AR3: Reserve Ranges – Outcomes vs. Estimates

Casualty Loss Reserve Seminar

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Outline

- What is meant by a range of reasonable reserve estimates?*

- Ranges in practice –
  - Common approaches
  - Results of a survey of SAOs

- Communicating ranges*

* Some material borrowed from the AAA Seminar on Effective Opinions

Types of reserve ranges

- Two main types of reserve ranges:

  – **Range of reasonable estimates:** expresses the degree of <u>uncertainty</u> in an estimate (for example, a range of estimates of the mean or actuarial central estimate)

  – **Range of possible outcomes:** includes the <u>full breadth</u> of <u>potential results</u> of the claim process; useful in measuring reserve <u>variability</u> (for example, percentiles or confidence levels).

- A **range of reasonable estimates** is <u>not the same</u> as a **range of possible outcomes**

Estimates vs. outcomes

- A **range of reasonable estimates** is a range of estimates that could be produced by using appropriate actuarial methods or alternative sets of assumptions that the actuary judges to be reasonable

  - ASOP No. 36 – "the actuary should consider a reserve to be reasonable if it is within a range of estimates that could be produced by an unpaid claim estimate analysis that is, in the actuary's professional judgment, consistent with both ASOP No. 43…and the stated basis of reserve presentation".

- A **range of possible outcomes** is a distribution that attempts to quantify probabilities of <u>all</u> possible outcomes, including those that are beyond "reasonably possible"

Uses of Ranges

- The type of range will vary depending on its intended use:

- Ranges of reasonable estimates can be useful for:

  - Setting management's best estimate

  - Determining the type of opinion (e.g., reasonable, deficient,…)

  - Testing management's best estimate during an audit

  - SEC filings – comments on uncertainty in the range of estimates

- Ranges of possible outcomes can be useful for:

  - Capital modeling – need aggregate reserve distribution

  - Risk management – scenario testing

  - CAT reinsurance modeling

  - SEC filings – comments on the reserve variability

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Focus: range of estimates

- My part of this session will focus on <u>ranges of reasonable estimates;</u> in particular Actuarial Central Estimates (ACE) as used in Statements of Actuarial Opinions.
- ACE definition (ASOP No. 43) = the expected value over the range of reasonably possible outcomes
- Endpoints of the range defined by Low and High estimates; where each is a reasonable estimate of the ACE.
- Alternative definitions may be appropriate in other contexts; for example, if state law required companies to book the 75th percentile reserve, then the range could be a range of reasonable estimates of the 75th percentile reserve
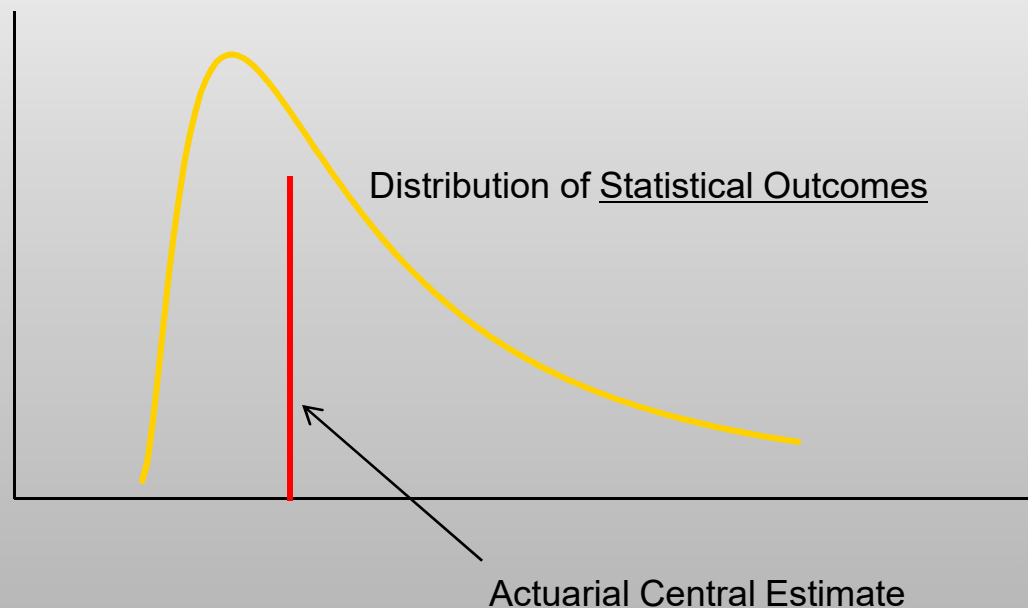
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Definitions

