# JOINT ASYMPTOTICS OF FORWARD AND BACKWARD PROCESSES OF NUMBERS OF NON-EMPTY URNS IN INFINITE URN SCHEMES

## Kovalevskii Artem

✧ *Email: artyom.kovalevskii@gmail.com; Novosibirsk State Technical University and Novosibirsk State University, Novosibirsk, Russia.*

We study the joint asymptotics of forward and backward processes of the numbers of non-empty urns in an infinite urn scheme. The probabilities of balls hitting the urns are assumed to satisfy the conditions of regular decrease. We prove weak convergence to a two-dimensional Gaussian process. Its covariance function depends only on the exponent of regular decrease of probabilities. The corollary of the main theorem asserts the weak convergence of the integral of the difference of forward and backward processes to the normal distribution. We obtain parameter estimates that have a joint normal distribution together with forward and backward processes.

We use these estimates to construct statistical tests for the homogeneity of the urn scheme on the number of thrown balls. We analyse the statistical tests by simulation and apply them to the analysis of the homogeneity of texts in natural language.