Looking Back to See Ahead:
Retrospective Testing of Loss Reserves

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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…

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Overview

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

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SCOPE OF REVIEW

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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

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THE METHODS

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Methods – Chain Ladder

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

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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

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Methods – Least Squares

§ Brosius
  § Paid
  § Incurred
§ Weighted Brosius
  § Paid
  § Incurred

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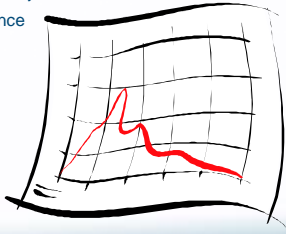
§ Frequency / Severity
§ Hindsight Outstanding – Unpaid
    § Average unpaid loss per yet to close claim
§ Hindsight Outstanding – IBNR
    – Average IBNR loss per yet to close claim
§ Claims Closure
    § Projection of claims to close by development period
    § Paid loss per yet-to-close claim

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Methods – Loss Ratio

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

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Methods – Composite

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

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THE METRIC

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The Metric: "Method Skill"

§ Error = Indicated Unpaid Ratio to Premium
  – Hindsight (HS) Unpaid Ratio to Premium

§ Anomaly = Hindsight Unpaid Ratio to Premium
  – 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

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Method Skill

§ Skill = 1 – $\dfrac{\text{Mean Squared Error}}{\text{Mean Squared Anomaly}}$

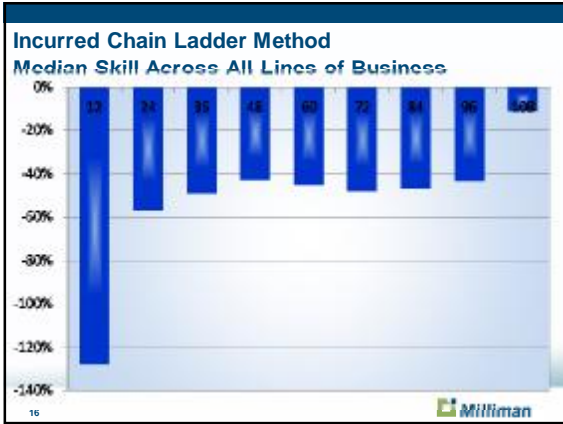§ Mean is measured across accident/report years

§ Observations:
  – Maximum Skill = 1
  – No minimum
  – It's all relative

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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%
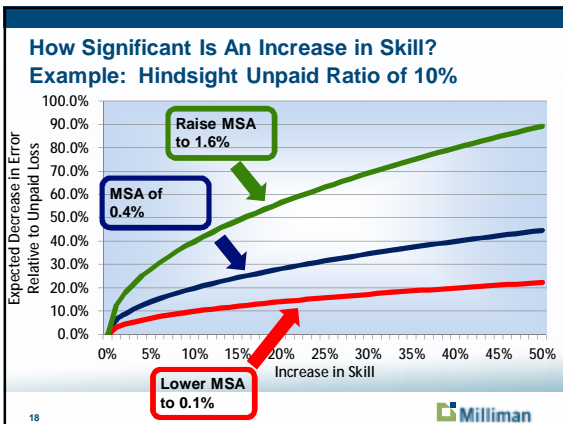
THE RESULTS

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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)

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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

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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)

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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

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Worst Performers
Early Evaluations

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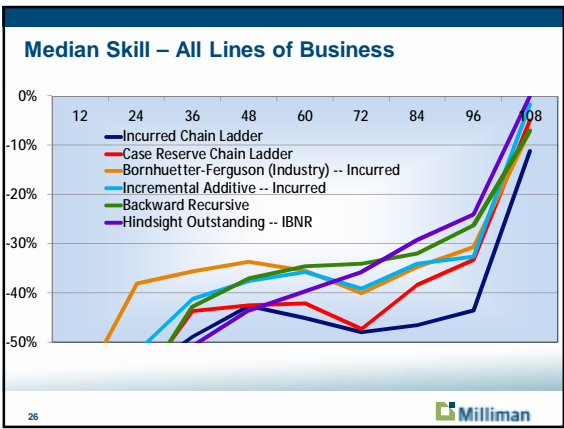23. Incremental Multiplicative – Paid

