

Looking Back to See Ahead: Retrospective Testing of Loss Reserves

Prepared for: Casualty Loss Reserve Seminar
Denver, CO

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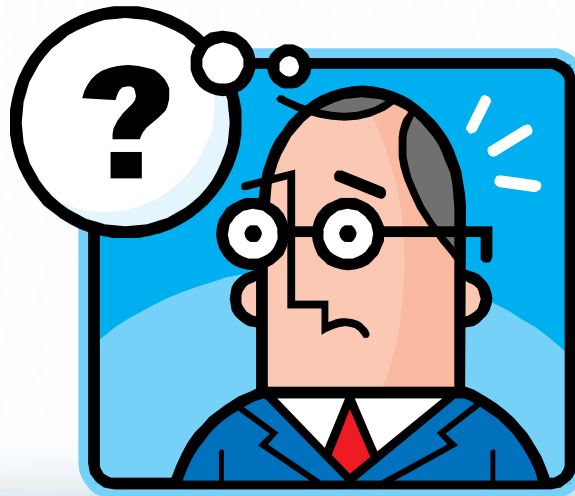
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So Many Methods, So Little Time

**Paid Chain Ladder,
Bornhuetter-Ferguson,
Backwards Recursive,
Munich Chain Ladder...**

**Claims Closure,
Hindsight Outstanding,
Frequency Severity,
Benktander...**



Overview

- Scope of Review
- The Methods
- The Metric
- Results
 - Development Age
 - Line of Business
 - Company Size
- Correlation
- Conclusions

SCOPE OF REVIEW

Scope of Review

- 3,110 Companies
- 16 Lines of Business
- 14 Evaluations (Excluding 2010)
- 30 Methods

- Hindsight Indications
 - 20.9 Million In Theory
 - 4.9 Million In Fact

THE METHODS

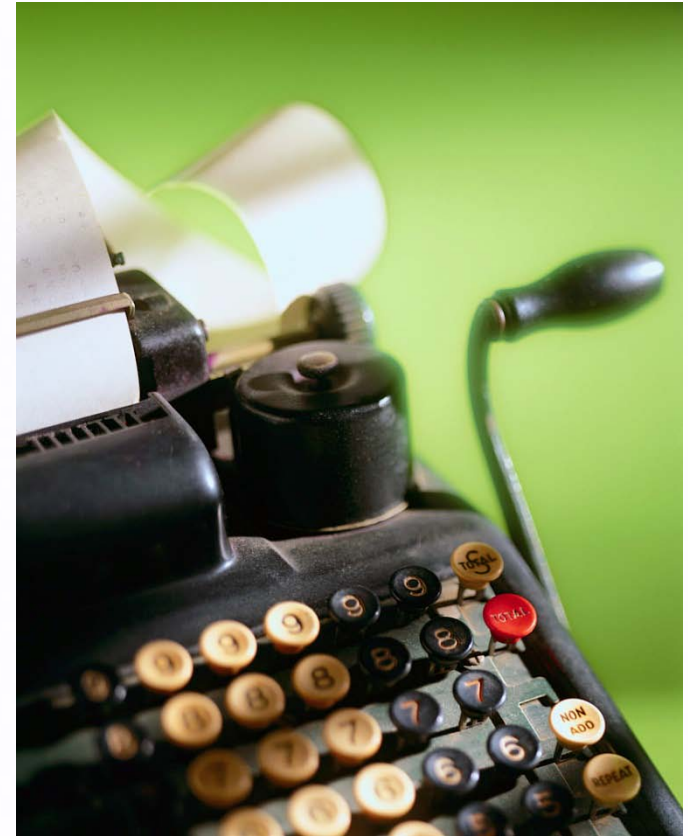
Methods – Chain Ladder

- Standard Chain Ladder
 - Paid
 - Incurred
 - Case Reserve
- Berquist-Sherman (Case Adjustment)
- Munich Chain Ladder
 - Paid
 - Incurred



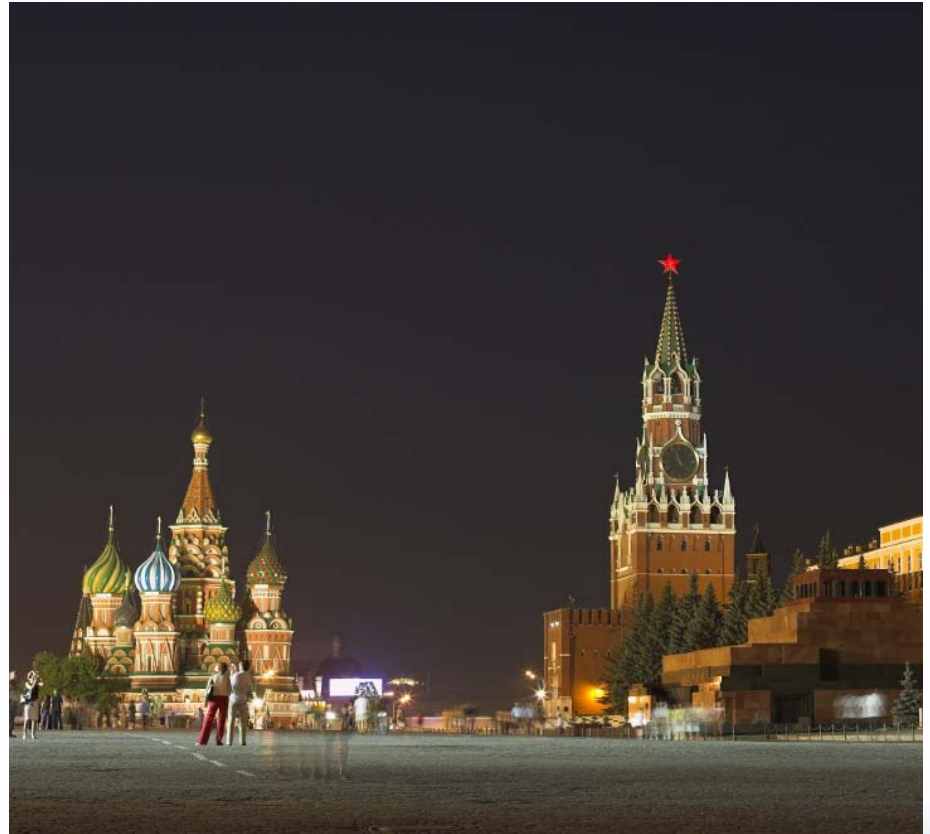
Methods – Incremental

- Incremental Additive
 - Paid
 - Incurred
 - (Normalized using net earned premium)
- Incremental Multiplicative
 - Paid (paid on prior paid)
 - Incurred (incurred on prior incurred)
- Backward Recursive
 - Paid on prior case / case on prior case



