

D117: 8.2 Cool stuff about Markov Chain.

Exercise 1

A Markov chain has the transition matrix show below

$$P = \begin{pmatrix} 0 & 1 \\ 0.3 & 0.7 \end{pmatrix}$$

1. Find the two-step transition matrix
2. Find $p_{11}(2)$
3. Find $p_{21}(2)$

Exercise 2

Profits at a brokerage firm are determined by volume of securities sold, and this volume fluctuates from week to week. If volume is high this week, then next week it will be high with a probability of 0.9 and low with a probability of 0.1. If volume is low this week then it will be high next week with a probability of 0.3. Assume that **state 1 is high volume** and that **state 2 is low volume**.

1. Find the transition matrix.
2. Find the four-step transition matrix.
3. If the volume is high this week, what is the probability it will be high in 4 weeks from now?
4. If volume is high this week, what is the probability that it will be low 4 weeks from now?

Exercise 3

A animal lives either in the woods or the meadows. If the animal is in the woods on one observation then it is three times as likely to be in the woods as the meadows on the next 3 observation. If the animal is in the meadows on one observation, then it is twice as likely to be in the meadows as the woods on the next observation. Assume that **state 1 is being in the meadows** and that **state 2 is being in the woods**.

1. Find the transition matrix for this Markov process.
2. If the animal is in the woods on the first observation, what is the probability that it is in the woods on the third observation.

Exercise 4

People living in a small town are classified according to employment into three groups: employed in industry, employed in small business, and self-employed. Formulate this situation as a Markov chain, and find the transition matrix.

Employment Last Year	Employment This Year	Percentage
Industry	Industry	50
	Small business	40
	Self-employed	10
Small business	Industry	10
	Small business	70
	Self-employed	20
Self employed	Industry	10
	Small business	30
	Self-employed	60

1. Find the transition matrix.
2. Find the two step transition matrix.
3. What is the probability that an individual employed in industry at one time is employed in small business 2 years later?
4. If an individual is self-employed this year, what is her most likely employment status 2 years from now ?
5. If an individual would like to be self-employed 2 years from now, what current employment status would give him the greatest likelihood of achieving his goal?