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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

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Median Skill – All Lines of Business

—Incurred Chain Ladder
—Case Reserve Chain Ladder
—Bornhuetter-Ferguson (Industry) -- Incurred
—Incremental Additive -- Incurred
—Backward Recursive
—Hindsight Outstanding -- IBNR

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Median Skill – Workers Compensation

—Incurred Chain Ladder
—Case Reserve Chain Ladder
—Bornhuetter-Ferguson (Industry) -- Incurred
—Incremental Additive -- Incurred
—Backward Recursive
—Hindsight Outstanding -- IBNR

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Median Skill – Large Companies

Legend:
- Incurred Chain Ladder
- Case Reserve Chain Ladder
- Bornhuetter-Ferguson (Industry) -- Incurred
- Incremental Additive -- Incurred
- Backward Recursive
- Hindsight Outstanding -- IBNR

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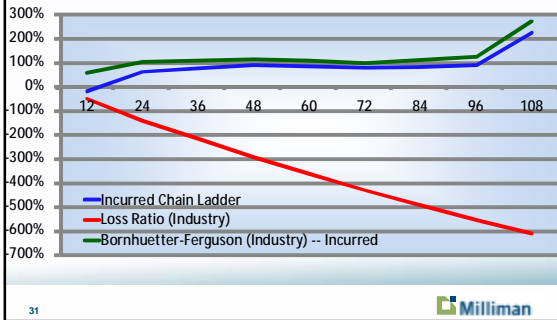
§ So should we be using these methods?
- How applicable are the results?
- Do we really need all of these methods?

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CORRELATION
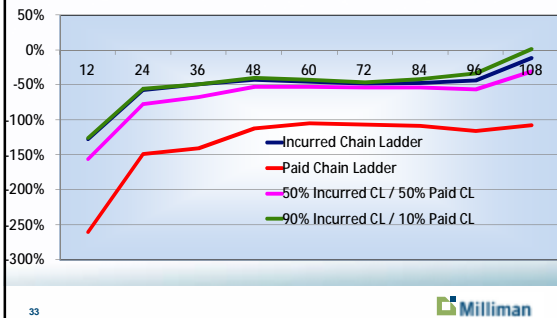
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Median Skill – All Lines of Business
Logarithmic Scale

- Incurred Chain Ladder
- Loss Ratio (Industry)
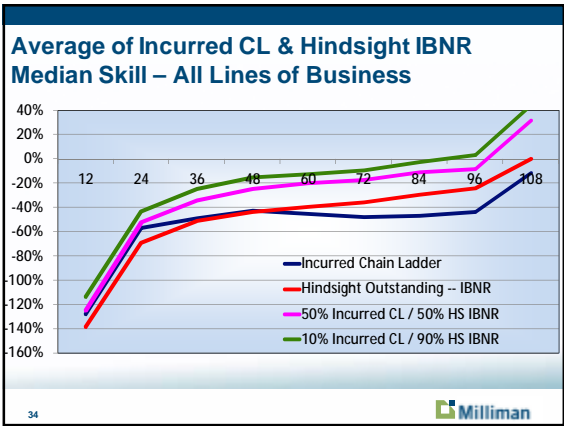- Bornhuetter-Ferguson (Industry) -- Incurred

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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

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Average of Paid / Incurred Chain Ladders
Median Skill – All Lines of Business

- Incurred Chain Ladder
- Paid Chain Ladder
- 50% Incurred CL / 50% Paid CL
- 90% Incurred CL / 10% Paid CL

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Average of Incurred CL & Hindsight IBNR Median Skill – All Lines of Business

Legend:
- Incurred Chain Ladder
- Hindsight Outstanding -- IBNR
- 50% Incurred CL / 50% HS IBNR
- 10% Incurred CL / 90% HS IBNR

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CONCLUSIONS

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Conclusion #1: Consider Different Methods

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Conclusion # 2: Consider Different Weights

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Questions?

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