- **Process Risk: the randomness of future outcomes** *given a known distribution of possible outcomes*

- **Parameter Risk: the potential error in the estimated parameters** used to describe the distribution of possible outcomes, *assuming the process generating the outcomes is known*

- **Model Risk: the chance that the model ("process") used** to estimate the distribution of possible outcomes is incorrect

- *A range of reasonable <u>actuarial central estimates</u> considers **parameter** and **model** risk, but <u>not</u> **process** risk*

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What is a range of reasonable actuarial central estimates?

Distribution of <u>Statistical Outcomes</u>

Actuarial Central Estimate

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What is a range of reasonable actuarial central estimates?

Distributions of Statistical Outcomes

Actuarial Central Estimates

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What is a range of reasonable actuarial central estimates?

Distribution of <u>Actuarial Central Estimates</u>

Range of Reasonable Actuarial Central Estimates

Actuarial Central Estimate

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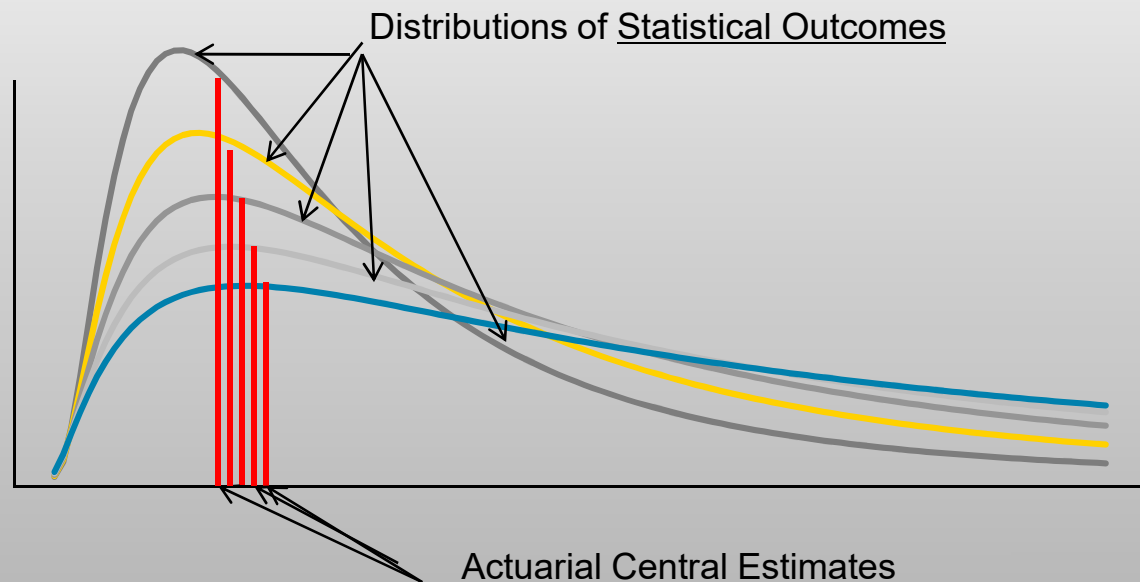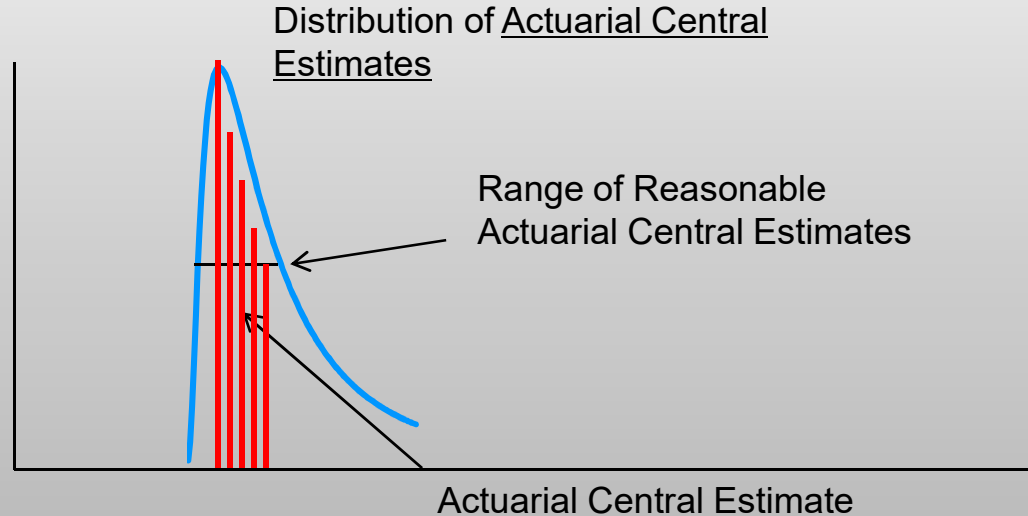
Common approaches for determining ranges of reasonable estimates

