## Vast Volatility Matrix Estimation using High Frequency Data for Portfolio Selection

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## Abstract

Portfolio allocation with gross-exposure constraint is an effective method to increase the efficiency and stability of selected portfolios among a vast pool of assets, as demonstrated in Fan et al (2008). The required high-dimensional volatility matrix can be estimated by using high frequency financial data. This enables us to better adapt to the local volatilities and local correlations among vast number of assets and to increase significantly the sample size for estimating the volatility matrix. This paper studies the volatility matrix estimation using high-dimensional high-frequency data from the perspective of portfolio selection. Specifically, we propose the use of "pairwise-refresh time" and "all-refresh time" methods proposed by Barndorff-Nielsen et al (2008) for estimation of vast covariance matrix and compare their merits in the portfolio selection. We also establish the concentration inequalities of the estimates, which guarantee desirable properties of the estimated volatility matrix in vast asset allocation with gross exposure constraints. Extensive numerical studies are made via carefully designed simulations. Comparing with the methods based on low frequency daily data, our methods can capture the most recent trend of the time varying volatility and correlation, hence provide more accurate guidance for the portfolio allocation in the next time period. The advantage of using high-frequency data is significant in our simulation and empirical studies, which consist of 50 simulated assets and 30 constituent stocks of Dow Jones Industrial Average index. Based on joint work with Jianqing Fan and Ke Yu.