Methods – Least Squares

- Brosius
 - Paid
 - Incurred
- Weighted Brosius
 - Paid
 - Incurred



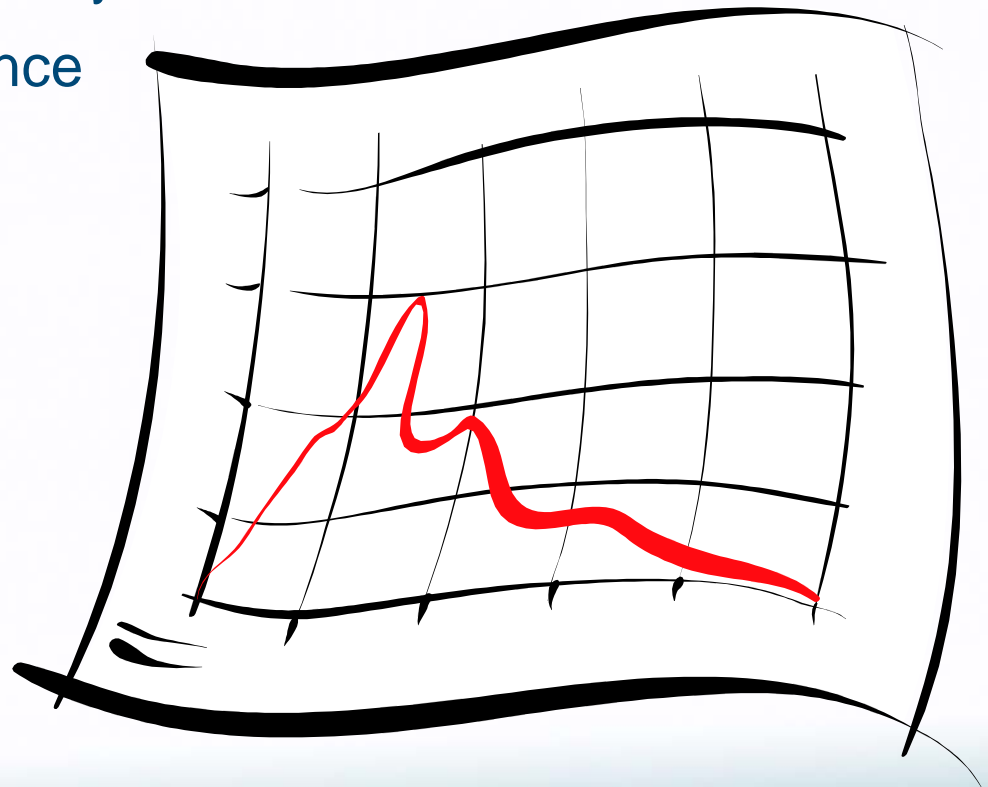
Methods – Count-Based

- Frequency / Severity
- Hindsight Outstanding – Unpaid
 - Average unpaid loss per yet to close claim
- Hindsight Outstanding – IBNR
 - Average IBNR loss per yet to close claim
- Claims Closure
 - Projection of claims to close by development period
 - Paid loss per yet-to-close claim



Methods – Loss Ratio

- Industry-Based
 - AM Best projections of accident year loss ratios
- Based on Company Experience
 - All prior years
 - Three prior years



Methods – Composite

- Bornhuetter-Ferguson
 - Industry loss ratio
 - Paid
 - Incurred
 - Method-based prior years' loss ratio
 - Paid
 - Incurred
- Benktander
 - Paid
 - Incurred
- Cape Cod
 - Paid
 - Incurred



THE METRIC

The Metric: “Method Skill”

- $\text{Error} = \text{Indicated Unpaid Ratio to Premium} - \text{Hindsight (HS) Unpaid Ratio to Premium}$
- $\text{Anomaly} = \text{Hindsight Unpaid Ratio to Premium} - \text{Wtd Avg HS Unpaid Ratio to Premium}$
- Weighted average is across accident/report years
- Observations:
 - Anomaly is a property of the data
 - Error is a property of the method

Method Skill

- $\text{Skill} = 1 - \frac{\text{Mean Squared Error}}{\text{Mean Squared Anomaly}}$
- Mean is measured across accident/report years
- Observations:
 - Maximum Skill = 1
 - No minimum
 - It's all relative

