PREDICTIVE MODELING APPROACH TO CASE RESERVES

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What is the ideal case reserve from an actuary's perspective?

One that optimizes the actuary's ability to perform.

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ACTUARIAL USES OF CASE RESERVES

- Development in loss triangles
- Allocation of total reserve estimate
- Input for pricing analysis

QUALITIES OF AN IDEAL ACTUARIAL CASE RESERVE

- Stability (constant adequacy over time)

IMPACT OF CHANGE IN MIX ON STABILITY

- Rarely true that types of claims are equally adequate. Differences usually exist by deductible, geography, industry classification, size of account, cause of loss, injury type, etc..
- Change in Mix => Change in Adequacy.
- It is rarely true that there is NO change in mix is occurring along any particular dimension.
- Therefore case adequacy is constantly changing.

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QUALITIES OF AN IDEAL ACTUARIAL CASE RESERVE

- Stability (constant adequacy over time)
- Uniformity (constant adequacy across population)

When we talk about the above two are we talking about case reserves by themselves or in conjunction with payments?

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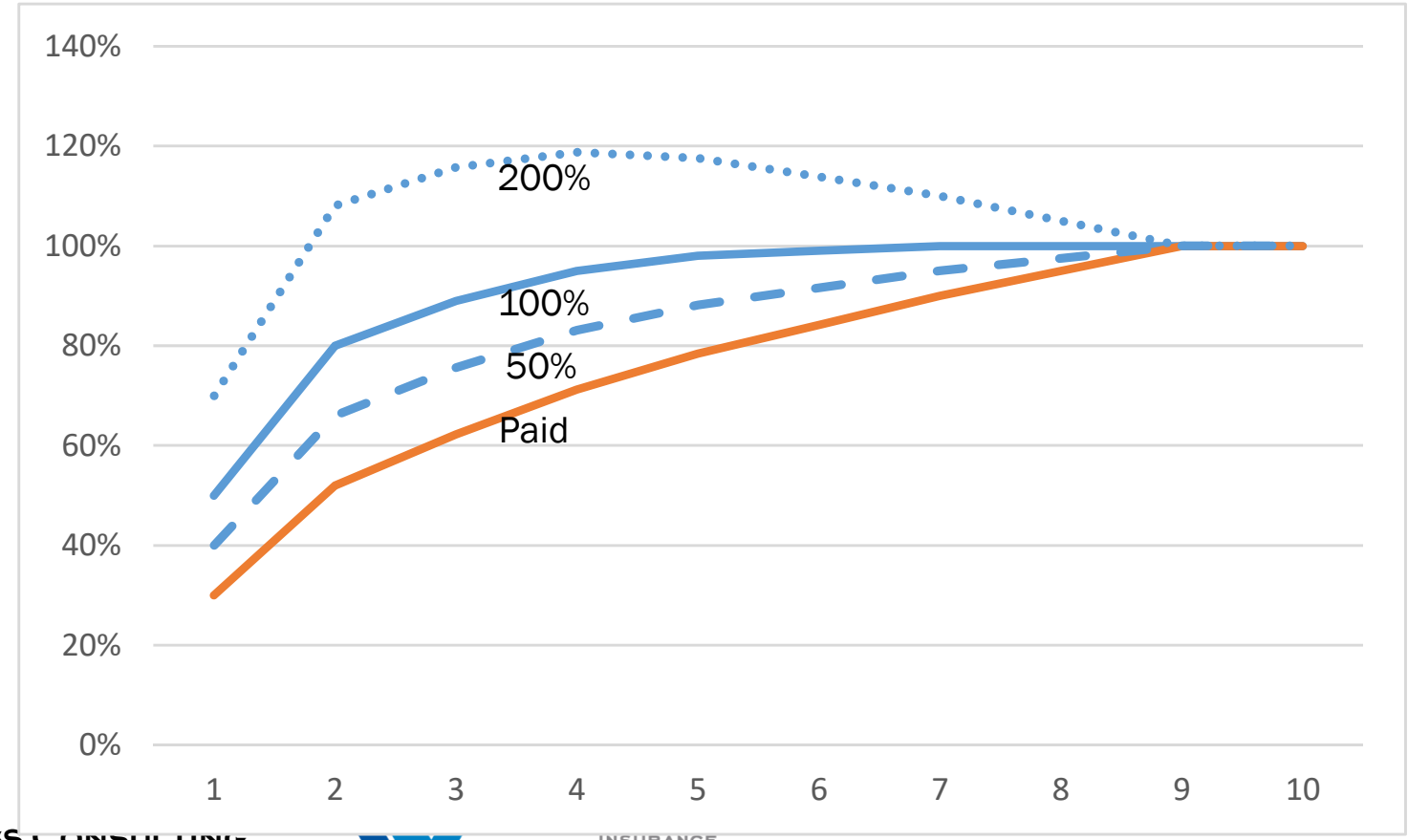
IMPACT OF CLAIM SETTLEMENT SLOW DOWN



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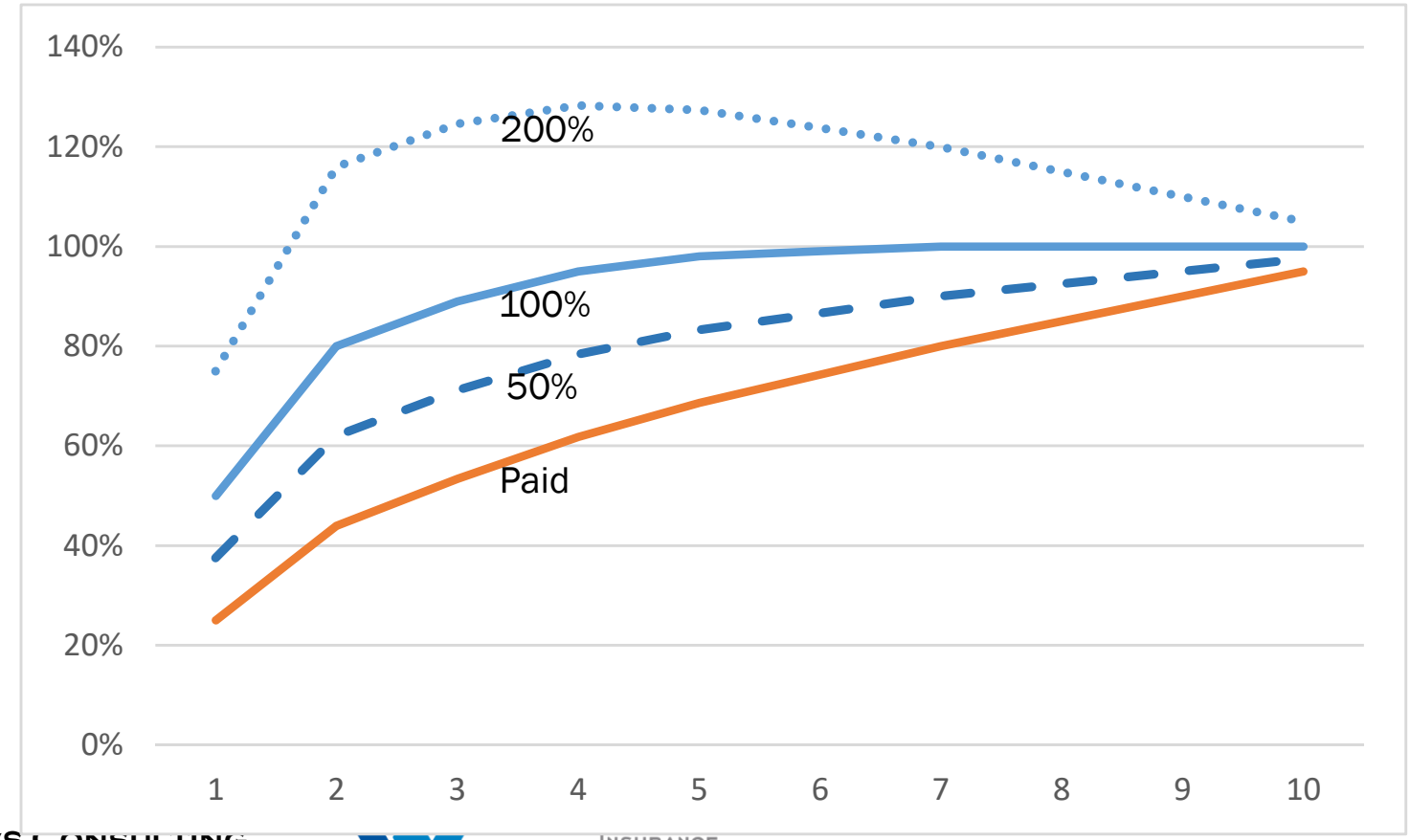
IMPACT OF CLAIM SETTLEMENT SLOW DOWN



