

Boxma, Onno; Ivanovs, Jevgenijs

Two coupled Lévy queues with independent input. (English) Zbl 1296.60241
Stoch. Syst. 3, No. 2, 574-590 (2013).

Summary: We consider a pair of coupled queues driven by independent spectrally-positive Lévy processes. With respect to the bi-variate workload process this framework includes both the coupled processor model and the two-server fluid network with independent Lévy inputs. We identify the joint transform of the stationary workload distribution in terms of Wiener-Hopf factors corresponding to two auxiliary Lévy processes with explicit Laplace exponents. We reinterpret and extend the ideas of *J. W. Cohen* and *O. J. Boxma* [Boundary value problems in queueing system analysis. Amsterdam-New York-Oxford: North-Holland Publishing Company (1983; [Zbl 0515.60092](#))] to provide a general and uniform result with a neat transform expression.

MSC:

[60K25](#) Queueing theory (aspects of probability theory)

[68M20](#) Performance evaluation, queueing, and scheduling in the context of computer systems

Cited in 2 Documents

Keywords:

[coupled processor model](#); [fluid network](#); [Lévy input](#); [Wiener-Hopf factorization](#)

Full Text: [DOI](#) [arXiv](#)

References:

- [1] Badila, S., Boxma, O., Resing, J. and Winands, E. (2012). Queues and risk models with simultaneous arrivals. Eurandom Report 2012-018. · [Zbl 1311.60103](#)
- [2] Blanc, J. P. C. (1987). A numerical study of a coupled processor model. In Computer Performance and Reliability (G. Iazeolla, P.-J. Courtois and O. J. Boxma, eds.) 289-303.
- [3] Borst, S. C., Boxma, O. J. and Jelenkovic, P. R. (2000). Coupled processors with regularly varying service times. In INFOCOM 912-921.
- [4] Borst, S. C., Boxma, O. J. and Jelenkovic, P. R. (2003). Reduced-load equivalence and induced burstiness in GPS queues with long-tailed traffic flows. Queueing Systems 43 273-306. · [Zbl 1047.90008](#) · [doi:10.1023/A:1023237129453](#)
- [5] Cohen, J. W. (1992). Analysis of Random Walks . Studies in Probability, Optimization and Statistics 2 . IOS Press, Amsterdam. · [Zbl 0809.60081](#)
- [6] Cohen, J. W. and Boxma, O. J. (1983). Boundary Value Problems in Queueing System Analysis . North-Holland Mathematics Studies 79 . North-Holland Publishing Co., Amsterdam. · [Zbl 0515.60092](#)
- [7] Debicki, K., Dieker, A. B. and Rolski, T. (2007). Quasi-product forms for Lévy-driven fluid networks. Math. Oper. Res. 32 629-647. · [Zbl 1341.60111](#) · [doi:10.1287/moor.1070.0259](#)
- [8] Den Iseger, P., Gruntjes, P. and Mandjes, M. (2013). A Wiener-Hopf based approach to numerical computations in fluctuation theory for Lévy processes. Math. Meth. Oper. Res. 33 1-18. · [Zbl 1281.60045](#) · [doi:10.1007/s00186-013-0434-9](#)
- [9] Fayolle, G. and Iasnogorodski, R. (1979). Two coupled processors: the reduction to a Riemann-Hilbert problem. Z. Wahrsch. Verw. Gebiete 47 325-351. · [Zbl 0395.68032](#) · [doi:10.1007/BF00535168](#)
- [10] Harrison, J. M. and Reiman, M. I. (1981). Reflected Brownian motion on an orthant. Ann. Probab. 9 302-308. · [Zbl 0462.60073](#) · [doi:10.1214/aop/1176994471](#) ·
- [11] Hooghiemstra, G., Keane, M. and van de Ree, S. (1988). Power series for stationary distributions of coupled processor models. SIAM J. Appl. Math. 48 1159-1166. · [Zbl 0652.60097](#) · [doi:10.1137/0148069](#)
- [12] Kella, O. (1996). Stability and nonproduct form of stochastic fluid networks with Lévy inputs. Ann. Appl. Probab. 6 186-199. · [Zbl 0863.60070](#) · [doi:10.1214/aoap/1034968070](#) ·
- [13] Kella, O. (2006). Reflecting thoughts. Statist. Probab. Lett. 76 1808-1811. · [Zbl 1102.60094](#) · [doi:10.1016/j.spl.2006.04.028](#)
- [14] Kella, O. and Ramasubramanian, S. (2012). Asymptotic irrelevance of initial conditions for Skorohod reflection mapping on the nonnegative orthant. Math. Oper. Res. 37 301-312. · [Zbl 1248.90029](#) · [doi:10.1287/moor.1120.0538](#)
- [15] Kella, O. and Whitt, W. (1992a). A tandem fluid network with Lévy input. In Queueing and Related Models , (U. N. Bhat and I. V. Basawa, eds.) 9 112-128. · [Zbl 0783.60089](#)

- [16] Kella, O. and Whitt, W. (1992b). Useful martingales for stochastic storage processes with Lévy input. *J. Appl. Probab.* 29 396-403. · [Zbl 0761.60065](#) · [doi:10.2307/3214576](#)
- [17] Konheim, A. G., Meilijson, I. and Melkman, A. (1981). Processor-sharing of two parallel lines. *J. Appl. Probab.* 18 952-956. · [Zbl 0485.60092](#) · [doi:10.2307/3213071](#)
- [18] Kyprianou, A. E. (2006). *Introductory Lectures on Fluctuations of Lévy Processes with Applications* . Universitext . Springer-Verlag, Berlin. · [Zbl 1104.60001](#)
- [19] Lang, S. (1999). *Complex Analysis* , fourth ed. *Graduate Texts in Mathematics* 103 . Springer-Verlag, New York. · [Zbl 0933.30001](#)
- [20] Miyazawa, M. and Rolski, T. (2009). Tail asymptotics for a Lévy-driven tandem queue with an intermediate input. *Queueing Syst.* 63 323-353. · [Zbl 1209.90117](#) · [doi:10.1007/s11134-009-9146-5](#)
- [21] Osogami, T., Harchol-Balter, M. and Scheller-Wolf, A. (2003). Analysis of cycle stealing with switching cost. *SIGMETRICS Perform. Eval. Rev.* 31 .

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.