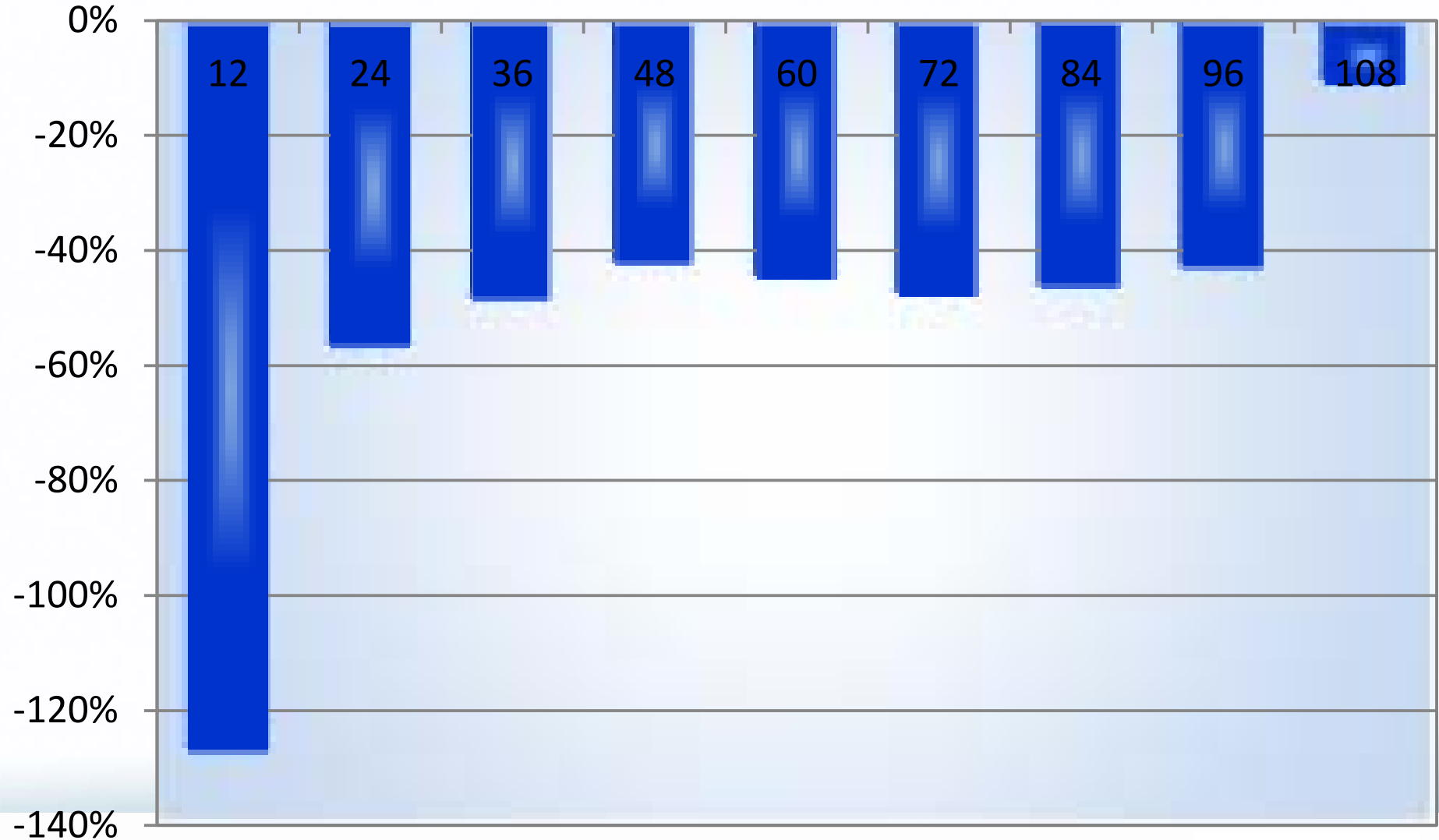
Skill – Advantages and Disadvantages

- Advantages
 - Provides a single number
 - Allows for normalization across different insurers
 - Calculation has a “credibility” adjustment for % paid
- Disadvantages
 - Does not address bias
 - What does skill mean in \$?



