ACSC/STAT 4720, Life Contingencies II

Fall 2017

Toby Kenney

Homework Sheet 4

Due: Friday 20th October: 12:30 PM

Basic Questions

1. A disability income insurance company collects the following claim data (in thousands):

i	d_i	x_i	u_i	i	d_i	x_i	u_i	i	d_i	x_i	u_i
1	0	1.9	-	8	0.5	0.6	-	15	2.0	-	5
2	0	-	5	9	0.5	1.3	-	16	2.0	4.4	-
3	0	2.1	-	10	0.5	0.7	-	17	2.0	4.5	-
4	0	0.3	-	11	0.5	2.5	-	18	2.0	3.9	-
5	0	0.1	-	12	1.0	3.5	-	19	5.0	6.3	-
6	0	0.1	-	13	1.0	-	5	20	5.0	7.0	-
7	0	2.1	-	14	1.0	5.0	-	21	5.0	7.9	-

Using a Kaplan-Meier product-limit estimator:

(a) estimate the probability that a random loss exceeds 3.4.

(b) estimate the median of the distribution.

(c) Use a Nelson-Åalen estimator to estimate the median of the distribution.

2. For the data in Question 1, use Greenwood's approximation to obtain a 95% confidence interval for the probability that a random loss exceeds 3.4, based on the Kaplan-Meier estimator.

(a) Using a normal approximation

(b) Using a log-transformed confidence interval.

3. An insurance company records the following data in a mortality study:

entry	death	exit	entry	death	exit	entry	death	exit
68.4	71.0	-	69.8	-	73.7	69.1	-	72.1
68.3	71.4	-	68.4	72.8	-	68.6	-	72.3
69.1	73.8	-	68.7	-	71.4	71.0	-	71.9
70.5	-	72.6	70.0	-	72.1	70.3	-	71.0
69.3	-	72.8	70.3	-	72.0	68.6	72.1	-
69.0	73.1	-	70.6	-	73.1	68.7	-	72.6
70.6	-	71.3	70.2	-	71.3	69.7	-	73.8
69.7	-	72.4	71.0	72.9	-	70.6	-	73.5
68.5	-	72.3	69.2	-	71.8	70.7	72.3	-
70.6	-	71.4	70.4	-	71.7	69.6	-	72.3
69.4	71.4	-	68.3	-	73.4	68.2	-	72.8

Estimate the probability of an individual currently aged exactly 71 dying within the next year using:

(a) the exact exposure method.

(b) the actuarial exposure method.

4. Using the following table:

Age	No. at start	enter	die	leave	No. at next age
55	0	28	4	10	14
56	14	31	3	14	28
57	28	21	6	24	19
58	19	38	1	42	14
59	14	29	2	41	0

Estimate the probability that an individual aged 58 withdraws from the policy within the next year, conditional on surviving to the end of the year.

Standard Questions

5. For the study in Question 3, use the actuarial exposure method, and assume that the number of deaths follows a Poisson distribution with mean exposure times probability of dying to find a 95% confidence interval for q_{71}.