

# Generalized Yule-Simon process

**Sergey Sosnovskiy<sup>1</sup>**

<sup>1</sup>Independent, Frankfurt am Main, Germany, <sup>2</sup>Frankfurt School of Finance Management, Frankfurt am Main, Germany

The goal of this paper is to introduce the multi-parameter generalization of the Yule-Simon model, which includes, as a particular case, the Ewens-Pitman distribution.

The aim of the proposed model is to explain heavy-tailed data with multiple power-law regimes, which often appear in empirical sciences.

The innovation probability and reinforcement rule (attachment kernel) are allowed to depend on both the system size and the number of clusters.

It is shown that probabilities of blocks and the related statistics follow relatively simple recurrence relations.

The impact of the parameters on the asymptotic regimes or limiting shape is studied using the (mean-field) Krapivsky-Redner approach, which neglects the effects of local correlations.

We also discuss the estimation approaches and illustrate the application of the generalized process for fitting the empirical data.

