

# Risk–Reward Optimisation for Long-Run Investors: an Empirical Analysis

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## **Abstract**

A common approach in portfolio selection is to characterise a portfolio of assets by a desired property, the ‘reward’, and something undesirable, the risk. These properties are often identified with mean and variance of returns, respectively, even though, given the non-Gaussian nature of financial time series, alternative specifications like partial and conditional moments, quantiles, and drawdowns seem theoretically more appropriate. We analyse the empirical performance of portfolios selected by optimising risk–reward ratios constructed from such alternative functions. We find that in many cases these portfolios outperform our benchmark (minimum-variance), in particular when long-run returns are concerned. We also find, however, that all the strategies tested (including minimum-variance) are sensitive to relatively small changes in the data. The main theme throughout our analysis is that minimising risk, as opposed to maximising reward, leads to good out-of-sample performance. Adding a reward-function to the selection criterion usually improves a given strategy only marginally.

*Keywords:* Portfolio optimisation, Optimisation heuristics, Partial moments, Downside risk, Expected Shortfall, Value-at-Risk, Risk measures, Performance measures, Threshold Accepting

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