- **Commonly-used approaches in practice**

  - Flat percentage adjustment

    - Not acceptable without support

  - Function of results from different methods

  - Low and high reasonable assumption sets

  - Combinations of the above approaches

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Flat percentage adjustment

- Often based on the actuary's experience with a certain line of business and the perceived variability in the estimation of loss and loss adjustment expense liabilities for the given line
- Examples
  - Auto, homeowners: -a%, +b%
    - Where a and b are smaller percentages
  - Workers' comp, medical professional liability: -c%, +d%
    - Where c and d are larger percentages
- Increased scrutiny from regulators and auditors when percentages are purely judgment
  => Needs to be some basis for the selected percentages

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Function of results from different methods

- An actuary may use the results of various methods to get a sense of how wide the range could be
  - Chain ladder vs. B-F vs. Cape Cod vs. Frequency x Severity, etc.
  - Incurred methods vs. paid methods
  - Vary weights given to these methods
- Combine with "does this make sense?" diagnostics
  - Are the indicated reserves logical and consistent by accident year?
    - The percentage reserve range width should get wider for older years
    - The dollar range width should get smaller for older accident years
  - Does the low estimate imply negative IBNR reserves? Is this reasonable?
  - Do the ultimate loss estimates imply reasonable loss ratios, average severities, etc?

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Low and high alternate, but reasonable, sets of assumptions

- Recalculation of point estimates using alternative sets of reasonable assumptions

- Reselect lower/higher reasonable loss development factors at certain development ages (include tail)

- Alternative selections of initial expected loss ratios

- Alternative trends (if using Cape Cod methods)