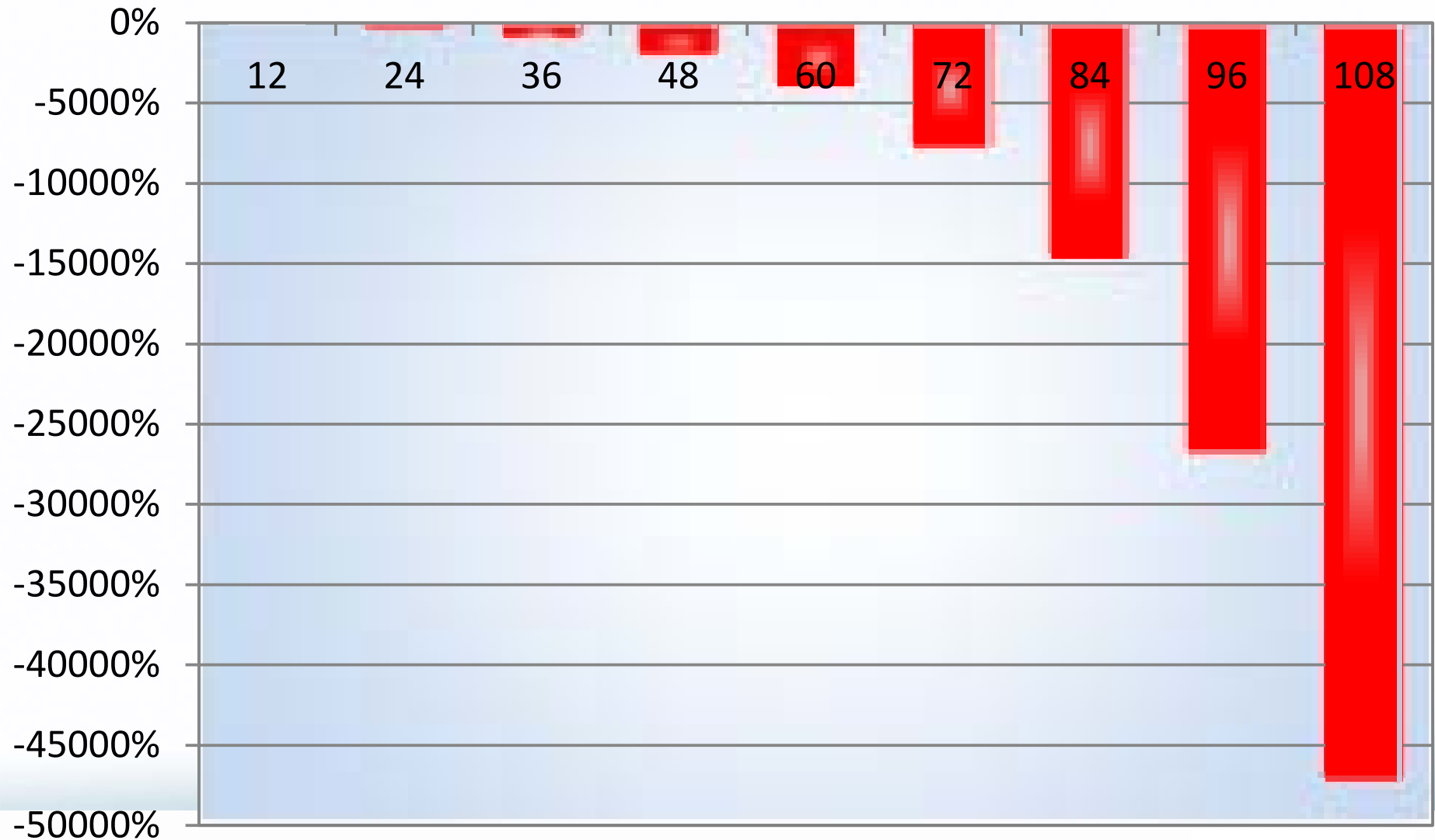
Incurred Chain Ladder Method

Median Skill Across All Lines of Business



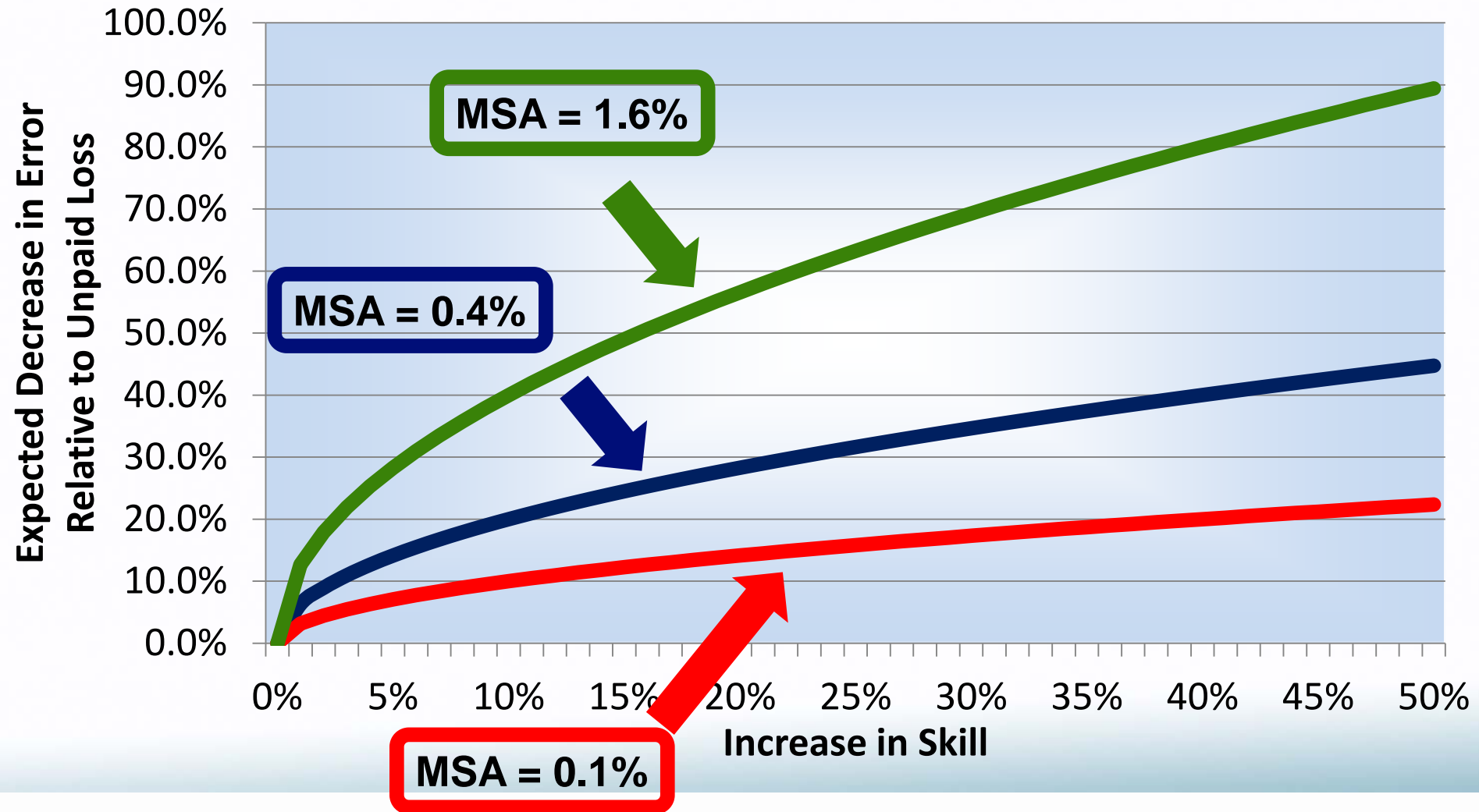
Industry Loss Ratio Method

Median Skill Across All Lines of Business



How Significant Is An Increase in Skill?

Example: Hindsight Unpaid Ratio of 10%



THE RESULTS

Results

- Development Age
 - Months of Development 12 through 108

- Line of Business
 - All Schedule P lines

- Company Size
 - Small (\$4.2M avg 2010 net annual premium)
 - Medium (\$17.5M avg premium)
 - Large (\$350M avg premium)

Best Performers

Mature Evaluations

1. Hindsight IBNR
2. Backward Recursive
3. Incremental Additive – Incurred
4. Bornhuetter-Ferguson – Incurred (Industry Loss Ratio)
5. Case Reserve Chain Ladder

Best Performers

Early Evaluations

1. Bornhuetter-Ferguson – Incurred (Industry Loss Ratio)
2. Benktander – Incurred
3. Incremental Additive – Incurred
4. Cape Cod – Incurred
5. Bornhuetter-Ferguson – Incurred (Prior Years' Loss Ratio)

Worst Performers

Mature Evaluations

- 30. Frequency / Severity
- 27. Loss Ratio (All Three Versions)
- 25. Weighted Brosius – Paid & Incurred
- 23. Brosius – Paid & Incurred
- 22. Incremental Multiplicative – Paid

