Solution to Problem 2.7

$$p_k = p_0 \prod_{i=0}^{k-1} \frac{l_i}{m_{i+1}} = p_0 r^k a^{\left(\sum_{i=1}^{k-1} i\right)} = p_0 r^k a^{\frac{k(k-1)}{2}} \quad \text{with } r = \frac{l}{m},\ k=1,2,....¥$$

and $p_0 = \dfrac{1}{1+\sum_{k=1}^{\infty} r^k a^{\frac{k(k-1)}{2}}}$ from the normalisation conditions

For ensuring the existence of the equilibrium solution, we need

$$a = \sum_{k=0}^{\infty}\left[\prod_{i=0}^{k-1}\frac{l_i}{m_{i+1}}\right] = \sum_{k=0}^{\infty} r^k a^{\frac{k(k-1)}{2}} < \infty$$

$$b = \sum_{k=0}^{\infty} \frac{1}{l_k \prod_{i=0}^{k-1} \frac{l_i}{m_{i+1}}} = \frac{1}{l}\sum_{k=0}^{\infty} r^k a^{\frac{k(k-1)}{2}} = \infty$$