Statistical Inference on a Changing Extreme Value Dependence

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Abstract

When analyzing multivariate time series of financial returns in several investments or losses observed in different lines of business of an insurance company, one often assumes stationarity. In particular, if the period of observations stretches over several decades, this assumption is questionable and should be checked statistically. In this talk, we focus on extreme risks, which are important e.g. for the calculation of the Value at Risk and several other risk measures.

While [1] developed methods to test whether the univariate extreme value behavior does not change over time, here we discuss tests for a constant extreme value dependence between the components of the observed random vectors, which can be described by the so-called angular measure. Such a test may for instance detect that an investment portfolio becomes less diversified, and hence more risky, over time.

Given independent, but not necessarily identically distributed regularly varying random vectors, we first propose an estimator of their local angular measure. Since its convergence will usually be slow, we consider the angular measure integrated over time and show that, under suitable smoothness assumptions on the underlying extreme value dependence, estimators of the integrated angular measure converge at a faster rate. Finally, we discuss how these estimators can be used to test whether the angular measure is constant over time.

Keywords: Extreme risks, extreme value dependence, test for a changing angular measure

References

[1] Laurens de Haan and Chen Zhou (2021). "Trends in extreme value indices." *Journal of the American Statistical Association*, vol. **116**, pp. 1265-1279.

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