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*The convergence of Doubly Stochastic Markov Chains*

In recent years, some interest has been devoted to studying doubly stochastic Markov chains. These chains appears naturally in many real-life applications such as quantum measurements. In this note, we proceed to characterize the asymptotic behavior of an homogeneous doubly stochastic Markov chains. In particular, we characterize the doubly stochastic matrices whose associated Markov chain (1) describes a cycle; (2) converges to a given matrix; and (3) diverges. We also provide a new sufficient condition for the infinite product of doubly stochastic matrices  $A_1 A_2 A_3 \cdots$  to converge to a scalar multiple of the all-ones matrix, thus improving a result of Schwarz.