SFI Week 11

Tuesday, 4 April 2023 09:05

1. Office hour

   By email appointment

   Dr. Fatemeh Parsa 13-14 Tue 515

   Thur Week 11

   Learning Cafe Tue, Thur 11-13 Basement Hub

2. W12 Group Presentation
   - Apply at least one method from this module
   - General insurance product

3. Mock exam

   Fatemeh {mark, Q}

The B-F method

Data given by Q ?

- Triangle (Slide 20, W11)
- Eearned Premium (EP) (Slide 22)
- The expected Ultimate Loss Ratio (optional)

Step 1. Development Factors (Ratio ↑)

Chain Ladder method

$$\text{e.g. } 1.158 = \frac{3334 + 3889 + 4503 + 5422 + 6142}{2866 + 3359 + 3848 + 4673 + 5369}$$

Cumulative incurred claim amounts.

Step 2. Initial Ultimate Loss + Loss Ratio

Accident Year	1	2	3	4	5	6
Earned Premium(EP)	4486	5024	5680	6590	7482	8502
Initial Ultimate Loss = 0.83 × EP	3717	4170 = 0.83 × 5024	4714 = 0.83 × 5680	5470	6210	7057

$$83\% = \frac{\text{Ultimate claims incurred for Accident Year 1}}{\text{Earned premium for Accident Year 1}}$$

$$= \frac{3717}{4486}$$

Step 3. Revised estimate of total Ultimate losses by accident year (AY)

From Step 1 (Slide 20)

AY	0	1	2	3	4	5
Ratio (r)	1.158	1.049	1.039	1.023	0.999	1

AY	6	5	4	3	2	1
f	1.290 = 1.158 × 1.049 × 1.039 × 1.023 × 0.999 × 1 = right × 1.158	1.114 = 1.049 × 1.039 × 1.023 × 0.999 × 1 = right × 1.049	1.062 = 1.039 × 1.023 × 0.999 × 1 = right × 1.039	1.022 = 1.023 × 0.999 × 1 = right × 1.023	0.999 = 0.999 × 1	1
$1-\frac{1}{f}$	0.225 $= 1-\frac{1}{1.290}$	0.102 $= 1-\frac{1}{1.114}$	0.058	0.022	-0.001	0
Initial UL (outcome of Step 2)	7057	6210	5470	4714	4170	3723

Emerging Liability = Initial UL × $(1-\frac{1}{f})$	1588 = 7057 × 0.225	633 = 6210 × 0.102	317	104	-4	0	future
Reported Liability = Last known figure = diagonal	5818	6142	5676	4946	4319	3717	past
Ultimate Liability = Eemerging Liability + Reported Liability	7406 = 1588 + 5818	6725	5993	5050	4315	3717	total

A cleaner table: Slide 23

Step 4. Reserve

Total $\boxed{\text{reserve}}$ = sum of Emerging Liability $= \boxed{21000}$ future

Claims paid to date = Sum of Reported Liability = 12256 past

Total claims = sum of Ultimate liability = 33256 total

The average cost per claim method

mean of X_i

Data given:

- Cumulative incurred claims (Slide 6 W11) S
- Cumulative number of reported claims (Slide 7) N

Step 1. Accumulated average incurred cost per claim (≈ mean X_i)

Slide 8

$\frac{S}{N}$ S ← slide 6, N ← slide 7

$$\text{e.g. } 6.708 = \frac{2777}{414}$$

2777 ← (AY 1, DY 0) slide 6

414 ← (1 0) slide 7

$$7.096 = \frac{3264}{460}$$

Step 2. Average incurred cost per claim (Slide 9)

Copied from Step 1 (Slide 8)

DY

AY	0	1	2	3	4	5	Ult
1	6.706 ① 89.2%	7.096 94.3%	7.162 95.2%	7.365 97.9% $= \frac{7.365}{7.524}$	7.559 $\boxed{100.5\%}$ $= \frac{7.559}{7.524}$	7.524 $\boxed{100.0\%}$ $= \frac{7.524}{7.524}$	7.524
2	7.179 ④ 90.0% $= \frac{7.179}{7.973}$	7.518 94.3% $= \frac{7.518}{7.973}$	7.553 94.7%	7.894 99.0%	8.013 ② $\boxed{100.5\%}$		③ $7.973 = \frac{8.013}{100.5\%}$
3	7.540 ⑦ 87.4% $= \frac{7.540}{8.632}$	8.036 93.1% $= \frac{8.036}{8.632}$	8.355 96.8% $= \frac{8.355}{8.632}$	8.498 ⑤ $\boxed{98.45\%}$ $= \frac{97.9\% + 99.0\%}{2}$			⑥ $8.632 = \frac{8.498}{98.45\%}$
4	8.530 ⑩ 88.3% $= \frac{8.530}{9.657}$	9.221 95.5% $= \frac{9.221}{9.657}$	9.229 ⑧ $\boxed{95.57\%}$ $= \frac{95.2\% + 94.7\% + 96.8\%}{3}$				⑨ $9.657 = \frac{9.229}{95.57\%}$

=

Step 3. Number of claims (N)

Slide 12

DY

AY	0	1	2	3	4	5	Ult
1	414 ① 83.8% $= \frac{414}{494}$	460 93.1% $= \frac{460}{494}$	482 97.6%	488 98.8%	492 99.6%	494 100%	494
2	453 ④ 83.7% $= \frac{453}{541}$	506	526	536	539 ② 99.6%		③ 541 $= \frac{539}{99.6\%}$

Step 4. Projected Loss estimate