Actuarial Case Reserves

NAIC Book Club

July 28, 2020

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Common (Hidden) Assumptions in Pricing

- Identically Distributed Residuals (GLM)
- Identical Loss Development

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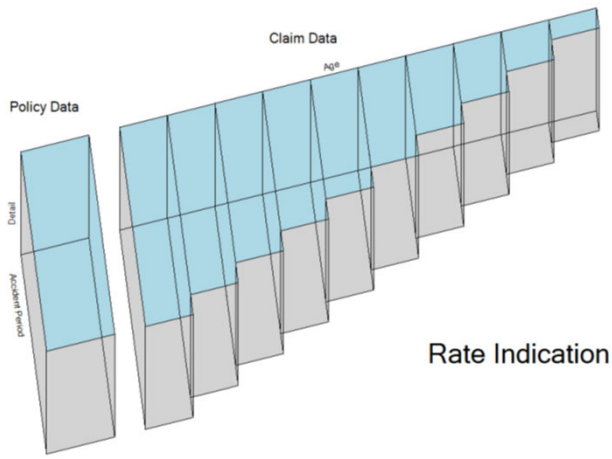

Rate Indication

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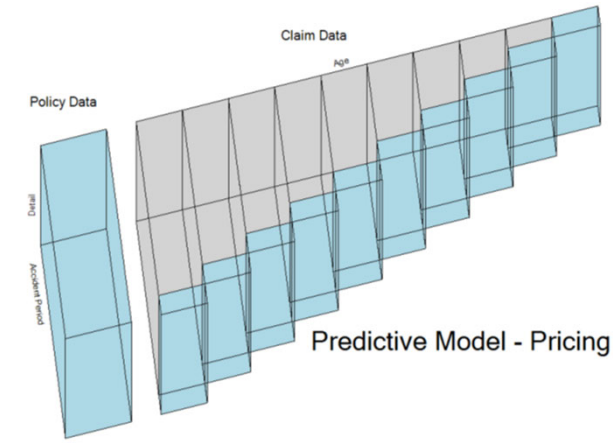

Predictive Model - Pricing

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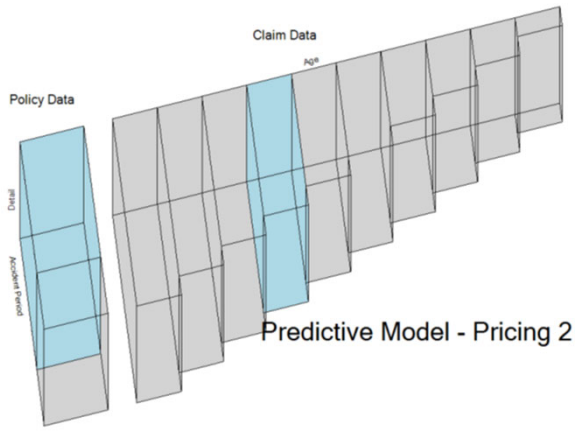

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The Mix Problem… An Example

- Two classes of business
  - Class 1.
    - Faster developing
    - Lower ultimate loss ratio (60%)
  - Class 2
    - Slower developing
    - Higher ultimate loss ratio (90%)
- Class 2 has always been there, but only recently started growing significantly

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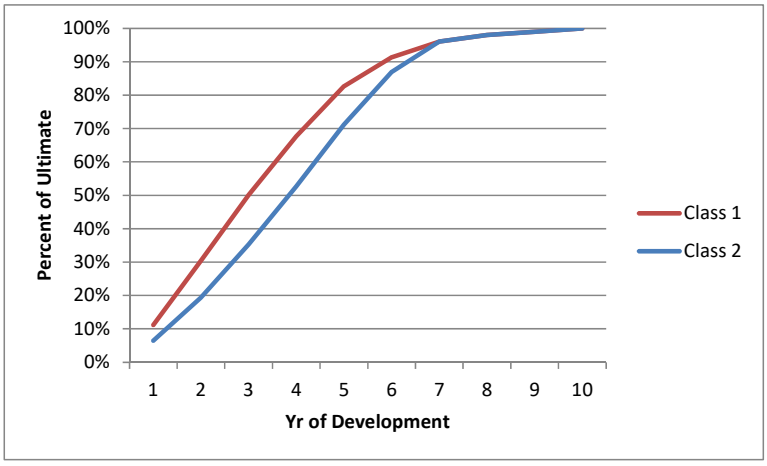
Different Development



