

High Dimensional Dependence Modelling with Heavy Tailed, Asymmetric Factor Models.

This paper proposes a new approach for modelling the dependence amongst a large cross section of financial assets, as captured by the joint distribution. The model utilises the factor structure inherent in financial data to alleviate the curse of dimensionality. The distribution is estimated using a two stage procedure. The first stage involves estimating the common factors and idiosyncratic components with principal components analysis (PCA), while in the second stage the distribution of these latent variables is estimated using maximum likelihood. The distribution of the factors is shown to be well captured by a new model that allows for time varying volatility and different upper/lower tail thickness. The asymptotic properties of the model are presented, showing that the parameter estimates of the overall multivariate model are consistent and asymptotically normal as both N (the cross section) and T (time dimension) go to infinity. Furthermore, it is shown that estimation error from the first stage is asymptotically negligible if \sqrt{T}/N goes to 0. Simulations support the theoretical findings. Finally, an application to risk management and portfolio construction is considered for a large cross section of US equity returns. The out-of-sample performance of the new model demonstrates statistically and economically significant improvement over a leading alternative from the literature.