Talk: Gap correlation – a measure of local dependence

Weihao Choo

30. September 2014
14:00 Uhr in F442

Abstract

This paper proposes and studies a new statistic, called "gap correlation", to quantify dependence between two variables at different percentiles. This statistic captures dependencies exhibited in for example stock markets where moderate returns are weakly dependent but extreme returns are highly dependent and linked often to a major correction. Another example is insurance where large natural catastrophe losses from related business lines happen simultaneously but "average" losses are weakly dependent.

Gap correlation is calculated from the copula, and is expressed as conditional tail expectations of percentile ranks. Gap correlation lies between −1 and 1, with higher values indicating stronger dependence. For example, gap correlation of a Gumbel copula starts below 1 then increases to 1, reflecting imperfect lower tail dependence and perfect upper tail dependence. For a Clayton copula exhibiting perfect lower tail dependence, gap correlation starts at 1, then decreases.

Gap correlation satisfies several "coherence" properties. Countermonotonicity, independence and comonotonicity yield gap correlation of −1, 0 and 1, respectively. In addition gap correlation increases with correlation order, therefore positively dependent variables have positive gap correlation, and vice versa. Lastly, taking a weighted average of gap correlation across all percentiles yields Spearman's correlation.