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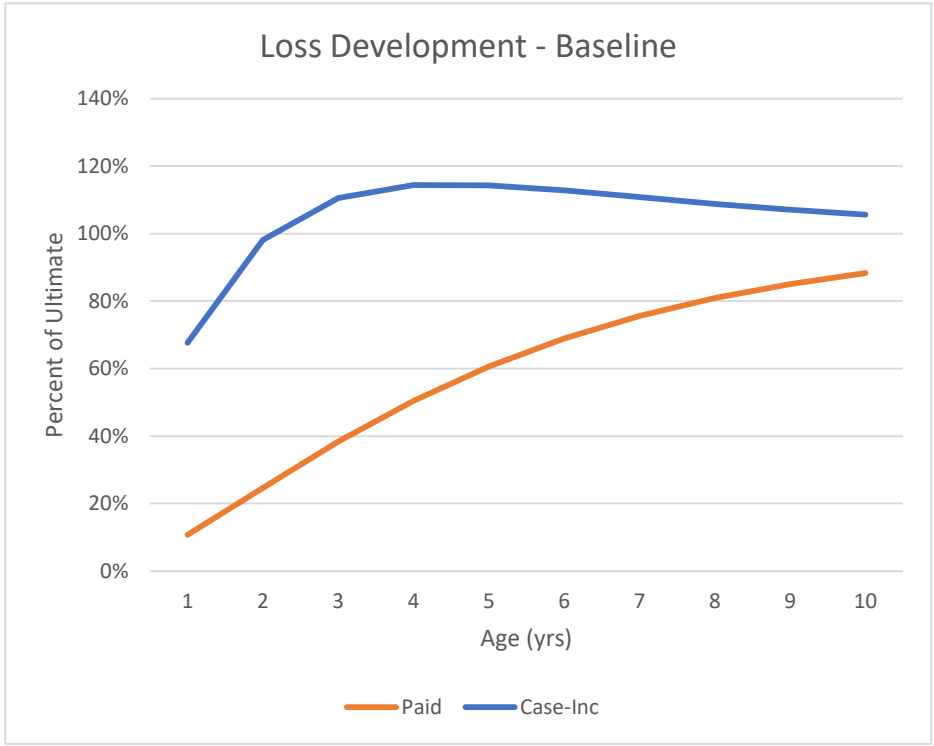
EXAMPLE OF SOME COVID AND INFLATION DYNAMICS



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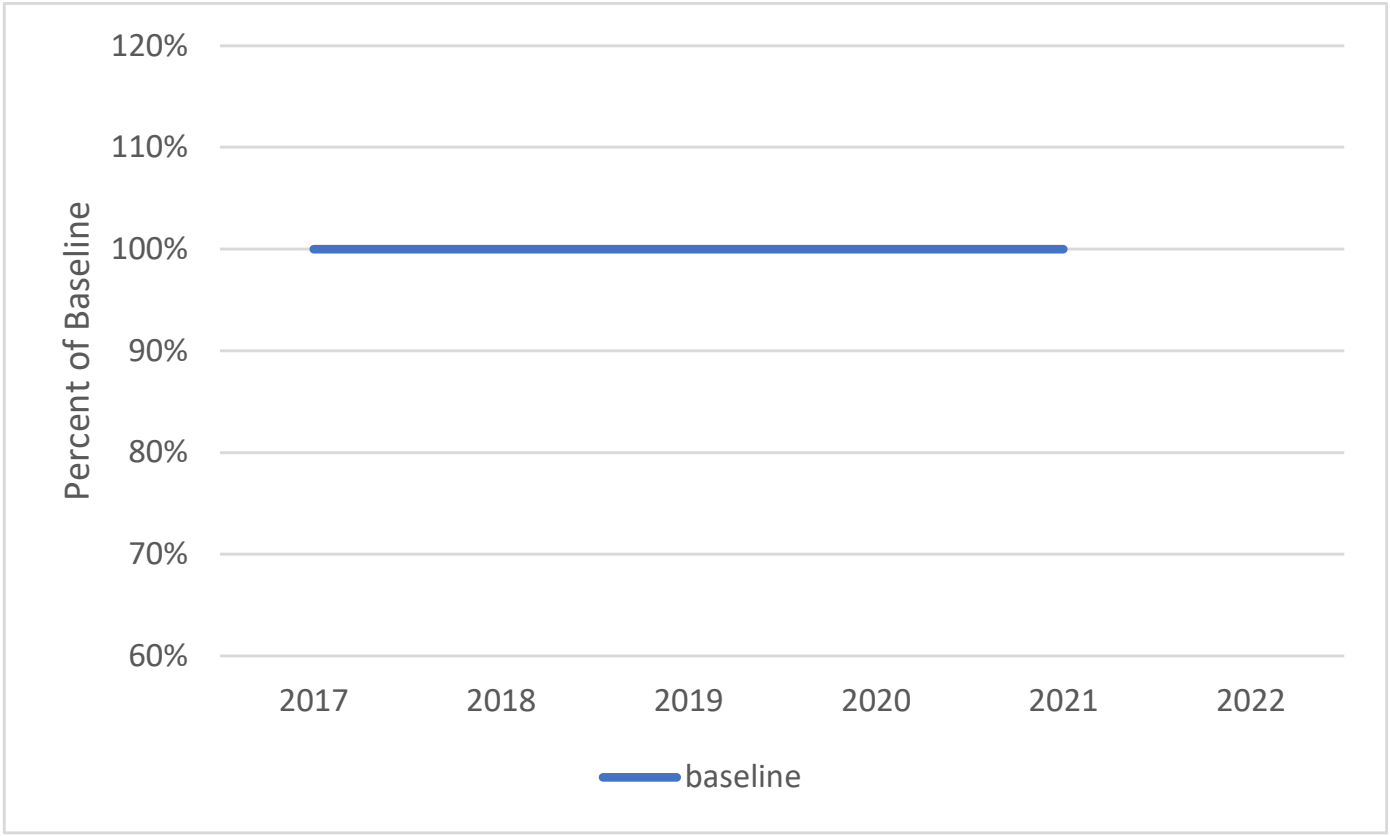
- Baseline Example: Ultimate Losses by year



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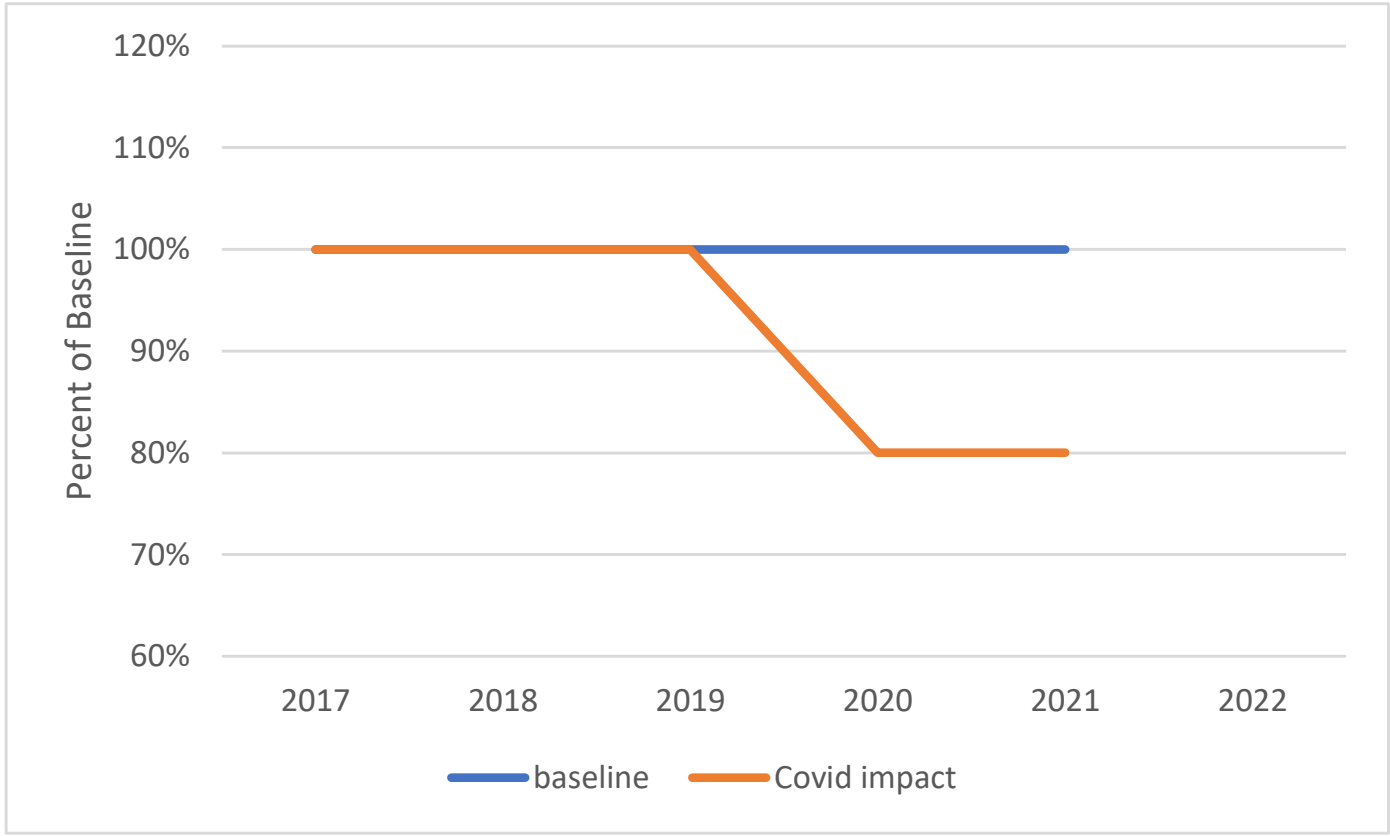
- Drop Ultimate losses 20% in 2020 and 2021
- Also, a slowdown of claim closure from average of 3 years to 4 years



