

# **Modelling High Dimensional Daily Volatilities Based on High-Frequency Data**

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## **Abstract**

It is increasingly popular in financial economics to estimate volatilities of asset returns by the methods based on realized volatility and bipower realized volatility from high-frequency data. However the most available methods are not directly relevant when the number of assets involved is large, due to the lack of accuracy in estimating high dimensional matrices. Therefore it is pertinent to reduce the effective size of volatility matrices in order to produce adequate estimates and forecasts. Furthermore, since high-frequency financial data for different assets are typically not recorded at the same time points, conventional dimension-reduction techniques are not directly applicable. In this paper we propose a new method for modelling volatility matrices based on multivariate non-synchronized high frequency return data. The new methodology consists of three steps: (i) estimate realized co-volatility matrices directly based on high-frequency data, (ii) fit a matrix factor model for daily volatility based on the estimated co-volatility matrices, and (iii) fit a vector autoregressive (VAR) model for the volatility factors. The asymptotic theory for the proposed estimators has been established. We illustrate the new methodology with the high-frequency price data on several hundreds of stocks traded in Shen Zhen and Shanghai Stock Exchanges over a period of 177 days in 2003.

(Joint work with Yazhen Wang, Pengfei Li and Jian Zou)

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