

Multivariate Extremes, Aggregation and Risk Estimation

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Abstract

We briefly introduce some basic facts about multivariate extreme value theory and present some new results regarding finite aggregates and multivariate extreme value distributions. Based on our results high frequency data can considerably improve quality of estimates of extreme movements in financial markets.

Secondly we present an empirical exploration of what the tails really look like for four foreign exchange rates sampled at varying frequencies. Both temporal and spatial dependence is considered. In particular we estimate the spectral measure, which along with the tail index, completely determines the extreme value distribution.

Lastly we apply our results to the problem of portfolio optimisation or risk minimization. We analyze how the expected shortfall and VaR scale with time horizon and find that this scaling is not by a factor of square root of time as is frequently used, but by a different power of time. We show that the accuracy of risk estimation can be drastically improved by using hourly or bihourly data.