MIS6: (Continued)

Case 4: Incomplete Grouped Data

Illustration of Data (Example)

We begin our mortality with 50 dragons, all age 30.

Between ages 30 & 31,

10 die
20 withdraw
10 enter the study

Between ages 31 & 32,

15 die
15 withdraw
10 enter the study

Q: Determine $\hat{a}_{0:30}$ (Need additional assumption to get an answer)

One approach is the Kaplan-Meier approach:

$KIM \Rightarrow$ unless otherwise stated, deaths occur at MOY; split withdrawals & new entrants 50/50 at BOY/EOY

Then use K-M as before

i.e. $\hat{S}(t) = \prod_{k \leq t} (1 - \frac{d_k}{r_k})$
A: Organize the data

<table>
<thead>
<tr>
<th>Age</th>
<th>30</th>
<th>31</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>10W</td>
<td>7.5W</td>
<td>7.5W</td>
</tr>
<tr>
<td>5E</td>
<td>5E</td>
<td>5E</td>
<td>5E</td>
</tr>
</tbody>
</table>

\[ S_1 = 10 \quad 10D \quad 15D \quad 15 \]
\[ r_1 = 45 \quad r_2 = 27.5 \]

\[ r_1 = 50 - 10W + 5E \quad \text{(from age 30 to 30.5)} \]
\[ r_1 = 45 \]

\[ r_2 = 45 - 10D - 1W + 5E = 7.5W + 5E \quad \text{(from age 30.5 to 31.5)} \]
\[ r_2 = 27.5 \]

\[ K-M \Rightarrow \hat{P}_{30} = (1 - \frac{10}{45})(1 - \frac{15}{27.5}) = \frac{35}{45} \cdot \frac{125}{275} \]
\[ \therefore \hat{P}_{30} = 1 - \frac{35}{45} \cdot \frac{125}{275} \]

Comments on Notation: Recall \( S = e^{-H} \)

1) Notation for K-M estimates are \( S_n(t) \) & \( H_n(t) \)

2) Notation for N-A estimates are \( \hat{S}(t) \) & \( \hat{A}(t) \)

Remark: Greenwood's Approximation uses \( S_n(t) \)
Klein & Akle's Approximation use \( \hat{S}(t) \)