

**Solution** (#1032) Let  $M$  denote the transition matrix for the Sunny/Rainy model in #606. We defined

$$M = \begin{pmatrix} 0.9 & 0.1 \\ 0.5 & 0.5 \end{pmatrix}.$$

So

$$M^2 = \begin{pmatrix} 0.86 & 0.14 \\ 0.7 & 0.3 \end{pmatrix}, \quad M^3 = \begin{pmatrix} 0.844 & 0.156 \\ 0.78 & 0.22 \end{pmatrix}.$$

The probability that it is Sunny on Day 3 given it is Rainy on Day 0 equals 0.78. The probability that it is Sunny on Day 11 given it is Sunny on Day 8 equals 0.844 as the transition matrix from Day 8 to Day 11 is the same as the transition matrix from Day 0 to Day 3.

In #407 we worked out the long term chance of sun as  $5/6$  and of rain as  $1/6$ . Hence for large  $n$  we have

$$M^n \approx \begin{pmatrix} 5/6 & 1/6 \\ 5/6 & 1/6 \end{pmatrix}.$$

This is saying that the long-term forecast is largely independent of the weather on Day 0.