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The Triangle

Year	Premium	Loss as of: Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10
2006	105	7.53	20.40	32.67	43.49	52.72	58.08	61.20	62.36	63.28	64.50
2007	105	8.06	20.72	32.65	43.52	54.68	60.16	63.87	64.15	63.71	
2008	105	6.48	19.23	30.80	42.47	52.70	58.32	60.99	62.91		
2009	105	7.21	19.21	30.81	42.44	52.93	59.64	61.78			
2010	105	7.43	21.88	34.36	43.89	53.76	59.81				
2011	105	6.76	19.19	33.07	43.90	54.42					
2012	105	7.11	18.49	30.01	40.40						
2013	120	8.44	22.18	37.25							
2014	140	8.65	25.87								
2015	160	9.81									

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Development Factors

2006	2.709	1.602	1.331	1.212	1.102	1.054	1.019	1.015	1.019
2007	2.571	1.576	1.333	1.256	1.100	1.062	1.005	0.993	
2008	2.967	1.602	1.379	1.241	1.107	1.046	1.031		
2009	2.666	1.604	1.378	1.247	1.127	1.036			
2010	2.944	1.570	1.277	1.225	1.113				
2011	2.840	1.724	1.327	1.239					
2012	2.602	1.622	1.346						
2013	2.630	1.679							
2014	2.990								
Last 3	2.740	1.675	1.317	1.237	1.115	1.048	1.018	1.004	1.019
Cumulative	9.108	3.324	1.984	1.506	1.218	1.092	1.042	1.023	1.019

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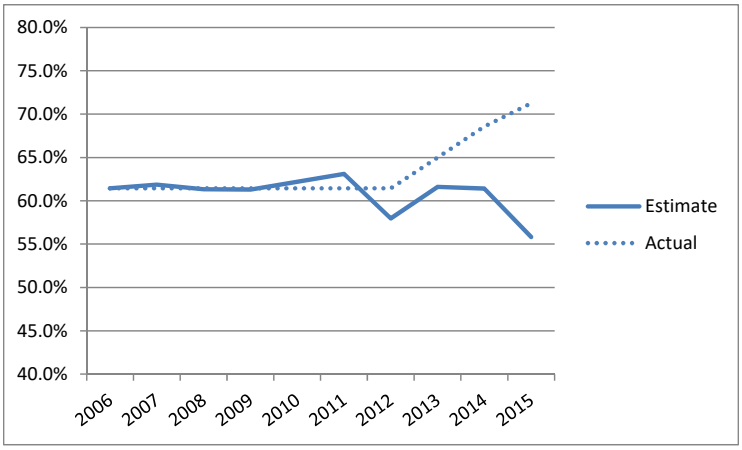
True Loss Ratio vs Estimate



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Potential Differences

- Industry classification
- Geography
- Deductible/Limit Profile
- Size of account
- Type of Claims
- Etc.

Dealing with development differences

- Separate triangles and dev factors for every important variable
  - Not practical
- Individual claim development models
- Actuarial case reserves

Some actuarial uses of case reserves

- Development in loss triangles
- Allocation of total reserve estimate
- Input for pricing analysis
  - Aggregate (rate indication, relativities)
  - Detailed (predictive modeling)

Qualities of an Ideal Actuarial Case Reserve

- Stability (constant adequacy over time)

Impact of change in mix on stability

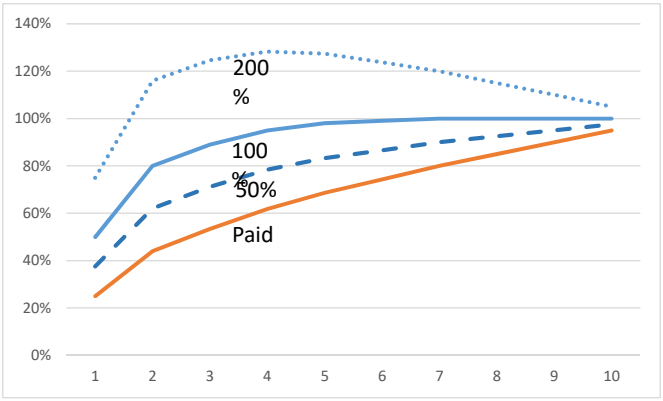
- Rarely true that types of claims are equally adequate. Differences usually exist by deductible, geography, industry classification, size of account, cause of loss, injury type, etc..
- Change in Mix => Change in Adequacy.
- It is rarely true that there is NO change in mix is occurring along any particular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

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?

