with

$$\mu = -\frac{\sum_{i\in\mathcal{A}} q_i + 2}{\mathrm{card}(\mathcal{A})},$$

and

$$\mathcal{A} = \big\{j \big| \mu + q_j < 0\big\},$$

where $\mathcal{A}$ can be determined in $O(\log(N))$ steps. We refer to the iterative procedure of Proposition 1 as $\mathrm{AS}_1(\mathbf{q})$ (Active-Set for $u = 1$).

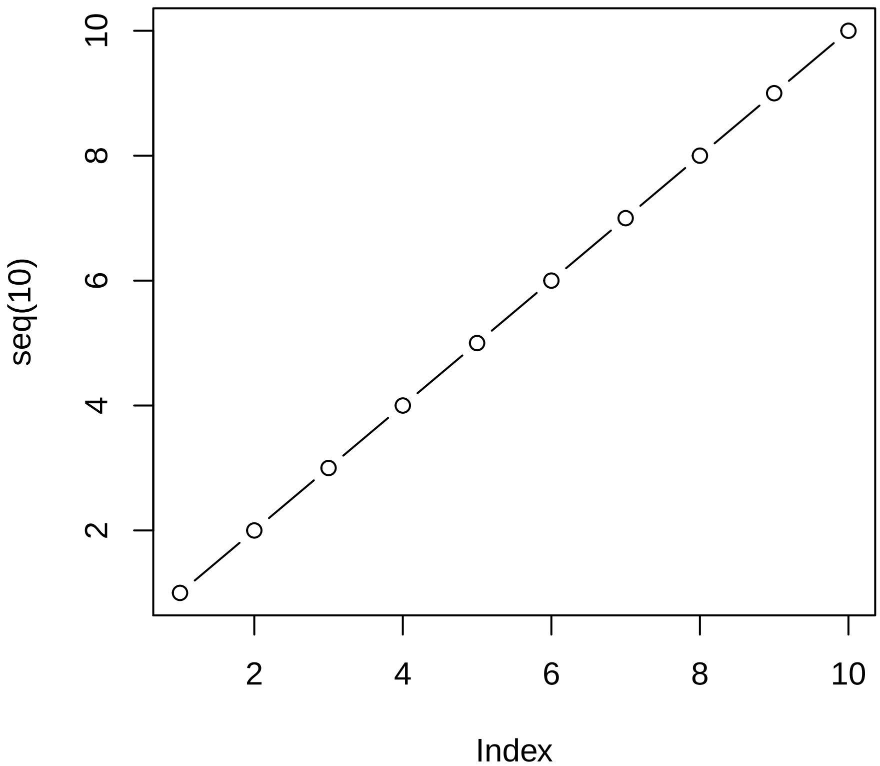

Figure 1: Caption of figure

Proposition 2.1 (Some name)**.** The optimal solution of the optimization problem (3) with $u = 1$ is

$$\mathbf{w}^{\star} = \left(-\frac{1}{2}(\mu\mathbf{1} + \mathbf{q})\right)^{+},$$

with

$$\mu = -\frac{\sum_{i\in\mathcal{A}} q_i + 2}{\mathrm{card}(\mathcal{A})},$$

and

$$\mathcal{A} = \{j \big| \mu + q_j < 0\},$$

where $\mathcal{A}$ can be determined in $O(\log(N))$ steps. We refer to the iterative procedure of Proposition 1 as $\mathrm{AS}_1(\mathbf{q})$ (Active-Set for $u = 1$).

Example of referencing: Proposition 2.1

3 Example of figures

```
plot(seq(10), type = "b")
```

Example referencing: Figure 1

References