

Portfolio Optimization with Linear and Fixed Transaction Costs

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Annals of Operations Research, special issue on financial optimization, 152(1):341-365, July 2007.

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We consider the problem of portfolio selection, with transaction costs and constraints on exposure to risk. Linear transaction costs, bounds on the variance of the return, and bounds on different shortfall probabilities are efficiently handled by convex optimization methods. For such problems, the globally optimal portfolio can be computed very rapidly. Portfolio optimization problems with transaction costs that include a fixed fee, or discount breakpoints, cannot be directly solved by convex optimization. We describe a relaxation method which yields an easily computable upper bound via convex optimization. We also describe a heuristic method for finding a suboptimal portfolio, which is based on solving a small number of convex optimization problems (and hence can be done efficiently). Thus, we produce a suboptimal solution, and also an upper bound on the optimal solution. Numerical experiments suggest that for practical problems the gap between the two is small, even for large problems involving hundreds of assets. The same approach can be used for related problems, such as that of tracking an index with a portfolio consisting of a small number of assets.

Page generated 2018-11-24 09:00:15 PST, by jemdoc.