This thesis is focused on the models based on extreme value theory and their practical applications. Specifically are described the block maxima models and the models based on threshold exceedances. Both of these methods are described in thesis theoretically. Apart from theoretical description there are also practical calculations based on simulated or real data. The applications of block maxima models are focused on choice of block size, suitability of the models for specific data and possibilities of extreme data analysis. The applications of models based on threshold exceedances are focused on choice of threshold and on suitability of the models. There is an example of the model used for calculations of reinsurance premium for extreme claims in the case of nonproportional reinsurance.