Impact of claim payment speed up



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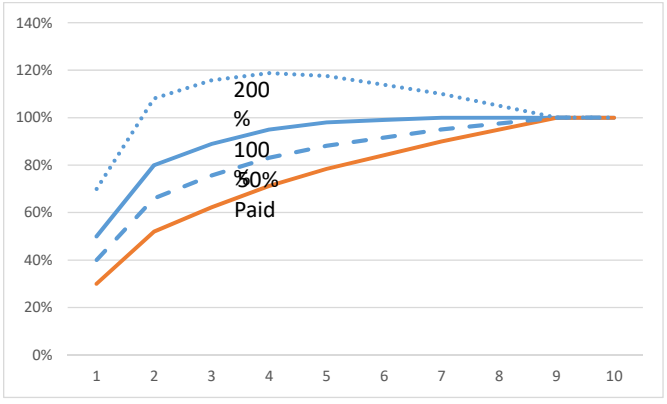
Impact of speed up



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Qualities of an Ideal Actuarial Case Reserve

- 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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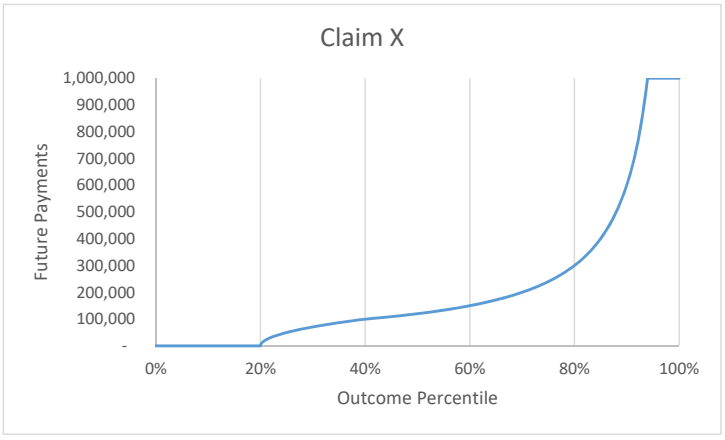

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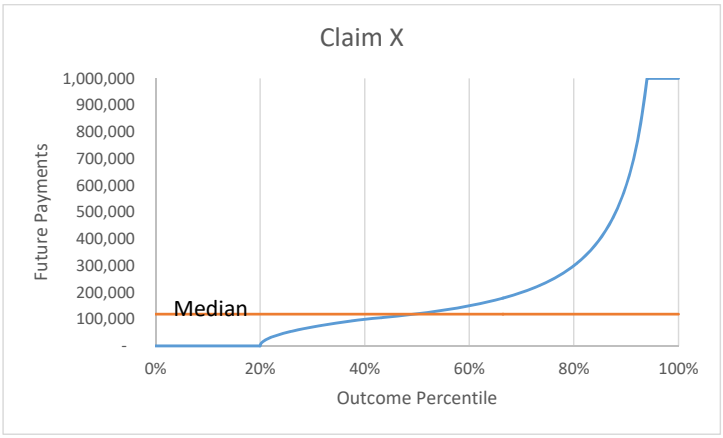

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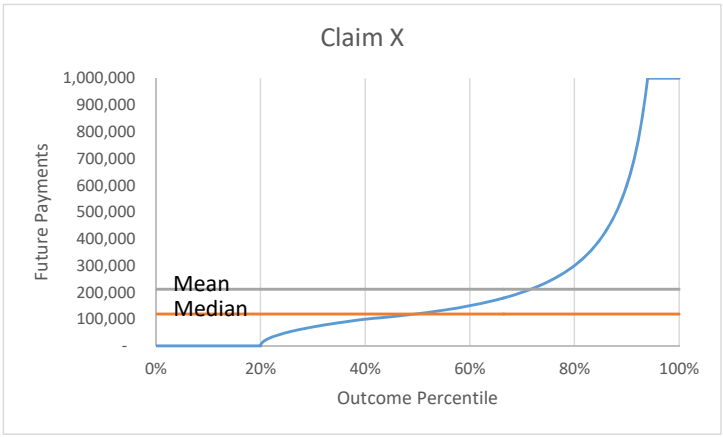

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Historical plea from actuary to claim department

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

Some Other Observations about Claim Dept Case Reserves

- Every company is different
- Changes over time
- Aggregating across companies does not help