Worst Performers

Early Evaluations

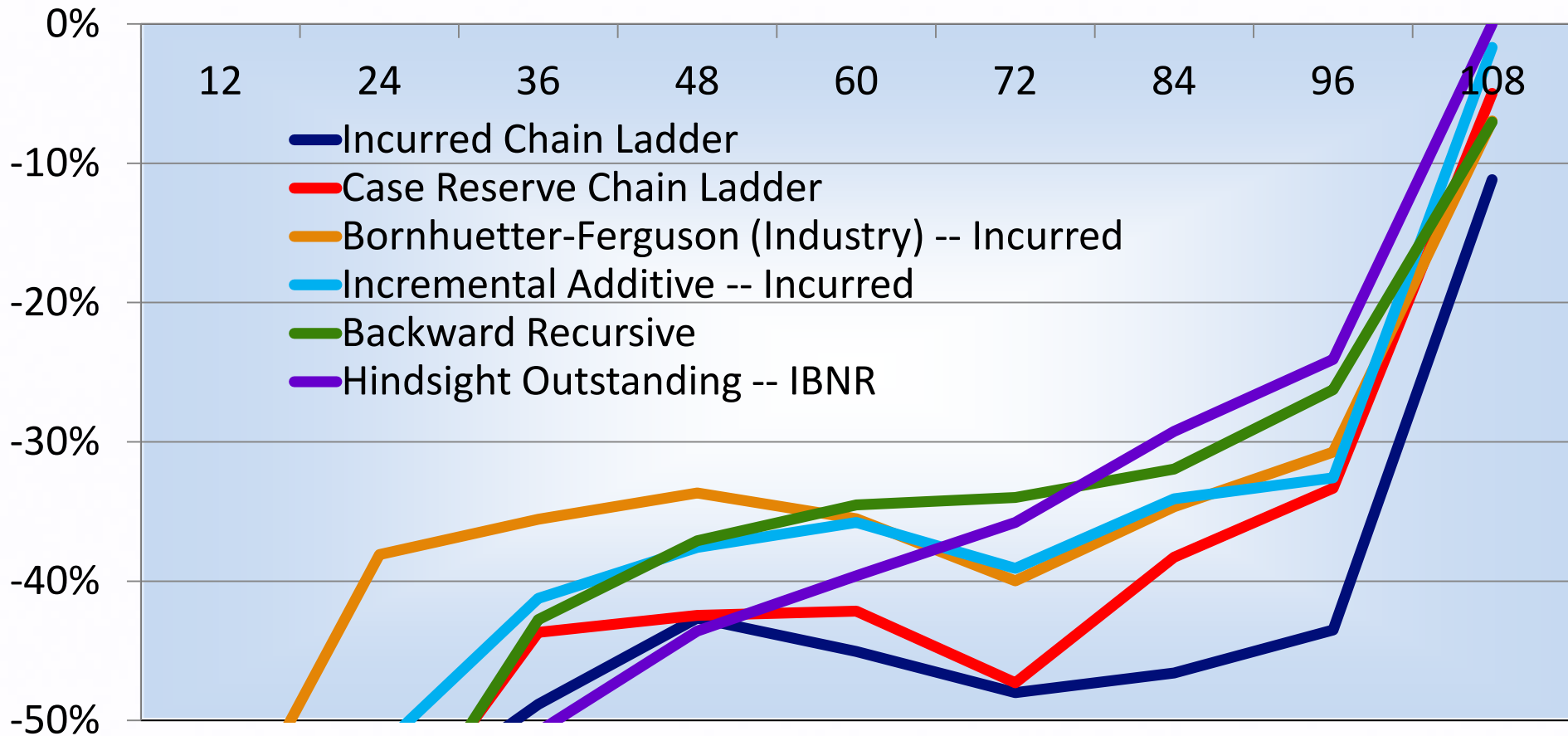
- 30. Frequency / Severity
- 27. Loss Ratio (All Three Versions)
- 25. Weighted Brosius – Paid & Incurred
- 24. Claims Closure
- 23. Incremental Multiplicative – Paid

Observations on the Best Performers

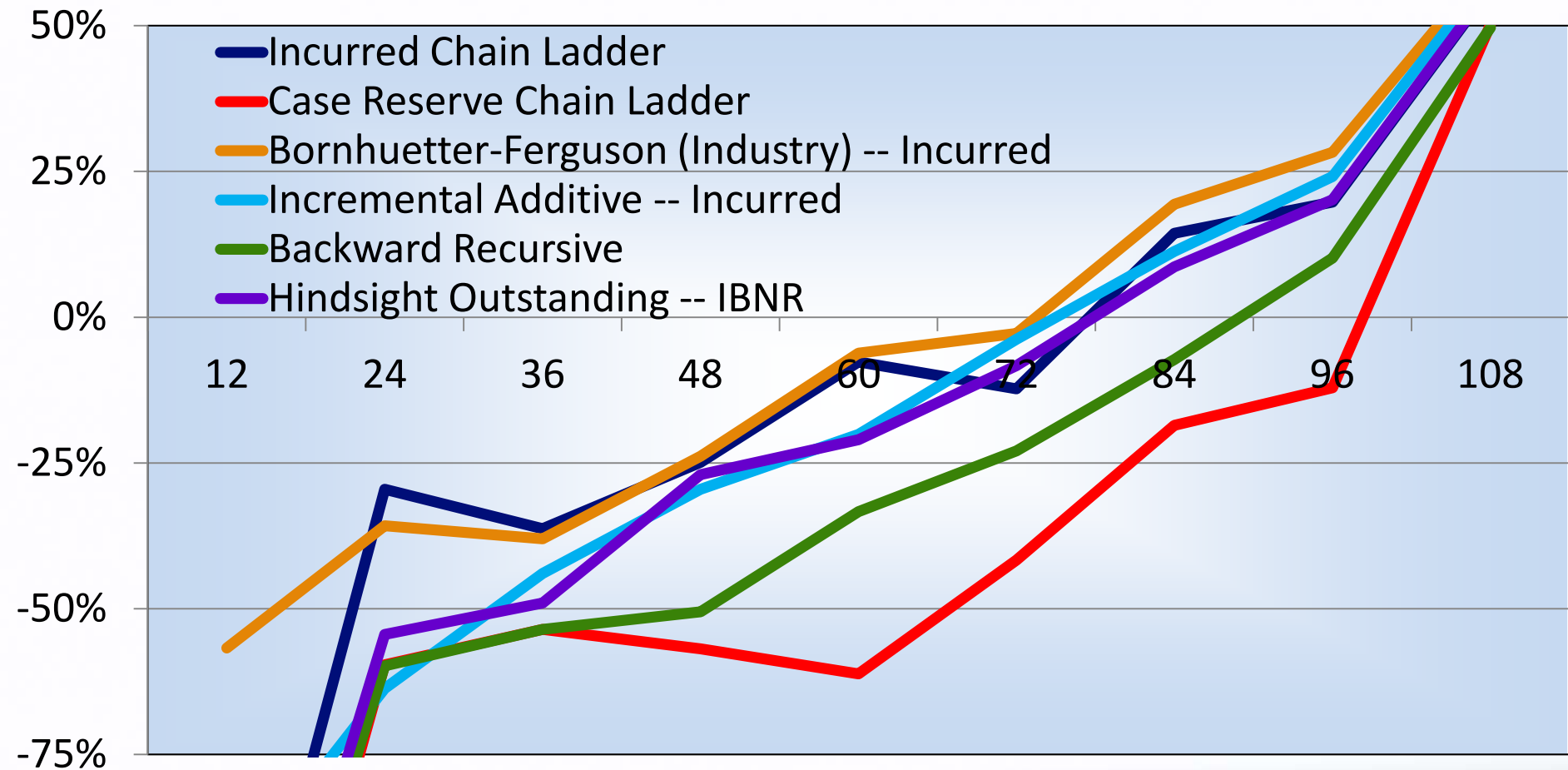
- Rely at least in part on case reserves
- Paid does not directly impact unpaid
 - (Small impact in Benktander and Cape Cod)
- Only one in common use
 - Bornhuetter-Ferguson