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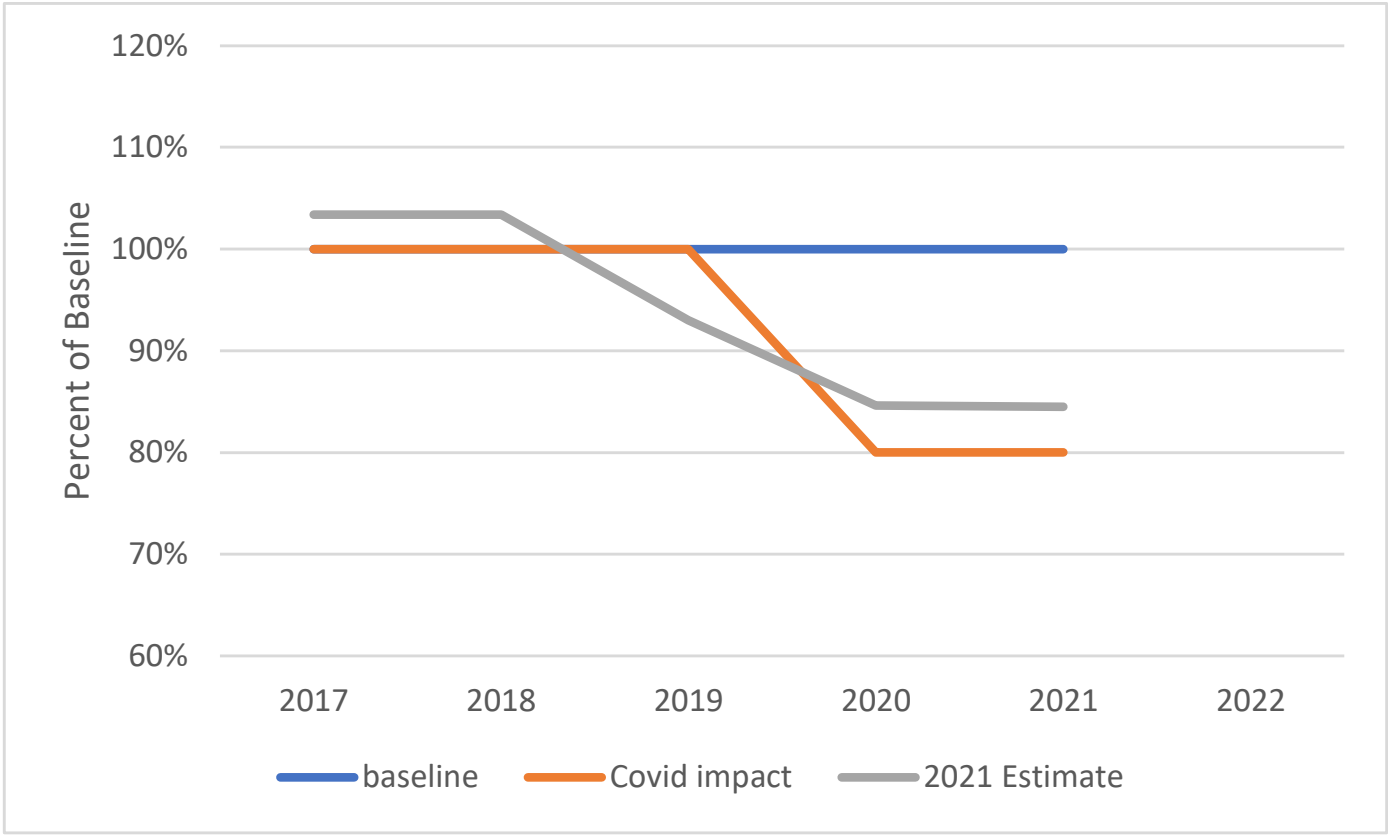
- Actuarial estimate using Link Ratio and B-F techniques



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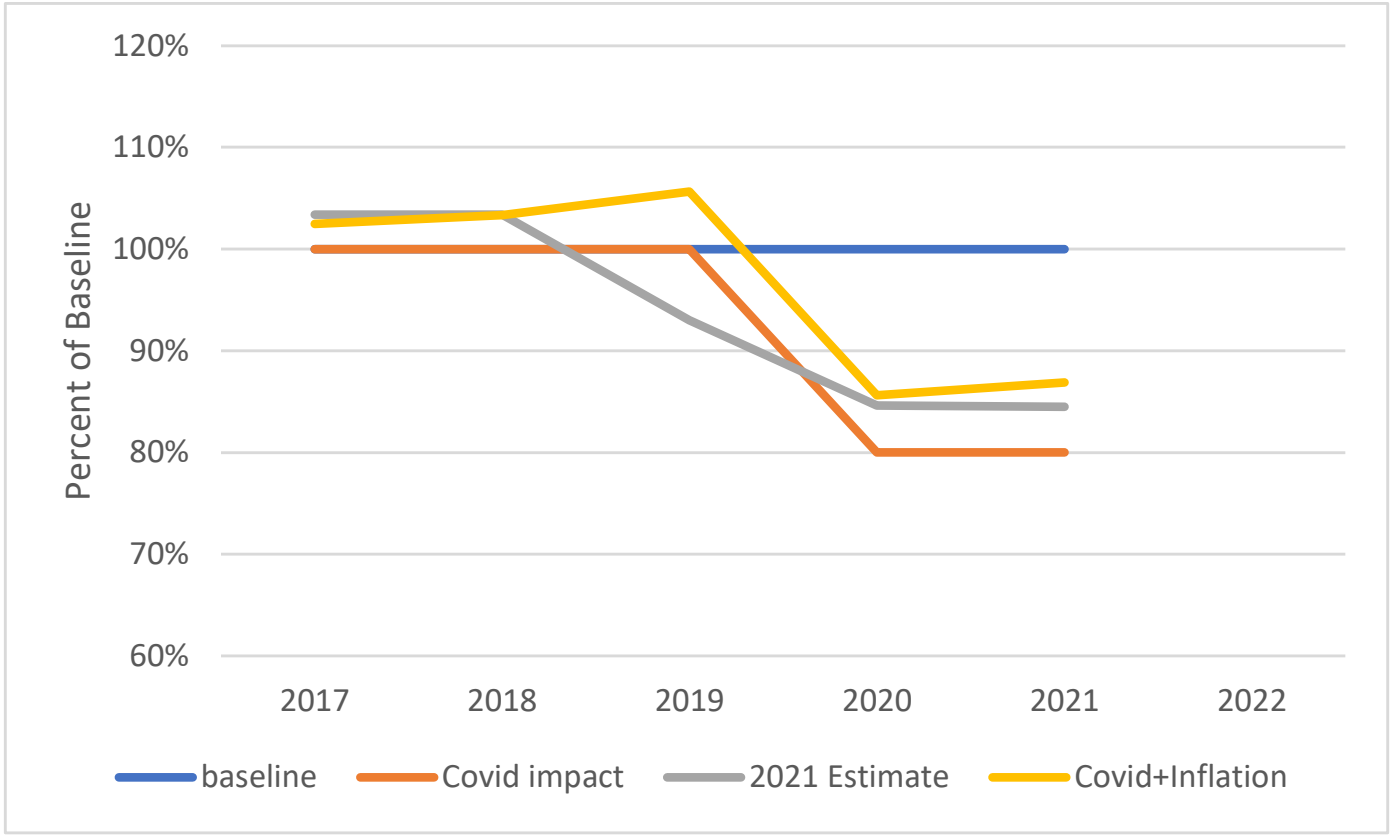
- Additional inflation (3 pts higher for 4 years starting in 2022)



