# LIMIT THEOREMS FOR BESSEL AND DUNKL PROCESSES OF LARGE DIMENSIONS

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## Abstract

We study Bessel and Dunkl processes $(X_{t,k})_{t\geq 0}$ on $\mathbb{R}^N$ with possibly multivariate coupling constants $k \geq 0$. These processes describe interacting particle systems of Calogero-Moser-Sutherland type with $N$ particles. For the root systems $A_{N-1}$ and $B_N$ these Bessel processes are related with $\beta$-Hermite and $\beta$-Laguerre ensembles. Moreover, for the frozen case $k = \infty$, these processes degenerate to deterministic or pure jump processes. We use the generators for Bessel and Dunkl processes of types A and B and derive analogues of Wigner's semicircle and Marchenko-Pastur limit laws for $N \to \infty$ for the empirical distributions of the particles with arbitrary initial empirical distributions by using free convolutions. In particular, for Dunkl processes of type B new non-symmetric semicircle-type limit distributions on $\mathbb{R}$ appear. Our results imply that the form of the limiting measures is already completely determined by the frozen processes. Moreover, in the frozen cases, our approach leads to a new simple proof of the semicircle and Marchenko-Pastur limit laws for the empirical measures of the zeroes of Hermite and Laguerre polynomials respectively. (based on joint work with Michael Voit)

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