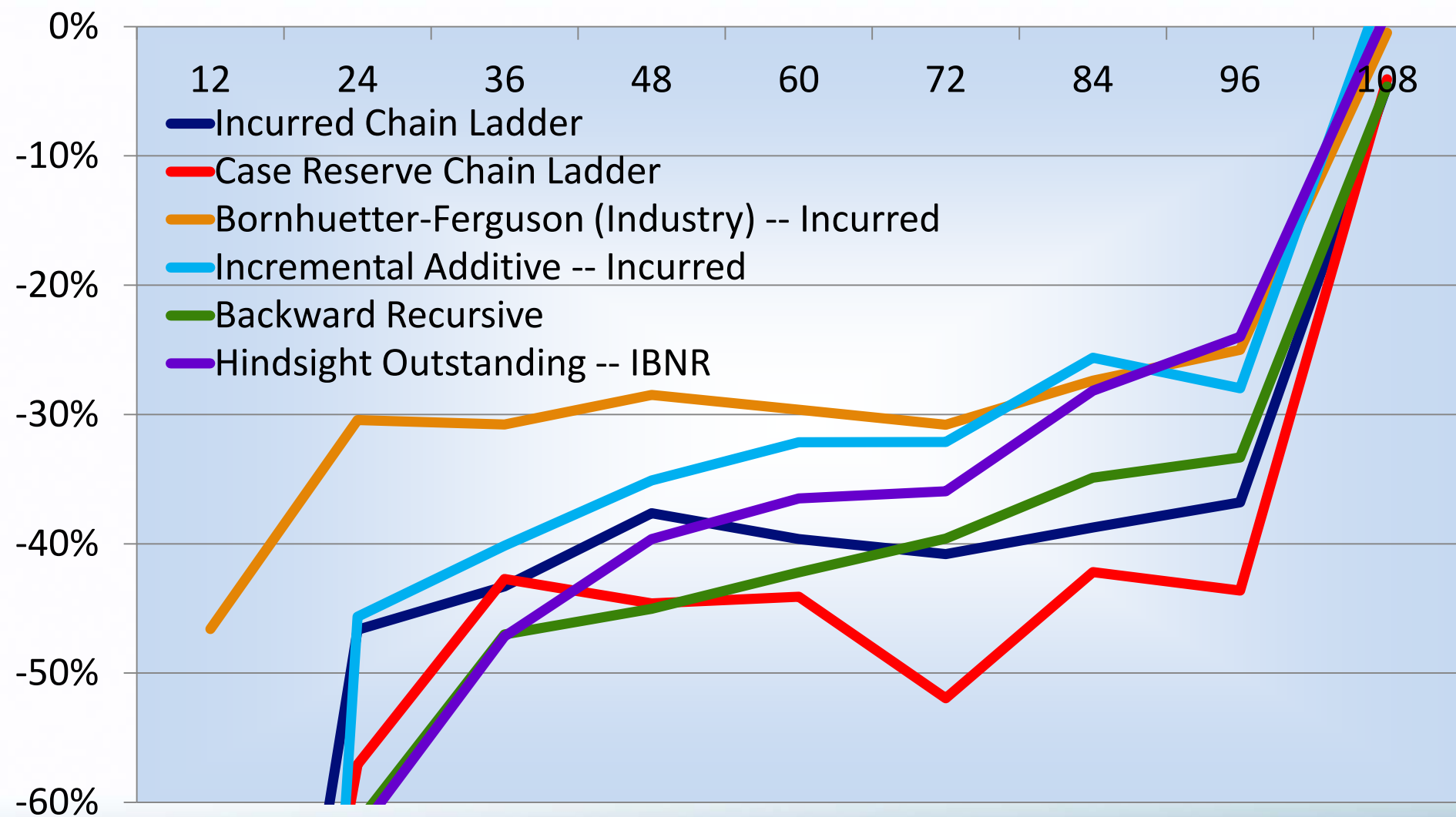
Median Skill – All Lines of Business



Median Skill – Workers Compensation



Median Skill – Large Companies



Initial Conclusion

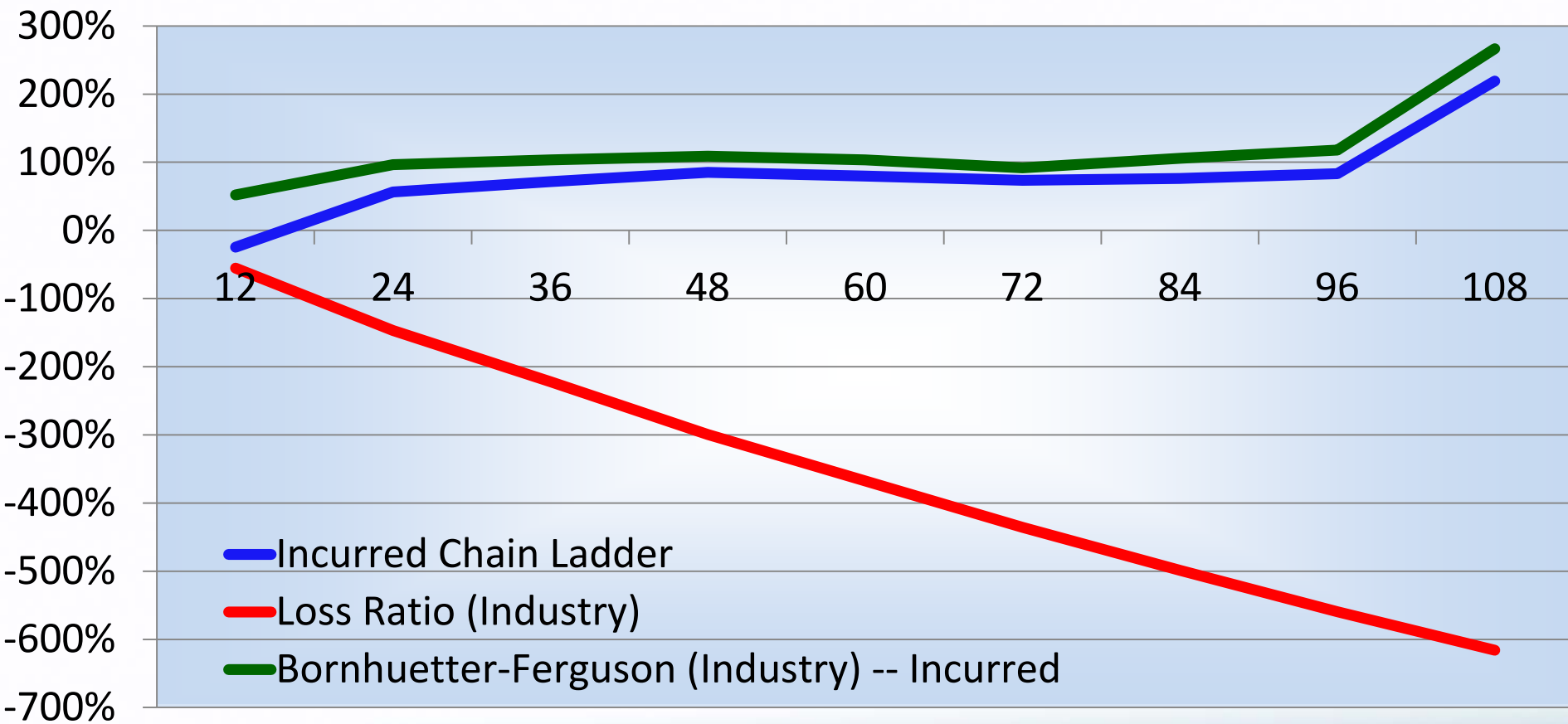
- Several methods outperform incurred chain ladder:
 - Bornhuetter-Ferguson – Incurred
 - Benktander – Incurred
 - Backward Recursive
 - Case Reserve Chain Ladder
 - Hindsight Outstanding – IBNR
 - Incremental Additive – Incurred

- So should we be using these methods?
 - How applicable are the results?
 - Do we really need all of these methods?