- Low (High): combination of optimistic (pessimistic) but reasonable assumptions

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Survey of SAOs

- Survey of actuarial analyses for 100+ insurance companies
  - Analyses in support of 2017 SAOs
  - Identifying company information anonymized
  - Database included:
    - Actuarial "point" estimate
    - "Low" and "high" estimates, if calculated
    - Carried reserves
    - Primary area of business
    - Type of company
    - Premium, surplus, other key statistics
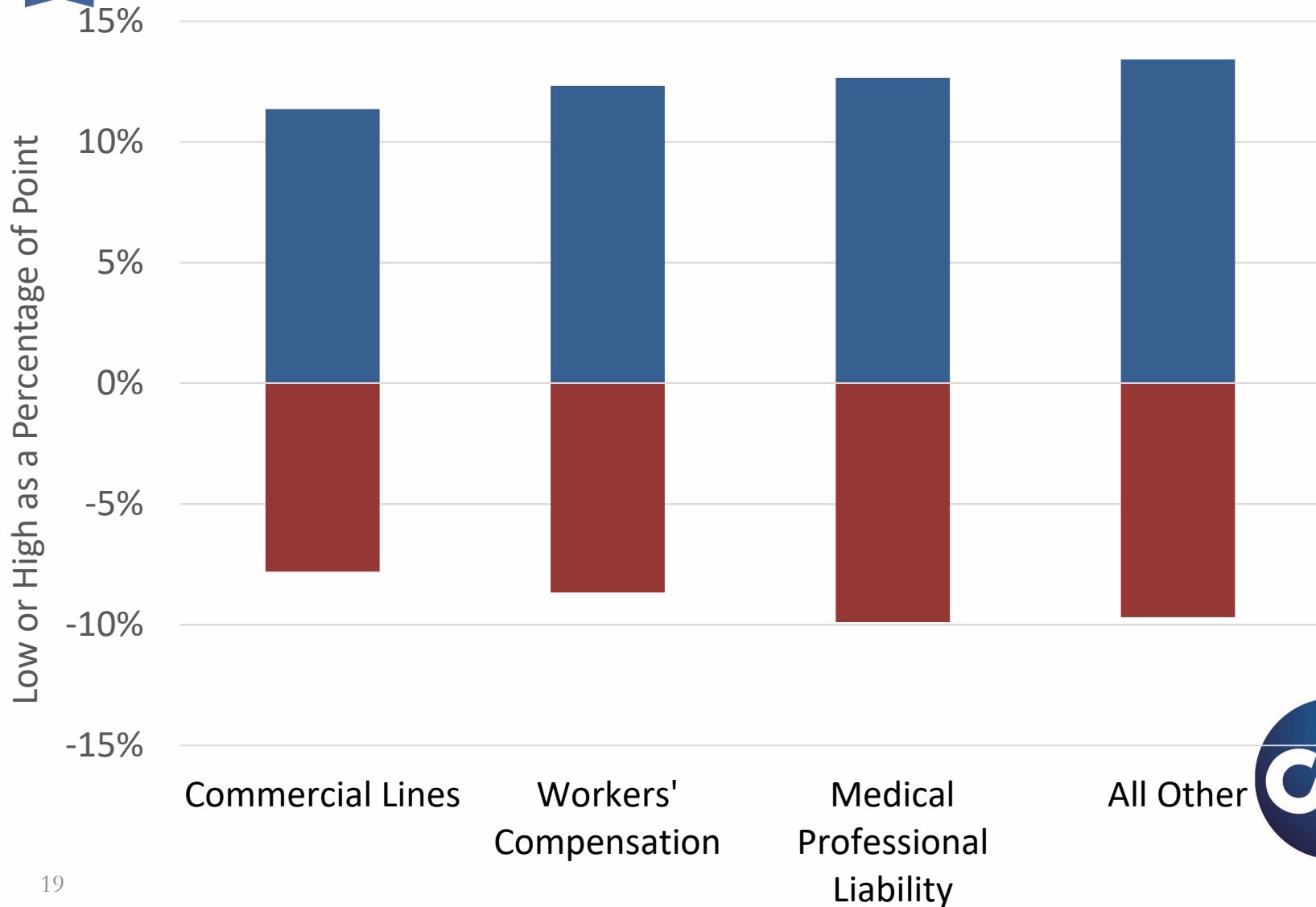- The results of this survey are shown on the following slides

