Li, Xiaoyue; Uysal, A. Sinem; Mulvey, John M.
Multi-period portfolio optimization using model predictive control with mean-variance and risk parity frameworks. (English) Zbl 07487818

Summary: We employ model predictive control for a multi-period portfolio optimization problem. In addition to the mean-variance objective, we construct a portfolio whose allocation is given by model predictive control with a risk-parity objective, and provide a successive convex program algorithm that provides 30 times faster and robust solutions in the experiments. We provide a comprehensive comparison of the models in regard of planning horizon, parameter estimation, as well as objective function choice. Computational results on a multi-asset universe show that multi-period models perform better than their single period counterparts in out-of-sample period, 2006-2020, in the presence of market impact costs. The out-of-sample risk-adjusted performance of both mean-variance and risk-parity formulations beat the fix-mix benchmarks, and achieve Sharpe ratio of 0.64 and 0.97, respectively. We also include tests on different asset universes (Fama French industry portfolios) and alternative parameter estimation methods (Bayes-Stein and Black-Litterman) with consistent findings.

MSC:
90Bxx Operations research and management science

Keywords:
finance; multi-period portfolio optimization; model predictive control; risk parity

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