

Precept 4: Multiple Decrement and Associated Single Decrement Life Tables

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1 Equations

1.1 Multiple Decrement Life Tables

$${}_nq_x^i = {}_nq_x \cdot \frac{{}_nD_x^i}{{}_nD_x}$$

$${}_nd_x^i = {}_nq_x^i \cdot l_x$$

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

What do ${}_nq_x^i$, ${}_nd_x^i$, 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

$${}_np_x^i = [{}_np_x]^{R^i}$$

Where ${}_np_x$ comes from the parent lifetable.

To calculate ${}_na_x$:

- For ages under 10 and the second to last interval:

$$- {}_na_x^i = n + R^i \cdot \frac{{}_nq_x}{{}_nq_x^i} ({}_na_x - n)$$

- For the open ended age interval:

$$- {}^*_{\infty}a_{85}^{-i} = {}^*e_{85}^{-i} = \frac{e_{85}^0}{R^{-i}}$$

- For the other age groups:

$$- {}^*_na_x^i = \frac{-\frac{5}{24} \cdot {}^*_5d_{x-5}^i + 2.5 \cdot {}^*_5d_x^i + \frac{5}{24} \cdot {}^*_5d_{x+5}^i}{{}^*_5d_x^i}$$

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

delimit ;

- 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