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Tail decay rates in double QBD processes and related reflected random walks. (English)

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Summary: A double quasi-birth-and-death (QBD) process is the QBD process whose background process is a homogeneous birth-and-death process, which is a synonym of a skip-free random walk in the two-dimensional positive quadrant with homogeneous reflecting transitions at each boundary face. It is also a special case of a 0-partially homogeneous chain introduced by Borovkov and Mogul'skii [*Sib. Math. J.* 37, No. 4, 647–682 (1996); translation from *Sib. Mat. Zh.* 37, No. 4, 745–782 (1996; [Zbl 0878.60023](#))]. Our main interest is in the tail decay behavior of the stationary distribution of the double QBD process in the coordinate directions and that of its marginal distributions. In particular, our problem is to get their rough and exact asymptotics from primitive modeling data. We first solve this problem using the matrix analytic method. We then revisit the problem for the 0-partially homogeneous chain, refining existing results. We exemplify the decay rates for Jackson networks and their modifications.

MSC:

- [60K25](#) Queueing theory (aspects of probability theory)
- [90B25](#) Reliability, availability, maintenance, inspection in operations research
- [60F10](#) Large deviations
- [60J80](#) Branching processes (Galton-Watson, birth-and-death, etc.)

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Keywords:

quasi-birth-and-death process; partially homogeneous chain; two-dimensional queues; stationary distribution; rough decay rate; exact asymptotics; reflected random walk; Jackson network with server cooperation

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