Precept 4: Multiple Decrement and Associated Single Decrement Life Tables

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1 Equations

1.1 Multiple Decrement Life Tables

$$ {}_n q_x^i = {}_n q_x \cdot \frac{{}_n D_x^i}{{}_n D_x} $$

$$ {}_n d_x^i = {}_n q_x^i \cdot l_x $$

$$ l_x^i = \sum_{a=x}^{\infty} {}_n d_a^i $$

What do ${}_n q_x^i$, ${}_n d_x^i$, and l_x^i represent?

1.2 Associated Single Decrement Life Tables

1.2.1 Chiang Method

Note: this is Approach C in Preston

Assume that the force of decrement function from cause i is proportional to the force of decrement function from all causes combined in the age interval x to $x+n$

$$ u^i(a) = R^i \cdot \mu(a) $$

and

$$ {}_n^* p_x^i = [{}_n p_x]^{R^i} $$

Where ${}_n p_x$ comes from the parent lifetable.

To calculate ${}_n a_x$:

- For ages under 10 and the second to last interval:
  - ${}_n^* a_x^i = n + R^i \cdot \frac{{}_n q_x}{{}_n^* q_x^i} ({}_n a_x - n)$

- For the open ended age interval:
  - ${}^{*}_{\infty}a_{85}^{-i} =^{*} e_{85}^{-i} = \frac{e_{85}^{0}}{R^{-i}}$
- For the other age groups:
  - ${}^{*}_{n}a_{x}^{i} = \frac{-\frac{5}{24}\cdot{}^{*}_{5}d_{x-5}^{i}+2.5\cdot{}^{*}_{5}d_{x}^{i}+\frac{5}{24}\cdot{}^{*}_{5}d_{x+5}^{i}}{{}^{*}_{5}d_{x}^{i}}$

1.2.2 Assume Mortality Hazard from All Decrements is Constant in the Age-Interval

Note: this is Approach B in Preston

$${}^{*}_{n}p_{x}^{i} = e^{-\int_{x}^{x+n} {}_{n}m_{x}^{i}dx} = e^{-n\cdot{}_{n}M_{x}^{i}}$$

$${}^{*}_{n}L_{x}^{i} = \frac{{}^{*}l_{x}^{i} -^{*} l_{x+n}^{i}}{{}_{n}M_{x}^{i}}$$

2 Stata

2.1 Delimit

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# delimit ;
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- This command tells Stata that each Stata command ends with a semicolon. If Stata does not see a semicolon at the end of the line, then it assumes that the command carries over to following line.
- This is useful because complicated commands in STATA are often too long to fit on a single line.
- \# *delimit cr* Ends the ";" use