

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

F-11 (022) FS (Problem 1)

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	52,000	1.220	470	?
2022	60,300	1.140	480	?
2023	68,700	1.080	550	?
2024	78,300	1.040	?	?
2025	?	?	?	21,920

** severity for AY 2025 was determined independently*

annual trend for exposures (premium trend)	n/a
annual trend for counts	-1%
annual trend for severity	6%

cumulative reported claims for AY 2024	6,733,800
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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:

Step 3 ultimate = exposure x frequency x severity
 = 78,300 x 0.755% x 22,160 <-- calculations shown below in steps 1 & 2
 = 13,107,696

IBNR = ultimate - reported
 = 13,107,696 - 6,733,800
 = 6,373,896 <-- final answer

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: (trended counts) / (OLEP)

AY	counts	trd fctr	EP	OLF **	trended frequency
2021	470	0.99^4	52,000	1.220	0.712%
2022	480	0.99^3	60,300	1.140	0.678%
2023	550	0.99^2	68,700	1.080	0.727%
2024	?	n/a	78,300	1.040	?
2025	?	n/a	?	n/a	0.719%

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

<-- select avg(2021, 2023) because 2022 is an outlier

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

frequency @ 2024	=	frequency @ 2025	/	back out count trend	x	back out OLF
	=	0.719%	/	0.99^1	x	1.040
	=	0.755%		0.99^1	x	1.040

Step 2 detrend given severity back to 2024

severity @ 2024	=	severity @ 2025	/	(1 + severity trend)^1
	=	23,490	/	1.06^1
	=	22,160		

Step 3 (Go back to the top for the final answer)

Reading: Friedland 11 (Frequency-Severity Methods)
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F-11 (022) FS (Problem 2)

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	66,000	1.250	660	?
2022	77,200	0.990	690	?
2023	81,100	0.980	730	?
2024	88,400	0.990	?	?
2025	?	?	?	24,750

** severity for AY 2025 was determined independently*

annual trend for exposures (premium trend)	n/a
annual trend for counts	-2%
annual trend for severity	8%

cumulative reported claims for AY 2024	7,248,800
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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:

Step 3 ultimate = exposure x frequency x severity

$$= 88,400 \times 0.875\% \times 22,917 \quad \text{<-- calculations shown below in steps 1 \& 2}$$

$$= 17,720,688$$

IBNR = ultimate - reported

$$= 17,720,688 - 7,248,800$$

$$= 10,471,888 \quad \text{<-- final answer}$$

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	660	0.98^4	66,000	1.250	0.738%
2022	690	0.98^3	77,200	0.990	0.850%
2023	730	0.98^2	81,100	0.980	0.882%
2024	?	n/a	88,400	0.990	?
2025	?	n/a	?	n/a	0.866%

* 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

$$\begin{array}{rclclcl} \text{frequency @ 2024} & = & \text{frequency @ 2025} & / & \text{back out count trend} & \times & \text{back out OLF} \\ & = & 0.866\% & / & 0.98^1 & \times & 0.990 \\ & = & 0.875\% & & 0.98^1 & \times & 0.990 \end{array}$$

Step 2 detrend given severity back to 2024

$$\begin{array}{rclcl} \text{severity @ 2024} & = & \text{severity @ 2025} & / & (1 + \text{severity trend})^1 \\ & = & 24,750 & / & 1.08^1 \\ & = & 22,917 & & \end{array}$$

Step 3 (Go back to the top for the final answer)