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The CVaR Paradox: Does Minimizing Tail Risk Ensure Better Downside Protection?

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Abstract

Conditional Value-at-Risk (CVaR) is widely used in portfolio optimization as a risk measure explicitly designed to account for extreme losses. However, previous empirical evidence from the Croatian equity market suggests that global minimum variance (GMV) portfolios may provide better protection against extreme losses than portfolios optimized specifically to minimize CVaR. This counterintuitive finding raises awareness that the effectiveness of the tail risk measures depends on how reliably the tail of the return distribution can be estimated. In small frontier markets, a limited number of listed stocks, short return histories and low liquidity leave relatively few observations in the tail. This makes estimated tail risk, and the portfolios built on it, potentially unstable. Using CROBEX constituent returns over a long sample that includes several crisis episodes, we study how the reliability of CVaR-based portfolios depends on the estimation window, the confidence level and the number of assets, and how far the risk anticipated in sample departs from the risk realized out of sample. We also explore whether regularization through portfolio constraints and penalties, can improve the stability and downside protection of these portfolios. By examining the circumstances under which minimum-CVaR optimization may fail to deliver superior downside protection, the study seeks to provide further insights into the practical limitations of tail-risk-based portfolio optimization. The findings are expected to contribute to a better understanding of the trade-offs between different risk minimization approaches and their implications for portfolio management in small frontier markets where data are scarce.

Keywords: Conditional Value at Risk; Estimation Uncertainty, Frontier Markets; Portfolio Optimization; Portfolio Regularization