181-9. The Invariant Distribution of Markovian Products of Random Matrices. Joel E. Cohen,

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Consider a sequence of vectors . . . Y(t-1), Y(t), Y(t+1), . . ., with nonnegative real elements, such that Y(t) = X(t)Y(t-1), where X(t) is an n x n nonnegative matrix and the sequence of matrices . . . X(t-1), X(t), X(t+1), . . . is a sample path of a discrete-time Markov chain $\underset{\sim}{X}$ whose state space is a (nice) set of nonnegative n x n matrices. (This model arises naturally in population dynamics, among other applied fields.) Let y(t) = Y(t)/‖Y(t)‖, for some norm ‖.‖. Then (y(t), X(t)) is Markovian, though y(t) by itself is not. Given the transition probability function of the X(t) process, one can write explicitly the transition probability function of the (y(t), X(t)) process. If $\underset{\sim}{X}$ is suitably ergodic, then (y(t), X(t)) becomes independent of (y(t-s), X(t-s)) asymptotically as s gets large. When the Markov process $\underset{\sim}{X}$ is time-homogeneous as well as sufficiently ergodic, the distribution of (y(t), X(t)) converges to a distribution that can be calculated. From this limiting distribution, one can also calculate the asymptotic almost sure rate at which Y(t) changes in size, known as the Furstenberg-Kesten limit of the Liapunov characteristic. A numerical example will be given. (Received March 8, 1982)