Assignment 7

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Outline

Question

Find the stationary distribution $q_0, q_1...$ for the Markov chain whose only nonzero stationary probabilities are

$$p_{i,1} = \frac{i}{i+1}, p_{i,i+1} = \frac{1}{i+1} \qquad i = 1, 2, ...$$

Solution

We know

$$u_{i+1} = p_{i,i+1}u_i = \frac{1}{i+1}u_i = \frac{u_0}{(i+1)!} \tag{1}$$

so that from

$$\sum_{k=1}^{\infty} u_k = u_0 \sum_{k=1}^{\infty} (\frac{1}{k!}) = e.u_0 = 1 \tag{2}$$

gives $u_0 = \dfrac{1}{e}$ and the steady state probabilities are given by

$u_k = \dfrac{1/e}{k!}$,   k=1,2,3....