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

Developing a case reserve algorithm

- Based on separate predictive model
- Not trivial, because target is ultimate loss
  - Known for old claims and simple claims
  - Not known for new and complex complains
  - Can't just use closed claims
- Can build a claim life cycle model
- Can remove aggregate biases first
- Can model and iterate

Variables to include

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

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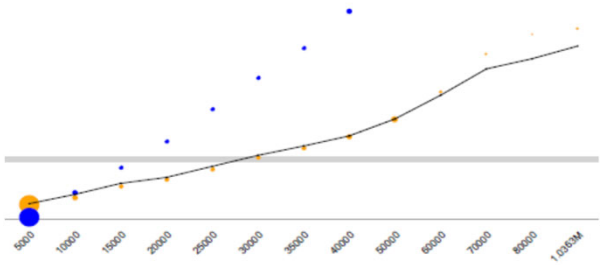
Indemnity Case Reserves Factor



Most recent year's indemnity payments

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Indemnity Case Reserves Factor

Claim Status

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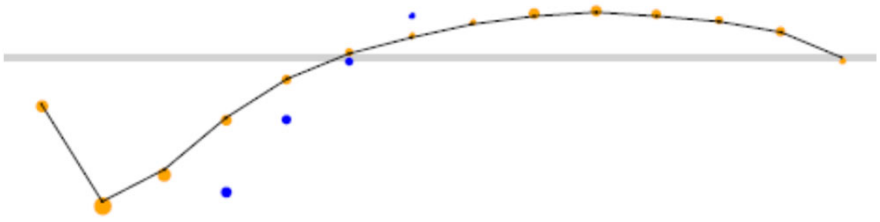
Indemnity Case Reserves Factor



Years since injury

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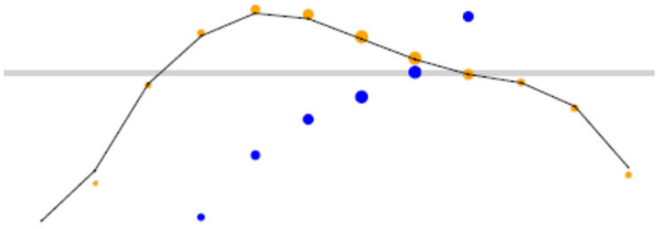
Indemnity Case Reserves Factor



Years since birth

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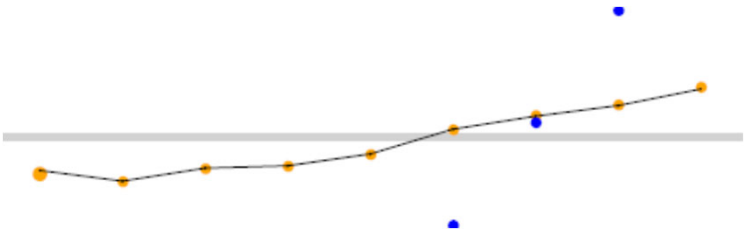
Indemnity Case Reserves Factor



Most recent year's medical payments

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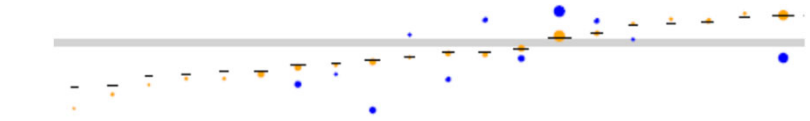

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Validation

- Put back into triangle(s)
- Should have relatively flat development (across any cut of the data)
- Still may need development factors
  - Remaining imperfections
  - True late reporting
  - Changing environment

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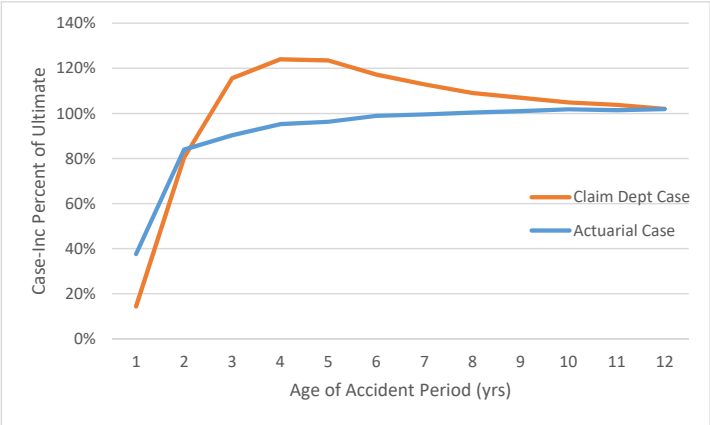

