## Portfolio optimization with the implied integrated variance

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## Abstract:

In this paper, we consider portfolio optimization using two closely related option implied densities: the density of the integrated variance and the risk-neutral price density. We solve the Bayesian inverse problem of an implied integrated variance and an implied correlation coefficient between the stock price and the volatility shocks, and present an algorithm to estimate the corresponding risk-neutral price density and its various moments. We then present applications to portfolio optimization assuming a correlated stochastic volatility: we first compute the Sharpe ratio and the Value-at-Risk estimates as distributions and expectation. Then, using the implied integrated variance, we value a portfolio of assets with mutually correlated volatilities, compute the CAPM beta and model the Merton maximum utility function.