Saving Markowitz with Cauchy Interlacing Risk Parity

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Abstract

It is well known that Markowitz Portfolio Optimization often leads to unreasonable and unbalanced portfolios that are optimal in-sample but perform very poorly out-of-sample. There is a strong relationship between these poor returns and the fact that covariance matrices that are used within the Markowitz framework are degenerated and ill-posed, leading to unstable results by inverting them, because of very small eigenvalues. In this paper we circumvent this problem in two steps: the enhancement of traditional risk parity techniques, which consider only volatility, aiming to avoid matrix inversions (including the widespread Naive Risk Parity model) within the Markowitz framework; the preservation of the correlation structure, as much as possible, aiming to isolate a "healthy" portion of the correlation matrix, that can be inverted without generating unstable and risky portfolios, aiming to rescue the original Markowitz framework, by means of using the Cauchy Interlacing Theorem. Using Brazilian and US market data, we show that the discussed framework enables one to build portfolios that outperform the traditional and the newest risk parity techniques.

Full article at:

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3654300