Distribution of Low and High Ranges
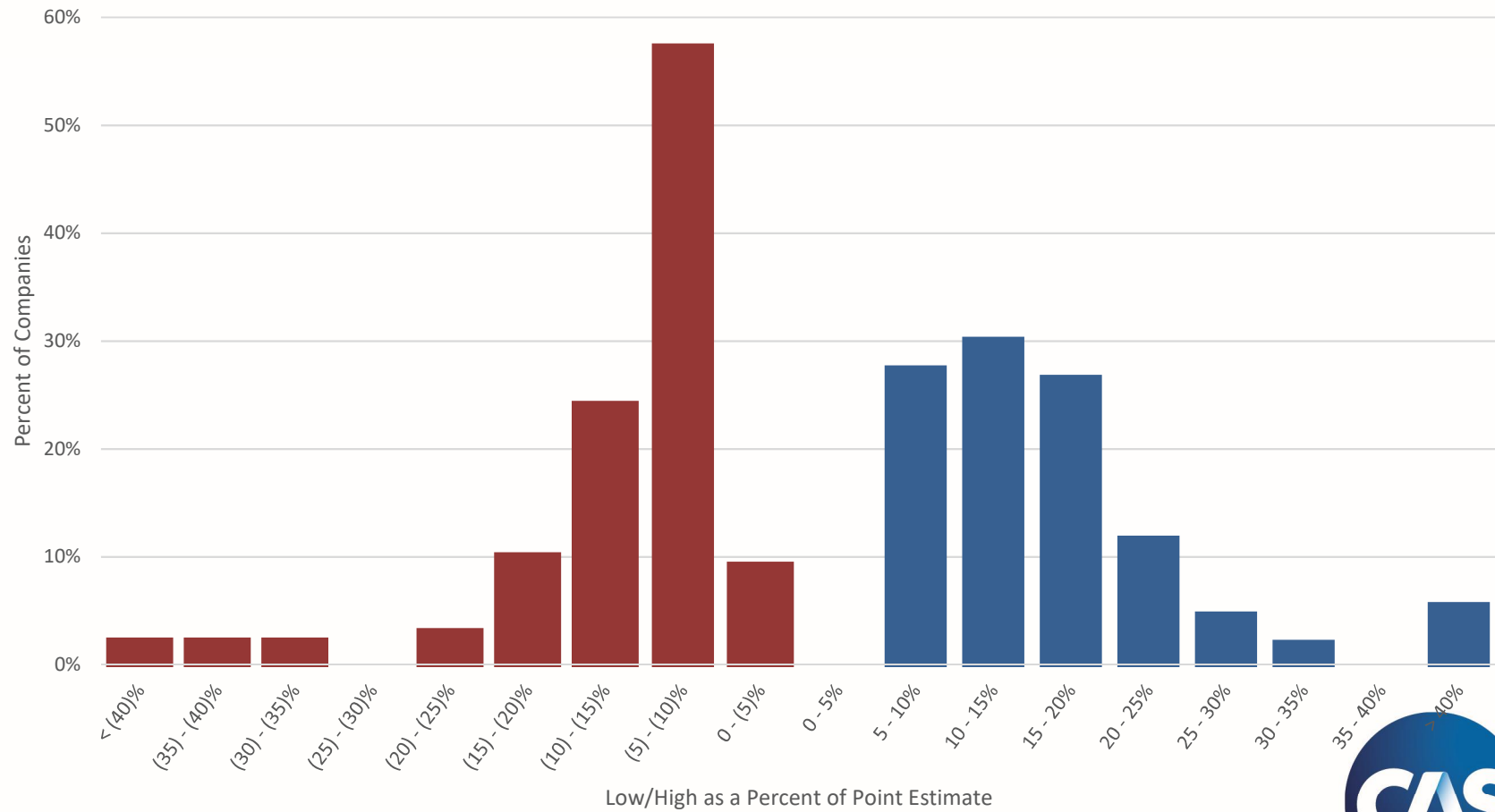
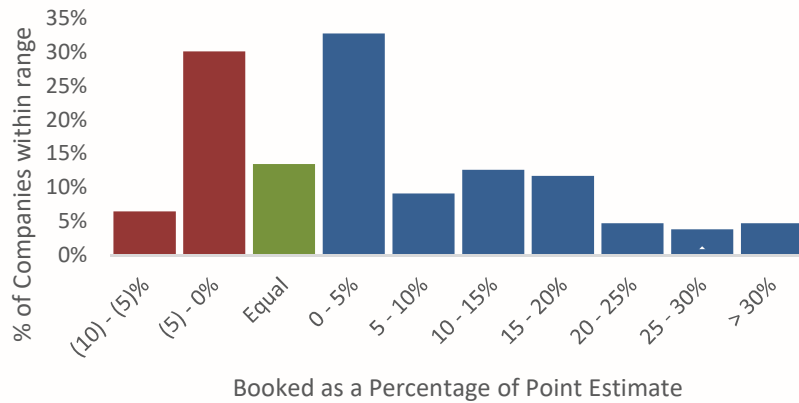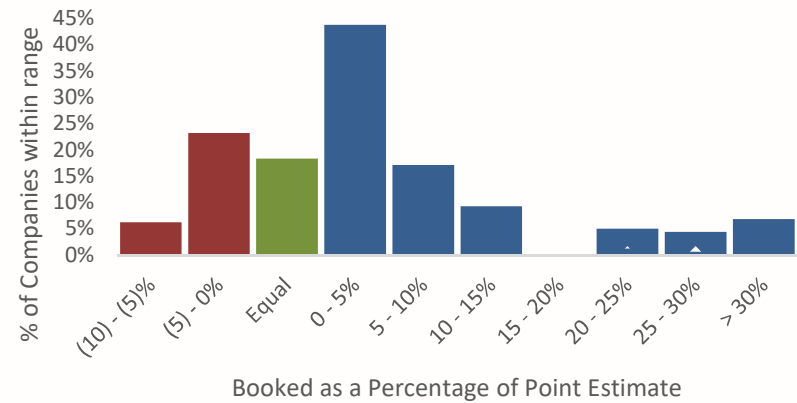Average Range by Size of Point Est.

