Bounds for joint portfolio with unknown dependence structure

Ruodu Wang

University of Waterloo

Abstract:
Let $S = X_1 +....+ X_n$ be a joint portfolio of one-period profit-or-loss $X_1,...,X_n$. We assume the marginal distributions of $(X_1,...,X_n)$ are known but the joint distribution (or copula) of $(X_1,...,X_n)$ is unknown. For example, without the information on depedence, the possible range of the price of an European option on S, $E(S-K)_+$ is of our interest. The sharp upper bound of such $E(S-K)_+$ obtained by the comonotonic dependence scenario but the sharp lower bound is unknown in general for $n\ge 3$. In this talk, we will proivde a lower bound on $E[f(S)]$ where f is a convex function, and discuss the sharpness of this bound. The concept of completely mixable (CM) distributions will be introduced to obtain the sharpness for some commonly-used distributions. We will also discuss bounds on some risk measures related to S.