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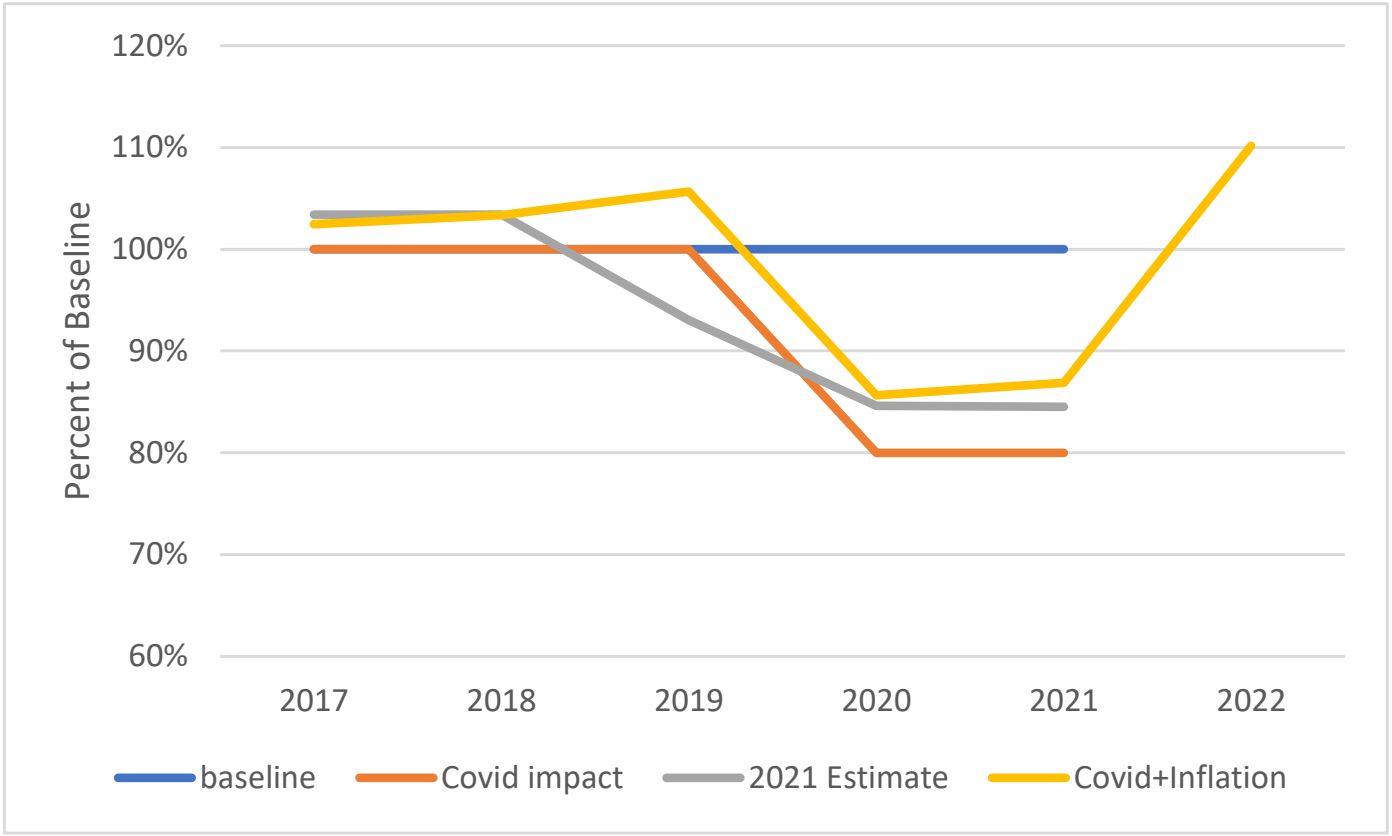
- Return to “normal” hazard/exposure in 2022



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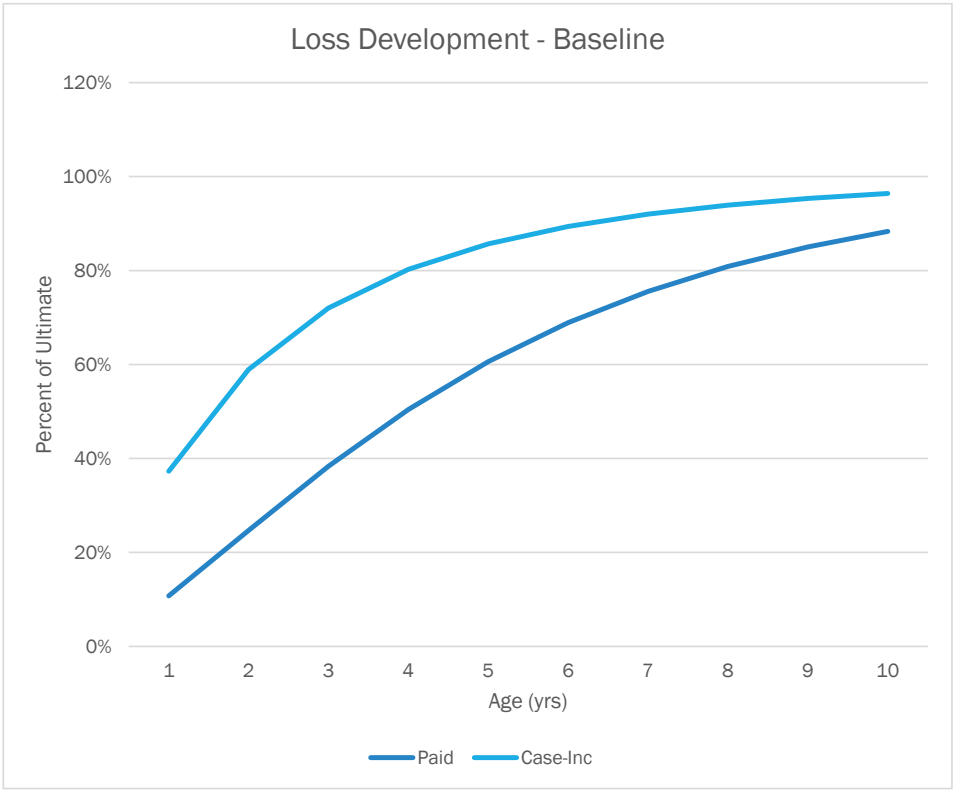
ALTERNATIVE BASELINE



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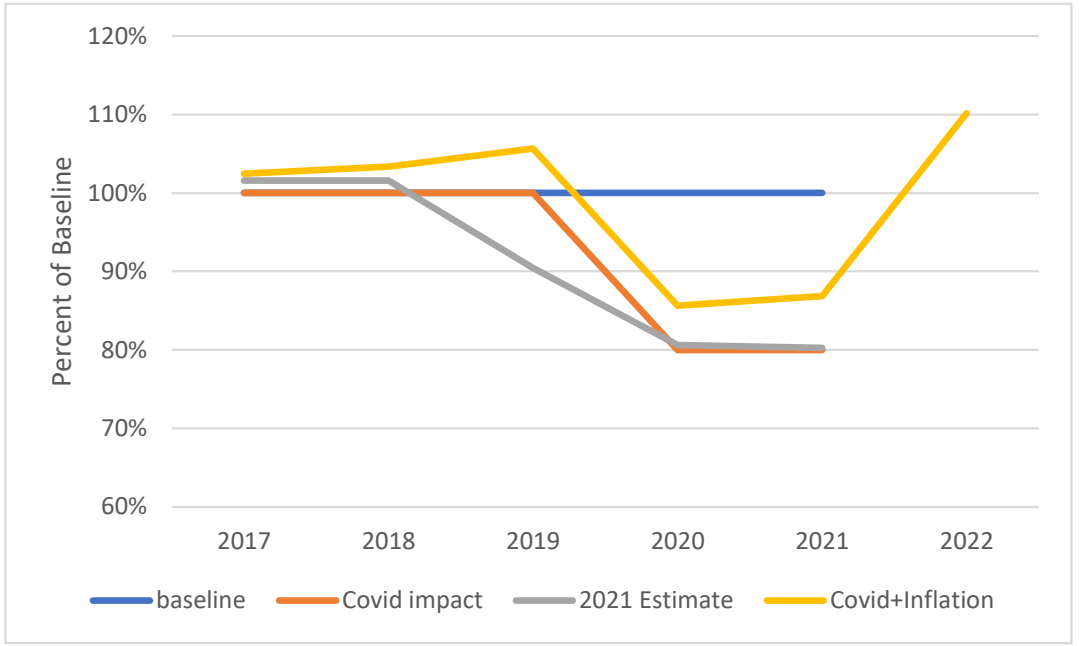

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QUALITIES OF AN IDEAL ACTUARIAL CASE RESERVE

- Case Res = E(future payments | available information), i.e. adequate
- Consistent determination over time
- Objective

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What is the ideal case reserve from a claim department's perspective?

One that optimizes the claim department's ability to perform.