Average Range by Business Area

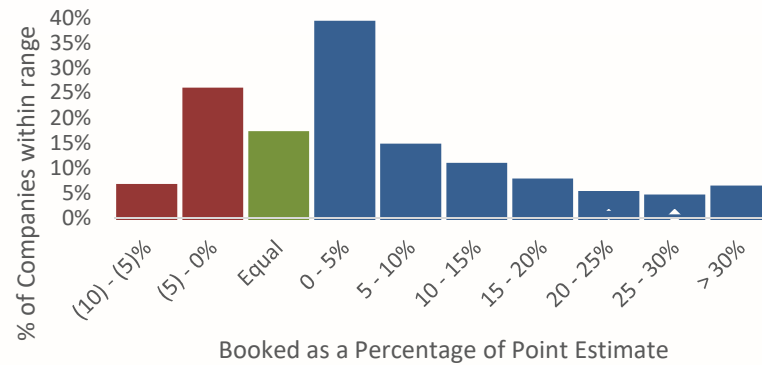# Distribution of Booked/Point Estimate

Companies with Point and Range

Companies with Point and No Range

All Companies

Survey takeaways

- Ranges can be wide (as % of the point estimate)
  - But not as wide as the range of possible outcomes
- High end of the range generally further from the point estimate than the low end of the range
- Wider ranges seem to be associated primarily with companies with small reserve amounts
  - Wider ranges are also associated with longer-tailed lines
- Many actuaries form their opinion on reserve reasonableness with just a point estimate (no range)
  - For these companies, the high and low estimates are closer to the point estimate than for companies with ranges
  - Ranges can help justify a "Reasonable" SAO

Communication Issues

- The measurement objective
  - Identification of the measurement objective is essential to the effective communication of a range of reasonable estimates
  - What have you measured?
    - If you are using stochastic reserving methods, then are you measuring the mean, median, 75th percentile, mode, actuarial central estimate…?
    - If you are using deterministic methods, then you are probably measuring the actuarial central estimate

Communication Issues

- Range endpoints
  - Reasonableness is a subjective measure
  - The "endpoints of a range of reasonable estimates" is not objectively determinable
  - Better to use "a" rather than "the" when defining range of reasonable estimates
  - Once you establish the endpoints of the range of reasonable estimates, then any reserve slightly lower (higher) than the low (high) end is not a reasonable estimate
- Beyond the range endpoints
  - Actual results outside of the range are possible!

Communication Issues

- Reliability of the range
  - What is the basis for the assumptions that were used to create the range?
  - How comfortable is the actuary with the reliability of the estimates that define the range?
  - Does the width of the range reflect the uncertainty in determining the actuarial central estimate?