CORRELATION

Median Skill – All Lines of Business

Logarithmic Scale

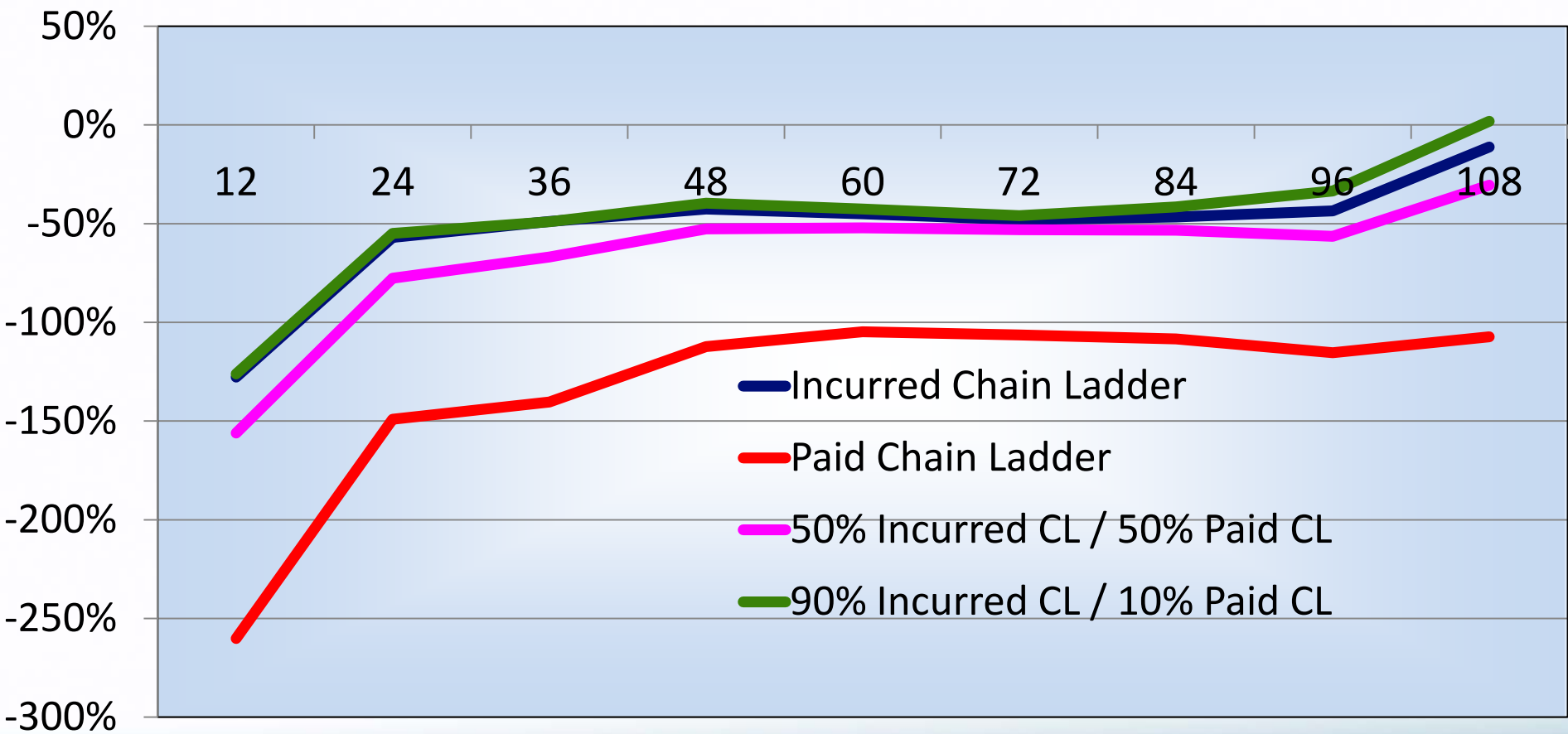


Correlation – Observations

- The less correlated two methods are, the greater the skill of an average of those methods
- Ideal weighting will depend on
 - Correlation
 - Individual method skill
- Also important: lack of bias in methods

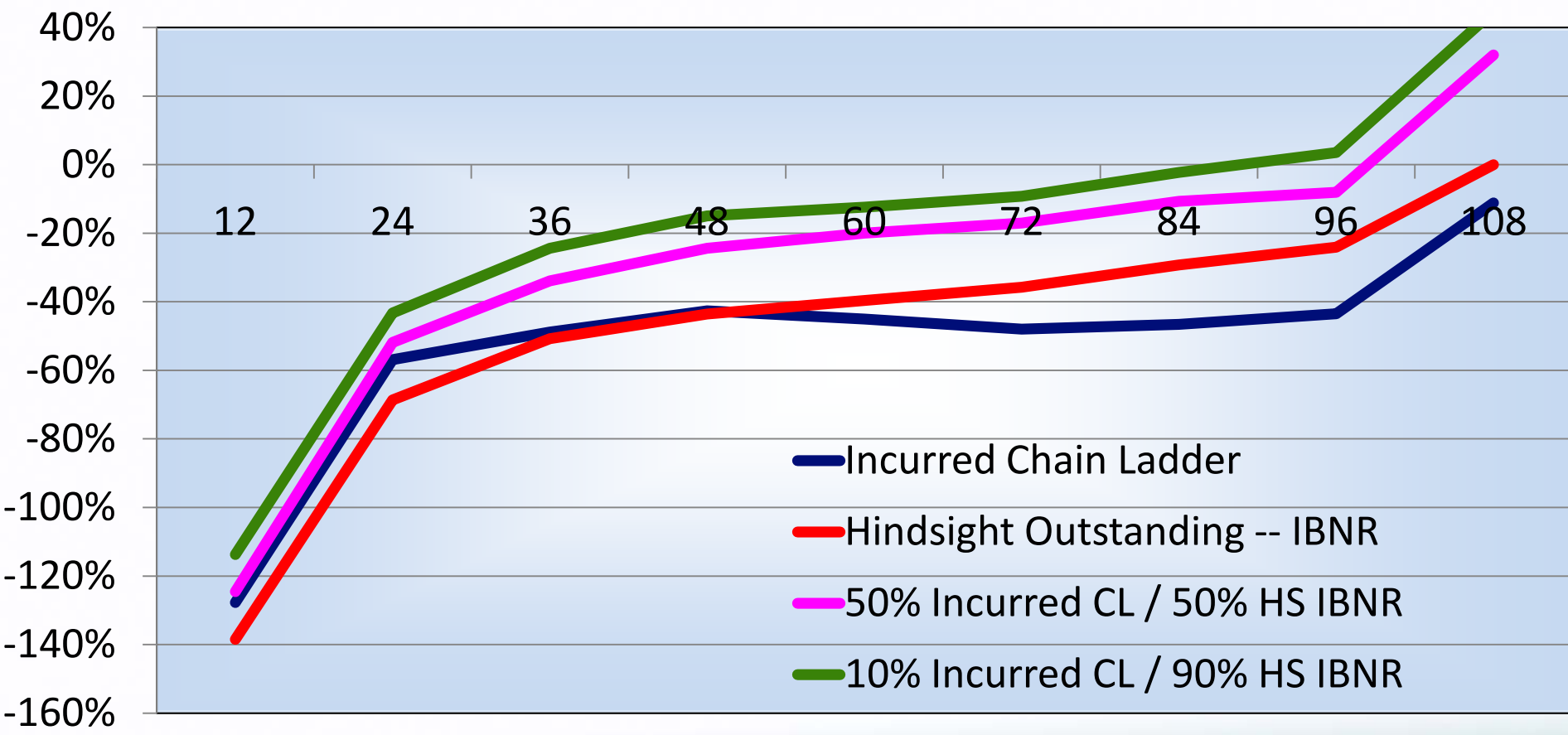
Average of Paid / Incurred Chain Ladders

Median Skill – All Lines of Business



Average of Incurred CL & Hindsight IBNR

Median Skill – All Lines of Business



CONCLUSIONS

Conclusion #1: Consider Different Methods



Conclusion # 2: Consider Different Weights



Questions?

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Paper in Summer 2012 CAS E-Forum:
<http://www.casact.org/pubs/forum/12sumforum/Forray.pdf>

