

Measuring Market Risk with the Folded Peaks-Over-Thresholds Approach

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Abstract

In this paper, we discuss the folding procedure for the peaks-overthresholds (POT) models and their applications in market risk measurement, namely the value-at-risk (VaR) and the expected shortfall (ES). Folding is defined as a procedure in which when data fall below a certain threshold value, a transformation formula will move the data points above the threshold. First, an initial fitting with the generalized Pareto distribution (GPD) over a temporary threshold is done. Second, from the initially-fitted GPD estimates and a newly-selected threshold, a folding transformation of moves the data points lower to the new threshold to higher values. Third, the data points higher than the new threshold are fit to the GPD for inference and risk estimation. The risk measures from the folded GPD approach are compared with the ARMA-GARCH financial econometric and the unfolded POT approach in terms of their performance in real financial time series data such as the stock indices and foreign currencies. The benefit of folding in the POT approach is lower estimates of standard errors for the GPD parameters given that an appropriate threshold has been selected. These would indicate more accurate GPD parameter estimates that lead to better VaR and ES estimates. The real data application results show that the VaR and ES from the folded POT methodology have less exceedances. Loss calculations indicate that those folded POT might mean higher capital adequacy, the conservatively set VaR and ES would cushion from extreme losses incurred from exceedance events.