Estimation of the extreme value distribution for Constant Conditional Correlation models

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Abstract

The Constant Conditional Correlation models are versatile tools for modelling the behaviour of financial returns. Mathematically speaking, they are solutions of a special class of stochastic difference equations (s.d.e). The extremal behaviour of general solutions of s.d.e. has been studied in detail in Kesten (1973) and Perfekt (1997). The spectral measure of the extreme value distribution is the central concept to understanding the joint extremal behaviour of the multivariate time series. In this paper we propose an estimator for the spectral measure and prove its consistency. Our estimator is the tail empirical measure associated with the multivariate time series. Successful use of the estimator depends on a good choice of k, the number of upper order statistics contributing to the empirical measure. We introduce a new criteria for the choice of k based on a scaling property of the spectral measure. We investigate the performance of our estimation technique on time series from HFDF96 data set. We use the estimated spectral measure to calculate probabilities of large movements in a currency exchange rate conditional on the occurrence of extreme returns in another related exchange rate. We are able to prove a high level of correlation in the extremes for most of the currencies in the EU. We also quantify the changes in the level of correlation in the extreme as the sampling frequency decreases. We are able to show that, for most of the European currencies, the level of correlation is very high even at 4-hour sampling frequency.