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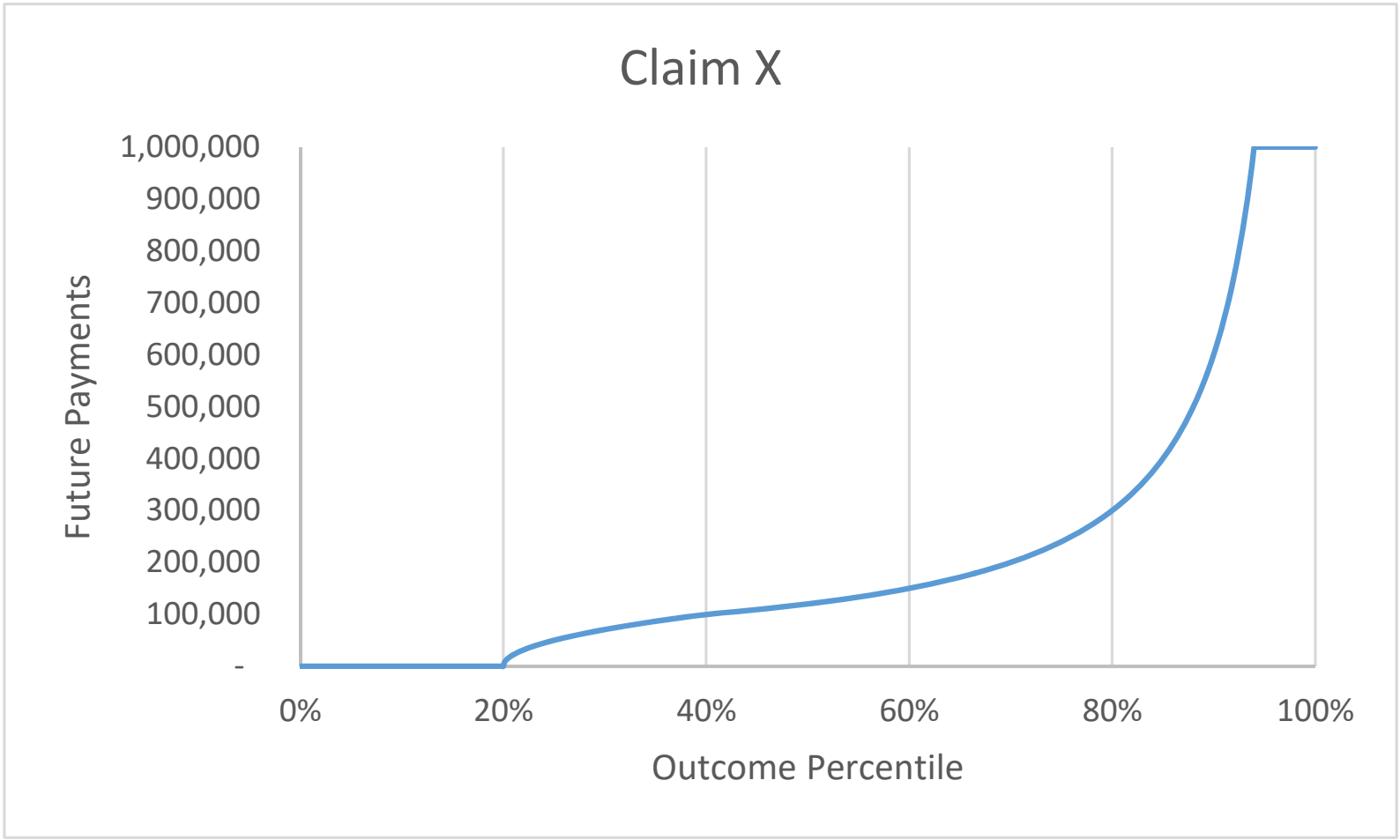
CLAIM DEPARTMENT USES OF CASE RESERVES

- Communicate their opinion
- Benchmark for negotiation
- Benchmark for performance



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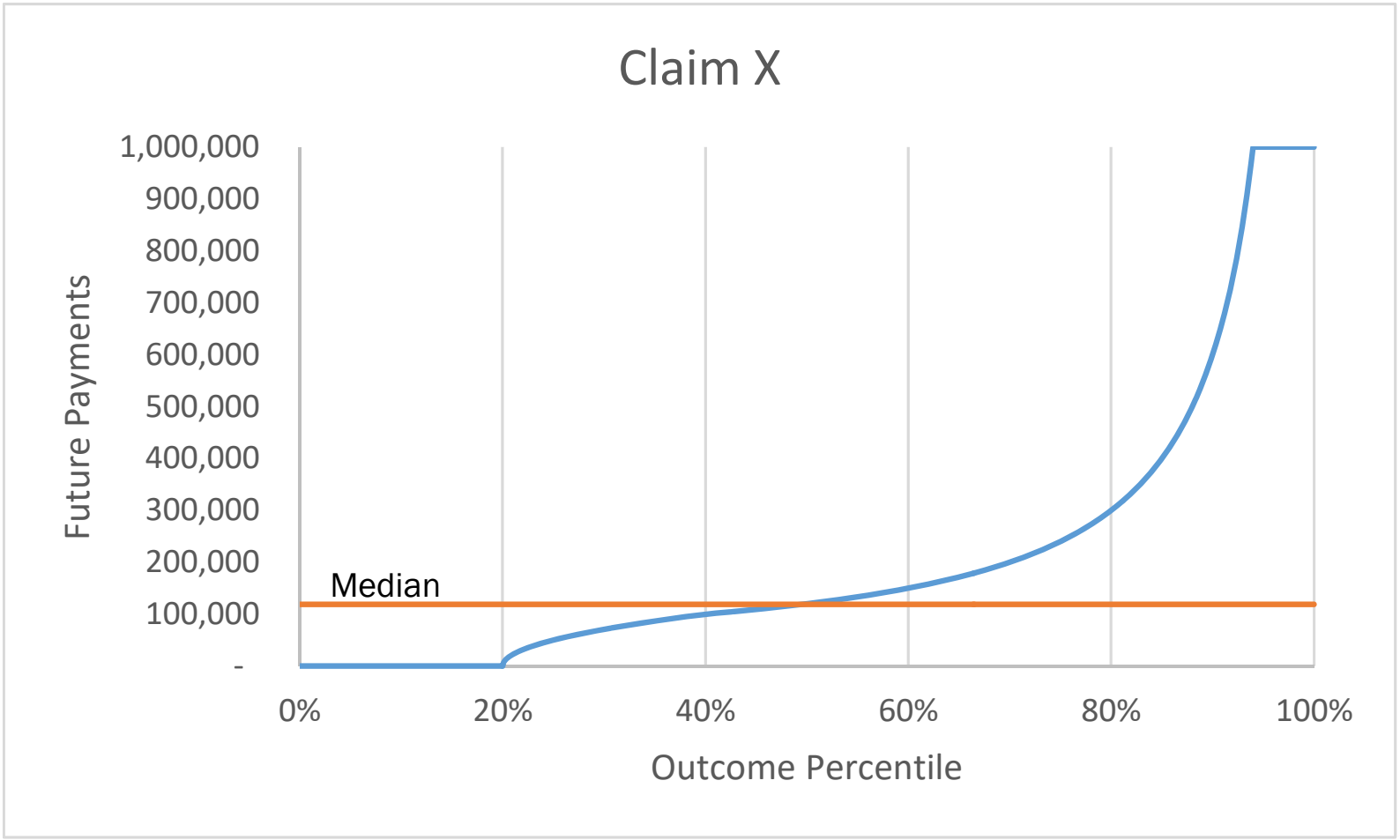

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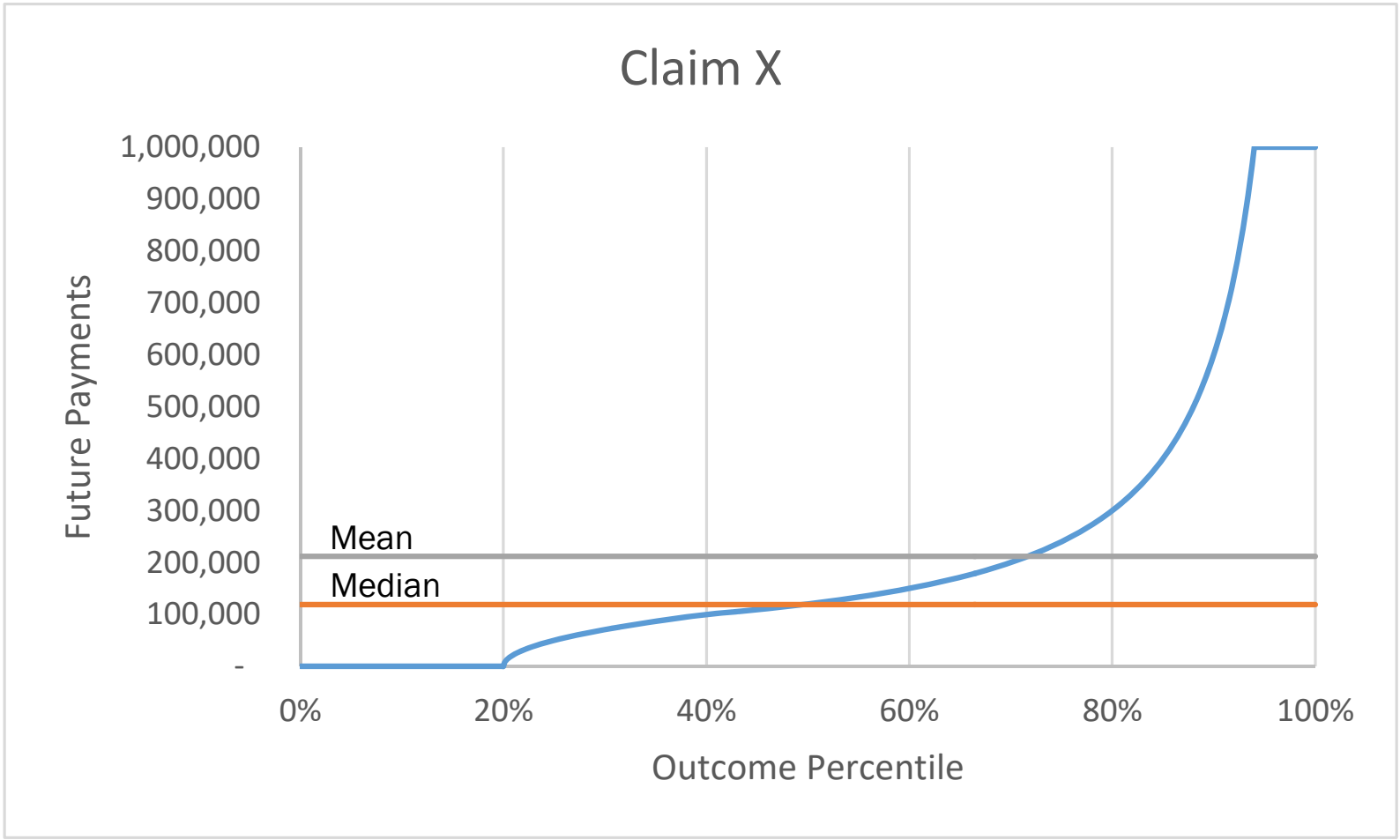

