

# **Multi-dimensional heavy-tailed based modelling for market risk factors of KGHM mining company**

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Mining companies to properly manage their operations and be ready to make business decisions are required to forecast potential scenarios for main market risk factors. Commonly used models are not reflecting market data characteristics like heteroscedasticity or regime switching. The main challenge is to properly quantify relations among main risk factors and its stability over time. Detailed studies of the risk factors dependency structure and finding proper correlation models may enable building more adequate forecast, especially for stress test scenarios. In this paper we examine the example market risk factors of KGHM mining company. Here we propose to model the corresponding time series by the multi-dimensional system based on the heavy-tailed distribution. The model allows for the description of the dependence between the risk factors that may change in time. Because the data exhibit non-Gaussian behaviour, the dependence structure we describe by the correlation coefficients that are not sensitive for large observations. Moreover, in the pre-processing step we segment the data to obtain the regimes of homogeneous structure. The proposed approach is motivated by the specific characteristics the time series that follows from the market behaviour. Based on the results of our study one enables to build the long term prediction scenarios that are crucial for the risk management of the company.