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Impact on relativities

- The impact to pricing can be significant
- Not uncommon to see more than 10% swing in relativity
- Can be considerably larger

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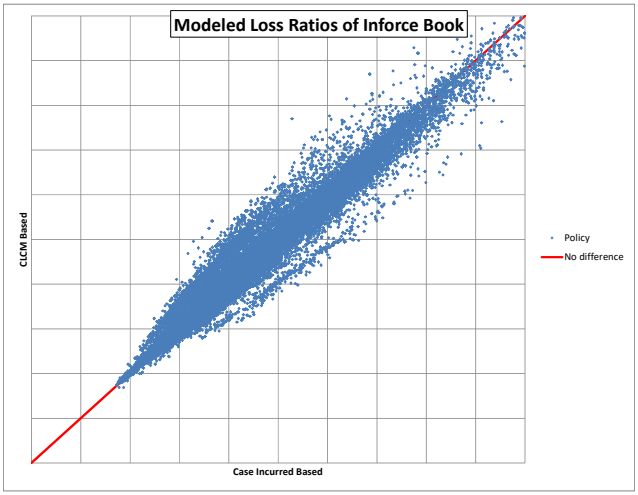
Example 1



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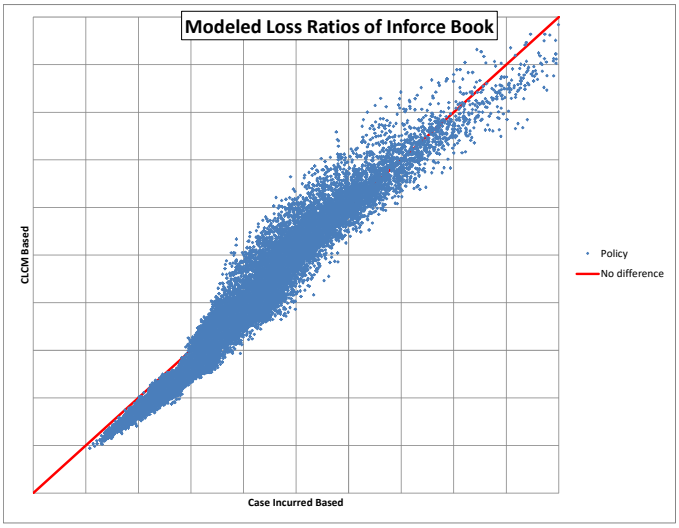
Example 2



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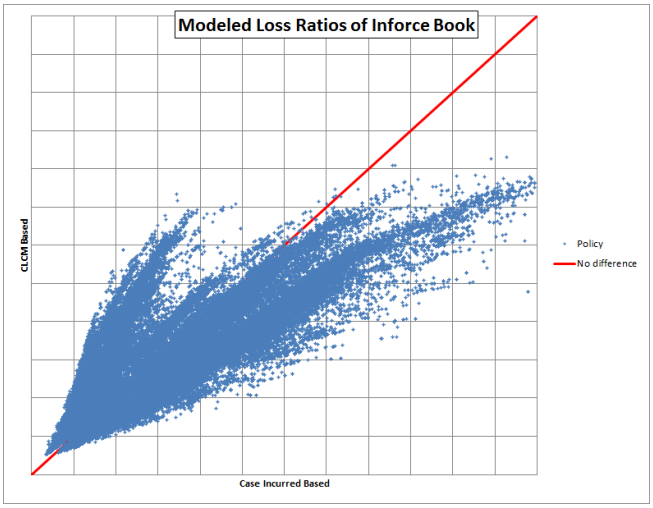
Example 3



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Possible Considerations for Regulators

- Understand the potential <u>impact</u> of differences in loss development across a book of business
  - On overall level
  - On relativity between segments
  - <u>Paid</u> loss development factors can be a good guide
- Ask what assumptions are being made about loss development differences across the book and whether those assumptions have been tested.
- Ask about the impact of changes in case reserving practices on the calculations (when traditional claim department case reserves are being relied on)
- As to see evidence of consistency of case development for actuarial purposes

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Summary

- Significant economic and analytical advantages to using separate case reserves for the actuary and for the claim department
- Building and actuarial case algorithm, using predictive modeling, claim and exposure characteristics at the claim level, and targeting 100% adequacy, often improves the quality of downstream estimates – for reserving and pricing.
- Regulators should be aware of this approach as well as the potential distortions caused by using claim department case reserves.

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