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HISTORICAL PLEA FROM ACTUARY TO CLAIM DEPARTMENT

- Don’t change things!
- Unrealistic
- Suboptimal with regard to outcomes

THE SOLUTION

- Two separate case reserve estimates
  - One controlled by the claim department for their purposes
  - One controlled by the actuarial department for their purposes
  - Comparison and discussion where appropriate

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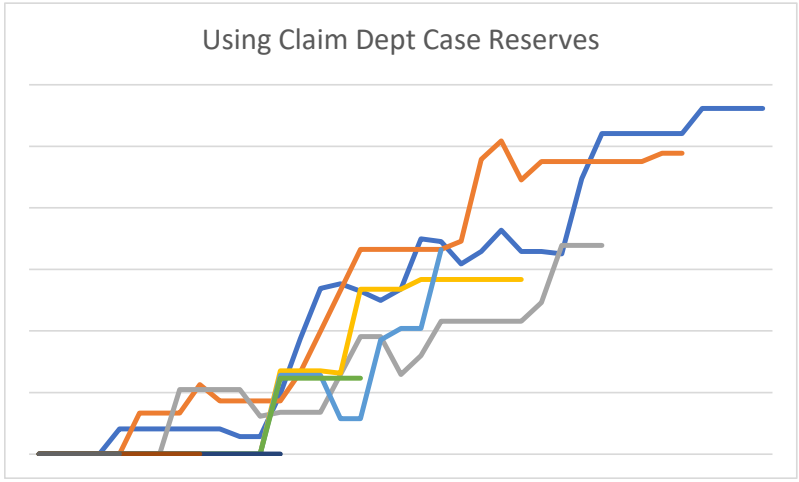
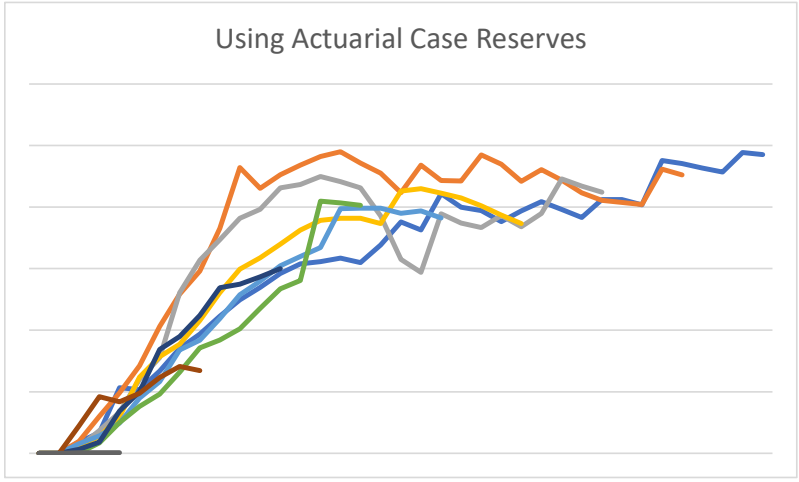
EXCESS CLAIMS





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MONITORING OF RESULTS/MODEL

- Faster recognition of expected value of claims when they are reported or when the facts change
- Since expected development at a claim level is zero, Actual vs Expected is far more powerful

USE OF ACTUARIAL CASE RESERVES
-GENERAL PROCESS

- Build an actuarial algorithm for case reserves
- Apply to every open claim at each triangle point
- Replace historical case reserves
- Organize into triangle
- Generalization of Berquist-Sherman

VARIABLES TO INCLUDE AS PREDICTORS

- Age of claim
- Payments to date
- Recent payments
- Claim variables
- Exposure variables
- Limit Remaining
- Time component?
- NOT the current case reserve

DATA TO INCLUDE

- Closed Claims
  - Advantage of being complete
  - Disadvantage of being biased toward simpler claims
  - Could use a cutoff point of where substantially ALL claims are closed, but relevance will likely suffer.
- Open Claims
  - Payments to date on these claims are known
  - There is information in the case reserves
  - Need to remove known biases

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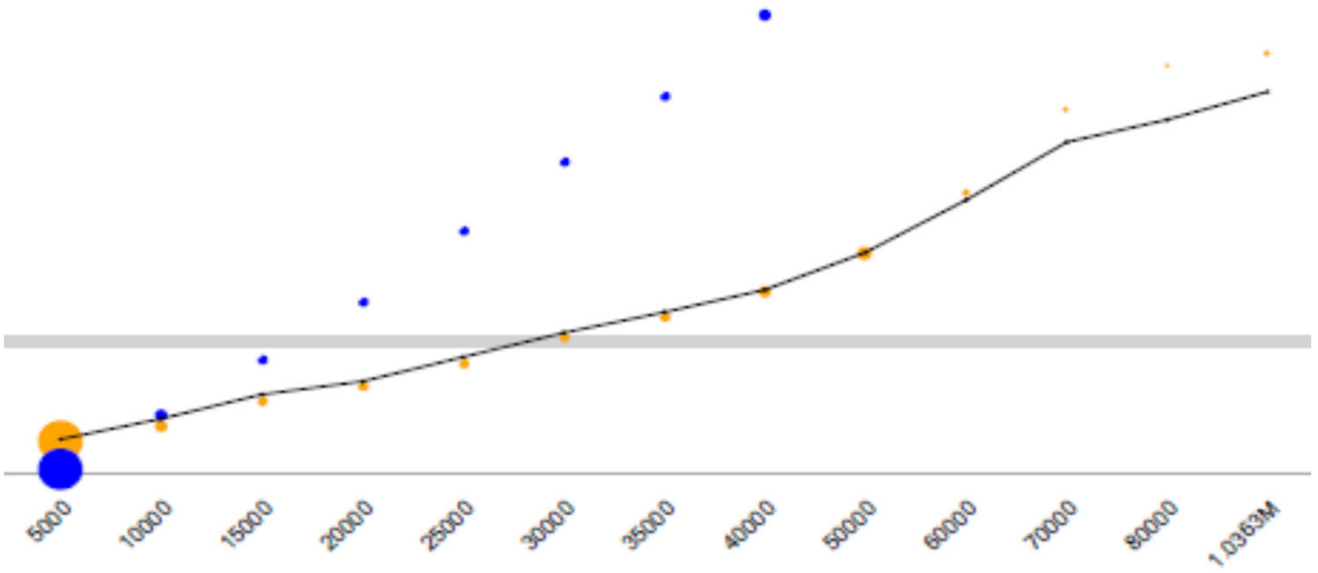
ADJUSTMENT TO CURRENT CASE

- It is likely that some known biases are already understood – general or specific
- In the specific case, individual development models may have been built to study the behavior of case reserves
- In the general case, IBNER might already be expected.
- In either case, adjustment is appropriate before building the actuarial case algorithm
- Marker-Mohl backwards-recursive approach, applied to “report-period by age” triangles is an easy starting point (develops factors that are applied to case reserves as of a certain age)

Indemnity Case Reserves Factor



MOST RECENT YEAR'S INDEMNITY PAYMENTS

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Indemnity Case Reserves Factor

