A Closer Examination of Extreme Value Theory Modeling in Value-at-Risk Estimation

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Extreme value theory has been widely used for modeling the tails of return distribution. Generalized Pareto distribution (GPD) is popularly acknowledged as one of the major tools in Value-at-Risk (VaR) estimation. As Basel II stipulates the significance level for VaR estimation from previous 5% quantile level to more extremal quantile levels at 1%, it demands a more accurate estimation approach. It is imperative to take a closer examination at GPD modeling performance at more extremal quantile levels. Empirical analysis outcomes show the acknowledged outperformance of GPD is sustained at 5% quantile level but not at 1% level. Alternative methods are introduced and the empirical outcomes indicate that both the penalized spline smoothing in semiparametric regression and maximum entropy density based dependent data bootstrap outperform GPD in modeling extremal quantile levels lower than 1%.

Keywords: Value-at-Risk, Extreme Value Theory, Generalized Pareto Distribution, Semiparametric Regression, Penalized Spline Smoothing, Maximum Entropy Bootstrap

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