

**Reading:** Friedland 11 (Frequency-Severity Methods)  
**Model:** 2017.Spring #16  
**Problem Type:** Reserving Methods - FS (Exposures & Trends 022)

F-11 (020) 2017.Spring Q16 (Problem)

**Find** Calculate the **IBNR** for **AY 2024** using a frequency-severity method.

**Given**

AY	EP (000s)	on-level factor	indicated ultimate counts	selected severity
2021	132,500	1.405	1,025	?
2022	275,250	1.300	3,070	?
2023	330,750	1.070	2,950	?
2024	360,825	1.050	?	?
2025	?	?	?	13,370

annual trend for exposures (payroll inflation rate)	n/a
annual trend for counts	-2%
annual trend for severity	5%

cumulative reported claims for <b>AY 2024</b>	30,880,900
---	------------

This problem has 2 differences from a more typical application of the frequency-severity method #2

- A The exposure base is earned premium and you're given on-level factors instead of an exposure trend.
- B The question doesn't ask about the most recent AY. It asks about the next-to-last AY.

Before doing any calculations, let's think ahead about what we're going to need. We want the IBNR but we'll first calculate the ultimate then just subtract the reported to date for AY 2024. For the frequency-severity method, we have for AY 2024:

$$\begin{aligned}
 \text{ultimate} &= \text{exposure} \times \text{frequency} \times \text{severity} \\
 &= 360,825 \times 0.861\% \times 12,733 \quad \text{<-- calculations shown below in steps 1 \& 2} \\
 &= 39,578,379 \\
 \\ 
 \text{IBNR} &= \text{ultimate} - \text{reported} \\
 &= 39,578,379 - 30,880,900 \\
 &= 8,697,479 \quad \text{<-- final answer}
 \end{aligned}$$

The details of how the frequency & severity are calculated are shown below:

**Step 1a** trend the counts and exposures (EP) first to 2025 to get frequency at the 2025 level:  $(\text{trended counts}) / (\text{OLEP})$

AY	counts	trd fctr	EP	OLF **	trended frequency
2021	1,025	0.98^4	132,500	1.405	0.508%
2022	3,070	0.98^3	275,250	1.300	0.808%
2023	2,950	0.98^2	330,750	1.070	0.801%
2024	?	n/a	360,825	1.050	?
2025	?	n/a	?	n/a	0.804%

\* OLEP = On-Level Earned Premium  
 \*\* OLF = On-Level Factor

<-- select avg(2023, 2024) because 2021 is an outlier

**Step 1b** detrend frequency from step 1a back to 2024

$$\begin{aligned}
 \text{frequency @ 2024} &= \text{frequency @ 2025} / \text{back out count trend} \times \text{back out OLF} \\
 &= 0.804\% / 0.98^1 \times 1.050 \\
 &= 0.861\%
 \end{aligned}$$

**Step 2** detrend given severity back to 2024

$$\begin{aligned}
 \text{severity @ 2024} &= \text{severity @ 2025} / (1 + \text{severity trend})^1 \\
 &= 13,370 / 1.05^1 \\
 &= 12,733
 \end{aligned}$$

**Final** (Go back to the top for the final answer)