CLAIM STATUS

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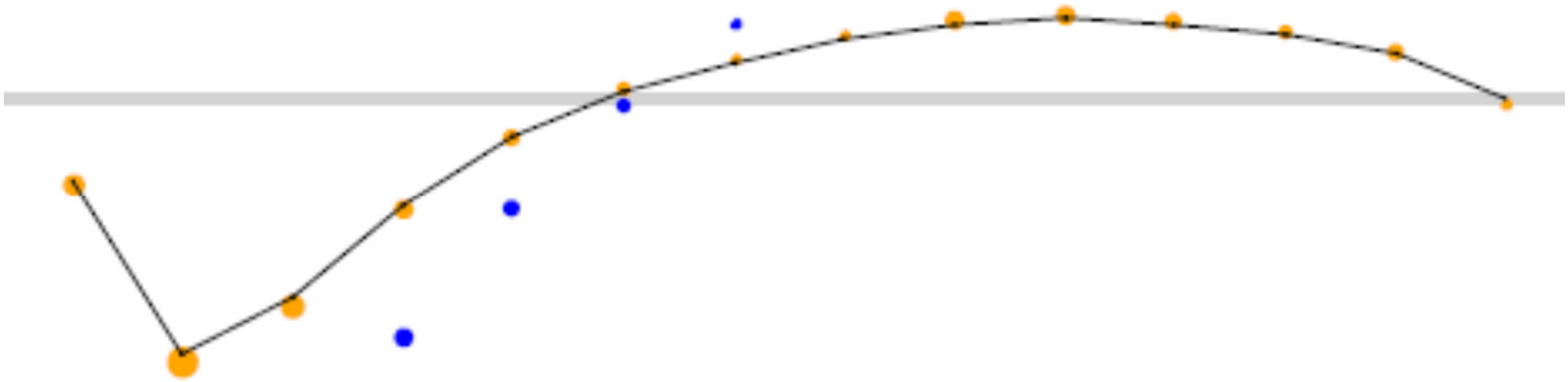
Indemnity Case Reserves Factor



YEARS SINCE INJURY

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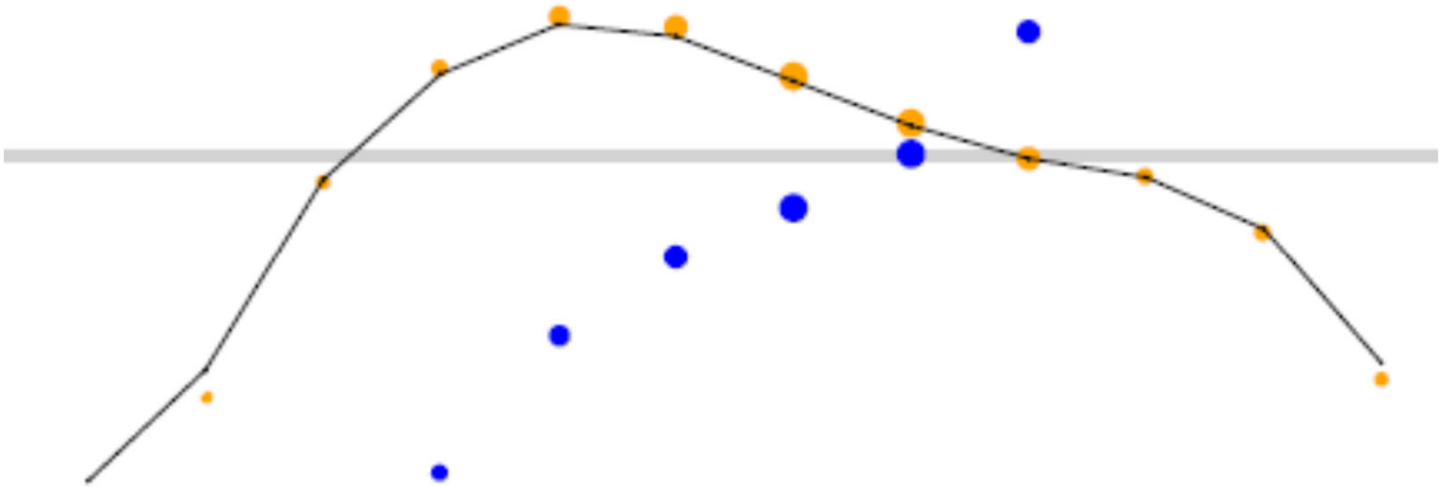
Indemnity Case Reserves Factor



YEARS SINCE BIRTH

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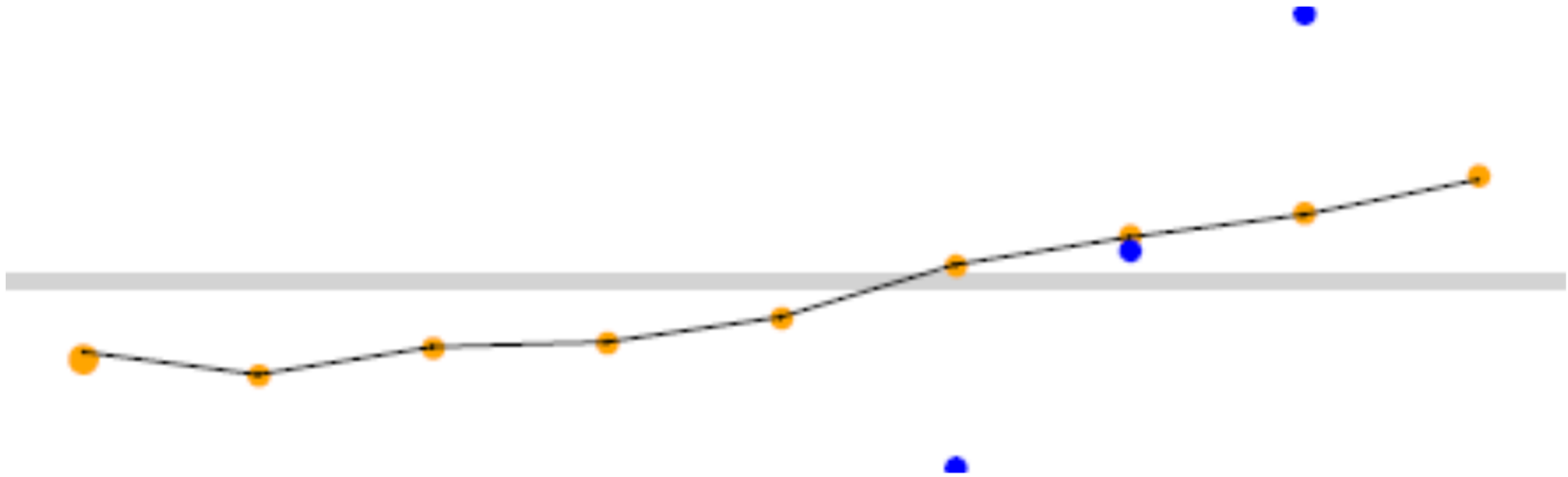
Indemnity Case Reserves Factor



MOST RECENT YEAR'S MEDICAL PAYMENTS

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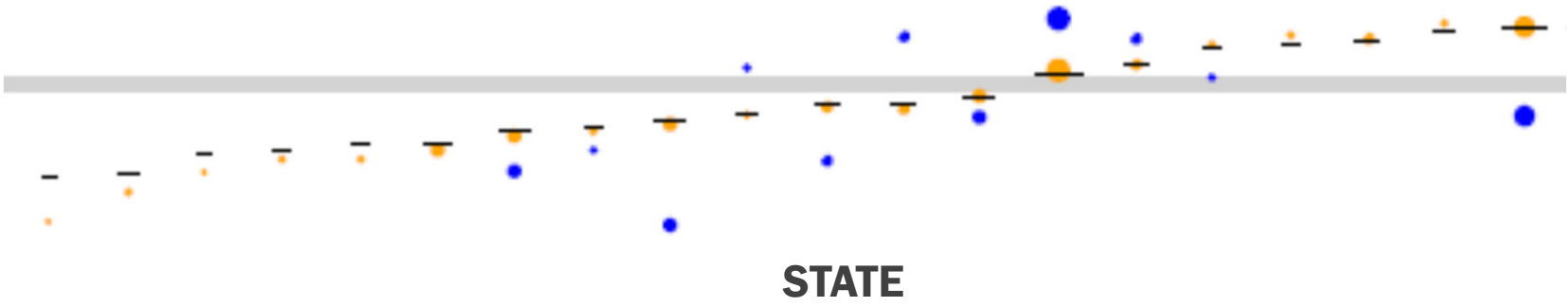
Indemnity Case Reserves Factor



