

**Abstract:** Autoregressive Conditional Heteroscedasticity (ARCH) models, which were originally proposed by Engle (1982), have been playing critical roles in modelling volatilities in financial time series. This talk aims at a high-dimensional extension of ARCH models to evaluate volatility matrices for high-dimensional multivariate financial time series. The critical difficulty in the extension is in so called “curse of dimension” caused by larger number of parameters for higher dimension of multivariate series. We introduce financial distances among components of multivariate series, which are different from the usual geographical one but are based on closeness of financial conditions, and apply dynamic panel data models by spatial weight matrices constructed by the financial distance. As a result, we propose spatio-temporal GARCH models that can identify volatility matrices for high-dimensional financial time series. We conduct comparative studies by real financial time series and show empirical features of the spatio-temporal GARCH models in terms of forecast of volatilities.