# Smooth distribution function estimation for lifetime distributions using Szasz–Mirakyan operators

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## Abstract

In this paper, we introduce a new smooth estimator for continuous distribution functions on the positive real half-line using Szasz–Mirakyan operators, similar to Bernstein's approximation theorem. We show that the proposed estimator outperforms the empirical distribution function in terms of asymptotic (integrated) mean-squared error and generally compares favorably with other competitors in theoretical comparisons. Also, we conduct the simulations to demonstrate the finite sample performance of the proposed estimator.

**Keywords** Distribution function estimation · Nonparametric · Szasz–Mirakyan operator · Hermite estimator · Mean squared error

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