

1.3.4 Measuring losses

→ Overview → There are many ways that losses can be defined. Here's a review on the different loss definitions, which were introduced in section 1.1.

- 1) Paid losses → The amount that has been paid to claimants
- 2) Loss reserve → An estimate of the amount required to ultimately settle any reported claim, excluding any payments already made. This amount is monitored + adjusted as payments are made + new information about the damages is obtained.
- 3) Reported/case incurred loss → The sum of paid losses + the current case reserve for a claim
- 4) Ultimate loss → The amount needed to close + settle all claims for a defined group of policies. This includes the reported loss, the JANWR reserve, + the JANWR reserve.

→ The expression of losses is based on three factors:

- 1) choice of relevant statements, e.g. paid or reported losses
- 2) time aggregation method, e.g. calendar, accident, policy, or report year
- 3) period of time, which is defined by both an accounting period + a valuation date
 - Accounting period → The specific time frame in which losses are recorded, which is often consistent w/ financial statements dates such as monthly, quarterly, or annually.
 - valuation date → The date at which losses are assessed for analysis, which can be different from the end of the accounting period. The valuation date can be expressed as the # of months after the start of the accounting period or the # of months relative to the end of the accounting period.

→ For example, an actuary may calculate the Ay 2023 reported losses as of 18 months, which implies the Ay 2023 reported losses as of June 30, 2024. The actuary can also select a valuation date relative to the end of the accounting period, such as six months after the end of Ay 2023.

→ Loss statements

→ Two common statements for loss aggregation are:

- 1) Paid losses → The sum of all payments made on any claims during the time period
- 2) Reported losses/case incurred losses → The sum of paid losses plus change in the case reserves during the time period. Since the starting case reserve at an Ay, Ry or Py is always 0, the reported losses are equal to the paid losses plus the ending case reserve

→ Loss data aggregation methods

- All 4 data aggregation methods apply to loss claim.
- CY aggregation → considers all loss transactions that occur during the CY
- AY ----- → considers all loss transactions for claims w/ an accident/occurrence date during the year
- Py ----- → considers all loss transactions on policies that were written during the year
- Ry ----- → considers all loss transactions for claims w/ a report date during the year

→ Unlike CY paid + reported losses, which are fixed at the end of the year, Ay + Py paid + reported losses can + often + change after the end of the year due to additional claim reports, loss payments + reserve changes. Thus, future development in losses needs to be estimated. Since it takes for policy year loss data to be fully developed, the estimation of future development in known claims based on Py aggregation involves greater uncertainty compared to aggregation of losses based on Ay.

→ Ry aggregation is usually used for the pricing of claims-made policies only, which will be discussed in a later section. w/ this type of aggregation, there are no JANWR claims, but stale claims can still be present. By losses may be subdivided based on the report lag, which is the duration between the accident date + the report date.

→ Examples → Given the following information:

Claim Number	Policy Effective Date	Date of Loss	Report Date	Transaction Date	Incremental Payment	Case Reserve as of Transaction Date
1	Aug 1, 2022	Nov 16, 2022	Dec 1, 2022	Mar 17, 2023	\$0	\$10,000
				Oct 16, 2023	\$6,000	\$1,000
				Feb 2, 2024	\$2,500	\$0
2	Sep 27, 2022	Apr 11, 2023	Apr 11, 2023	Jun 9, 2023	\$5,000	\$10,000
				Feb 8, 2024	\$8,000	\$4,000
					\$0	\$0

Assume these are the only claims reported to this company, the reserve on January 1, 2022, was \$0, and both claims were closed as of December 31, 2024.

→ Calculate incurred losses for:

$$\rightarrow \text{a) CY 2023} = \$10,000$$

$$\rightarrow \text{--- 2023} = \text{loss payments} + \Delta \text{Reserves} = \$12,000 \quad (\text{doing each individually})$$

$$\qquad\qquad\qquad \text{↑} \quad \text{↑}$$

$$\qquad\qquad\qquad \text{Paid losses} + \text{Overall } \Delta \text{Loss reserve}$$

$$\qquad\qquad\qquad (2023) \quad (\text{loss ending} - \text{loss beginning})$$

$$\qquad\qquad\qquad = \$7,000 + (\$5,000 - \$10,000) \quad \text{↑ end of previous year CR}$$

$$\rightarrow \text{--- 2024} = -\$3,000 \quad \text{just thinking through} \quad \downarrow$$

$$\qquad\qquad\qquad = \$4,500 + \$0 - \$3,000 = -\$1,500 \quad \text{using formula}$$

→ b) Ay 2023 as of 12/31/2024

$$\rightarrow 12/31/2022 = \$10,000$$

$$\rightarrow 12/31/2023 = \text{Paid losses} + \text{case reserve}$$

$$\qquad\qquad\qquad (\text{end})$$

$$\qquad\qquad\qquad = (\$10,000 + \$6,000) + 1,000$$

$$\qquad\qquad\qquad = \$17,000$$

$$\rightarrow \text{Ay 2023 as of 12/31/2024} = \text{Paid losses} - \text{ending CR}$$

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = \$17,000 - 1,000$$

→ c) Ay 2023 as of 12/31/2024 = 0

→ d) Ry 2023 as of 12/31/2023 = Paid losses + ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = 9,000 - 1,000$$

$$\qquad\qquad\qquad = \$10,000$$

→ e) CY 2023 IL @ 12/31/2024 = Paid losses + Ending CR - Beginning CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$14,000$$

→ f) Ay 2023 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ g) PY 2023 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ h) Ry 2023 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ i) CY 2024 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ j) Ay 2024 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ k) PY 2024 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ l) Ry 2024 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ m) CY 2025 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ n) Ay 2025 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ o) PY 2025 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ p) Ry 2025 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ q) CY 2026 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ r) Ay 2026 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ s) PY 2026 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ t) Ry 2026 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ u) CY 2027 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ v) Ay 2027 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ w) PY 2027 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ x) Ry 2027 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ y) CY 2028 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ z) Ay 2028 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ aa) PY 2028 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ ab) Ry 2028 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ ac) CY 2029 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ ad) Ay 2029 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ ae) PY 2029 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ af) Ry 2029 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ ag) CY 2030 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$

$$\qquad\qquad\qquad = (\text{loss ending} + \text{CR} + \text{loss beginning}) - (\text{loss beginning}) = \$10,000$$

→ ah) Ay 2030 IL @ 12/31/2024 = Paid losses + Ending CR

$$\qquad\qquad\qquad \downarrow$$