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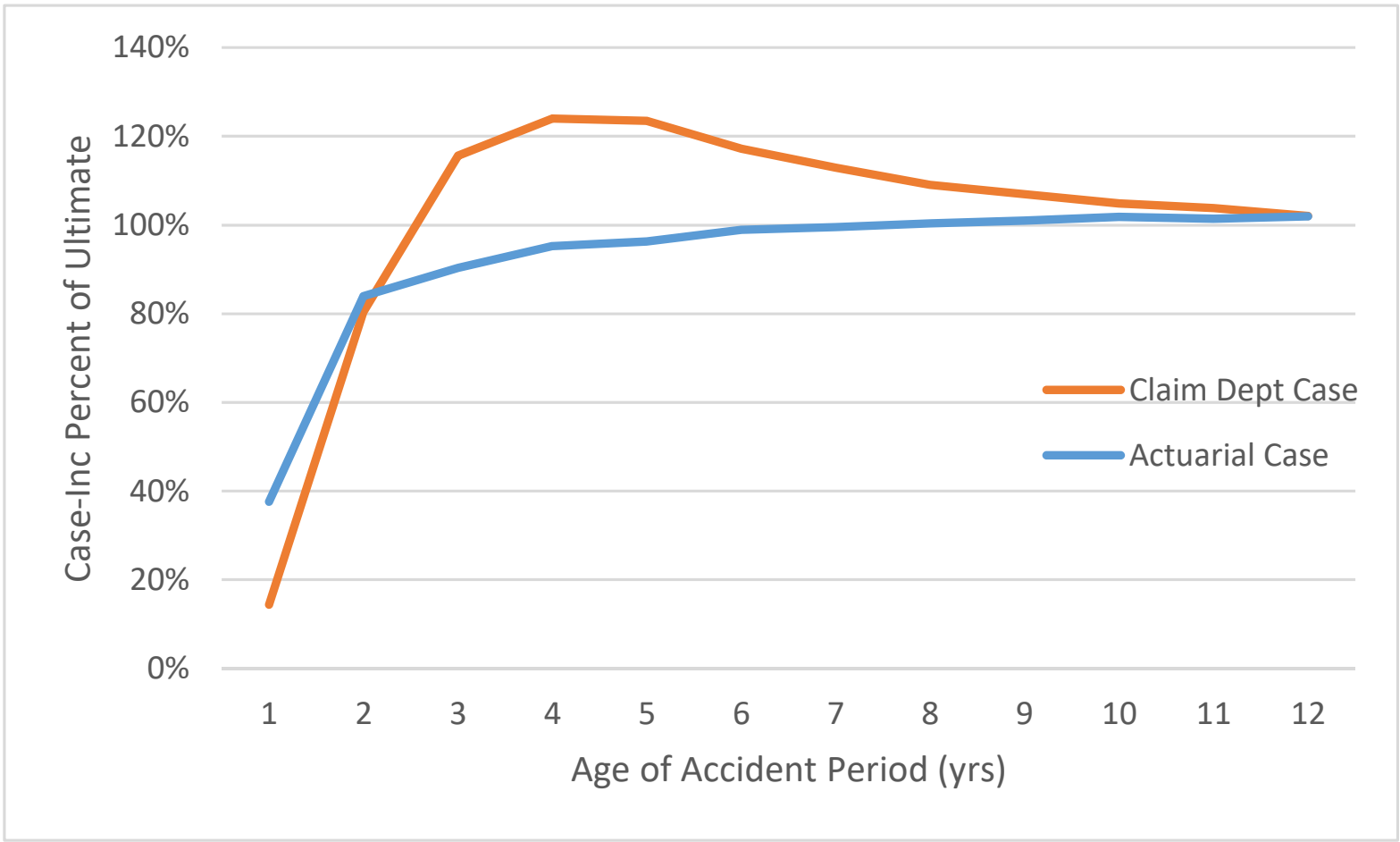

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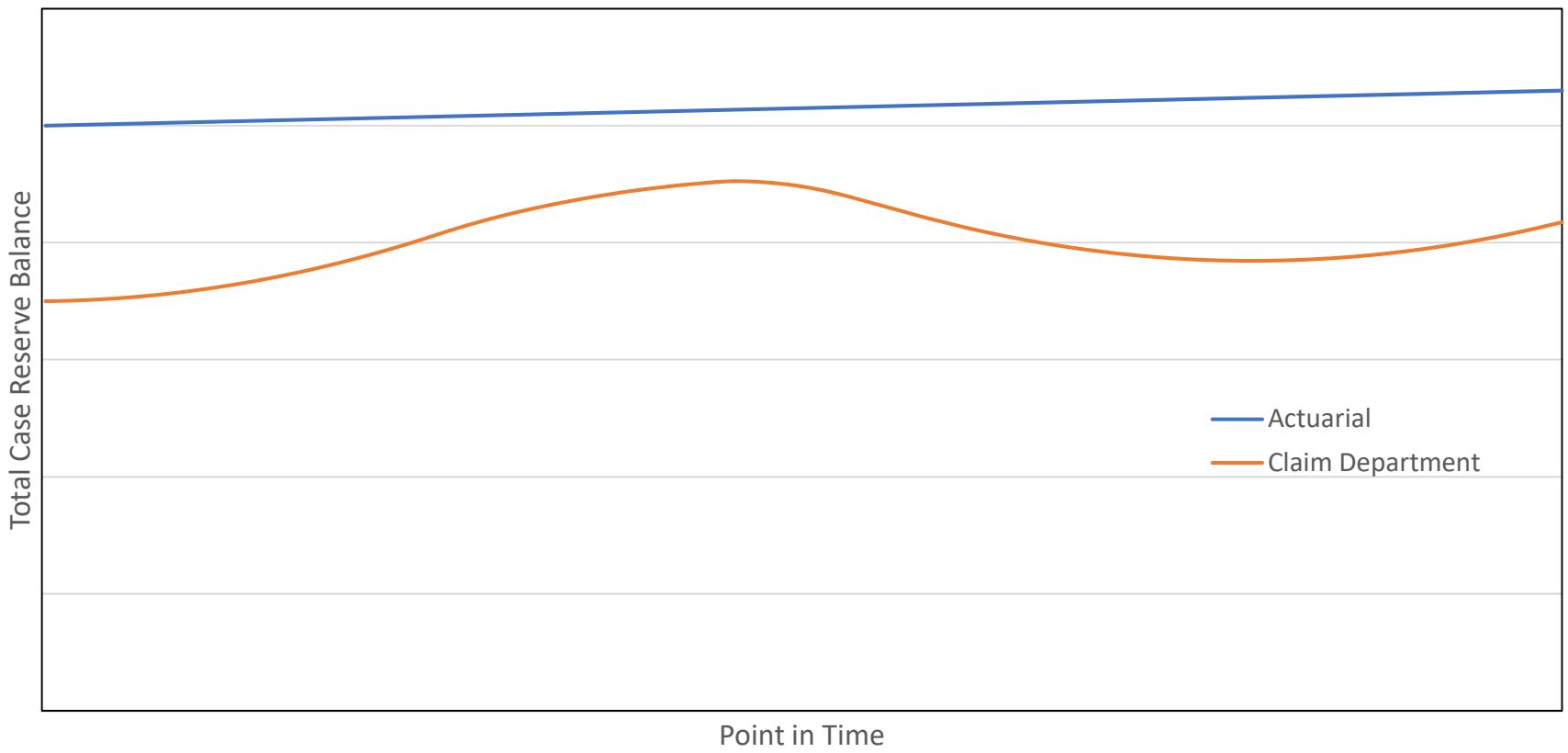
Total Case Reserve Balance
Point in Time
Actuarial
Claim Department

PRACTICAL APPLICATIONS OF ACTUARIAL CASE RESERVES

- Planning
- Reforecasting / Monitoring
- Evaluating U/W and Claims Performance
- Evaluating Impact of Initiatives

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ACR USE CASE: PLANNING

- How do we pick the right starting loss ratio?
- How much of past experience is signal vs. noise?
- How will planned mix shifts impact AY and CY loss ratios?

ACR USE CASE: EVALUATING U/W AND CLAIMS PERFORMANCE:

There are only three drivers of insurance results:

1. Risks available in the submitted book
2. Actions taken by the carrier
3. Dumb luck

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ACR USE CASE: EVALUATING U/W AND CLAIMS PERFORMANCE

Using IBNR0* and ACR, we can

- Evaluate the (changing) quality of the submitted book
- Calculate projected profit at the policy level, at inception
- Identify results that deviate from expectations, given all information available at inception and at every evaluation date thereafter

*IBNR0: The IBNR at the policy level at time=0, or inception date. Technically not IBNR, as these losses are not yet incurred. Instead, IBNR0 includes expected final loss on the full exposure yet to be earned. Equivalent to Pure Premium.

ACR USE CASE: REFORECASTING AND MONITORING

Common questions that are hard to answer:

- Is the observed frequency/severity of loss unexpected?
- Is the change in development pattern unexpected?
- What's our new estimate of annual net income, based on observed changes in mix?

ACR USE CASE: QUANTIFYING "UNDERWRITING INITIATIVES"

"We expect to see a ten-point reduction in loss ratio, because we are no longer writing stuffed animal manufacturers, and we're raising rates by 5% across the board."

- Was the targeted class really driving poor results?
- Will the mix shift result in changes to emergence that hide other problems?
- Is the rate hike driving adverse selection?

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UPDATES

- No need to go through the whole predictive modeling process each reserve analysis
- Simply re-apply the algorithm
- Revisit the algorithm less frequently or as new variables present themselves
- Not unusual to end up with different level of adequacy after adjustment, despite goal of 100%
  - With consistent application across triangle development factors should adjust

QUESTIONS?

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