Extreme value analysis in Multivariate Peaks Over Threshold Model

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Abstract: The classical analysis of multivariate extreme values was based on the blocking maxima of all relevant
variables. However, Multivariate Peaks Over Threshold (MPOT) method can make better use of the existing data
and has more stable analysis results when the time length of raw data is not sufficient. Several MPOT methods
have been proposed for the purpose of analyzing the extreme marine disaster, but the nature distribution of MPOT
method is really rare. This study proposed a new MPOT model for estimating of the return period, in which
the MPOT distribution is a nature distribution of multivariate POT methods and can be built easily according
to parametric models developed. Taking the responses of mooring forces of a semi-submersible to the wind and
waves as an example, we examine the practicalities of the joint threshold value selection in the MPOT model and
estimate the return period of mooring forces. Finally by the Monte Carlo simulation, the return period of mooring
force was estimated also. Through comparing results from different methods, the Monte Carlo simulation of the
MPOT model is feasible. The Monte Carlo simulation can reduce the calculation complexity in multivariate POT
problem further.

Keyword: MPOT, Multivariate Extreme, Mooring Force, Monte Carlo