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Persistence Probabilities for Auto-regressive Markov Chains

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We investigate the first crossing time of zero of an auto-regressive Markov chain with atomless innovations, denoted by T. Under a log-concavity assumption on the innovation law, we show that the law of T is log-convex for positive drifts, which implies a Baxter-Spitzer factorization as in the case of random walks. We also show that the law of T is never log-convex for negative drifts. For positive drifts, we conjecture that the law of T is, in general, completely monotonic and that the discrete Baxter-Spitzer factorization is actually a continuous Wiener-Hopf factorization.

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