Practical Solutions to Reserving Problems

A Hindsight Analysis of Five Reserving Methods

Prepared for: Casualty Loss Reserve Seminar

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Overview

- How do we measure the skill of a method?
- Universe of companies
- Methods considered
- Results
  - Development Age
  - Line of Business
  - Company Size
- Conclusions
- Appendices – available on-line
  - Analysis for sample companies
  - Additional information on effect of correlation

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Method Skill[1]

- 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

[1] See "Claim Reserving: Performance Testing and the Control Cycle," *Variance* 2009

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Universe of Companies

- 2,696 Companies
- 13 Lines of Business
- 13 Evaluations (Excluding 2009)
- 5 Methods

- Hindsight Indications
  - 2.3 Million In Theory
  - 1.0 Million In Fact

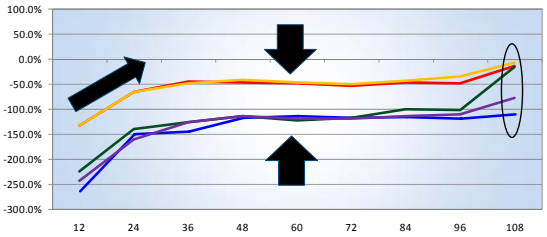
Methods Considered

- Paid Chain Ladder
- Incurred Chain Ladder
- Berquist-Sherman
- Case Reserve Chain Ladder
- Munich Chain Ladder

Results of Analysis

- Development Age
  - Months of Development 12 through 108
- Line of Business
  - All Schedule P lines
- Company Size
  - Small (< ~ $15M of net annual premium)
  - Medium (between $15M and $125M of premium)
  - Large (> ~ $125M of annual premium)

Median Skill – All Lines of Business



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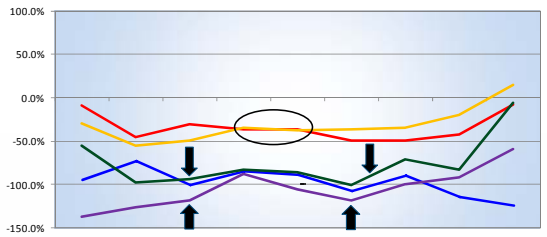
Median Skill – Homeowners/Farmowners



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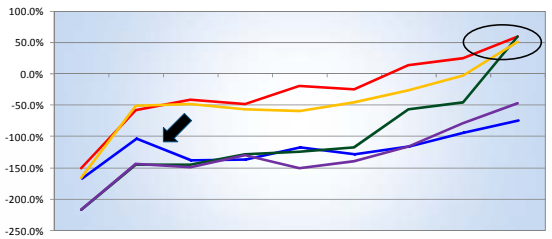
Median Skill – Workers Compensation



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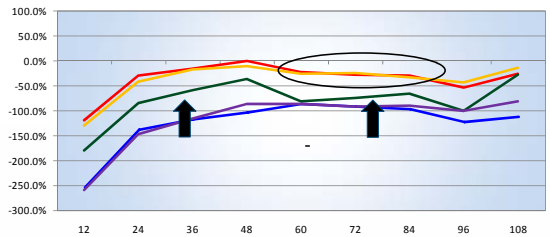
Median Skill – Commercial Auto Liability



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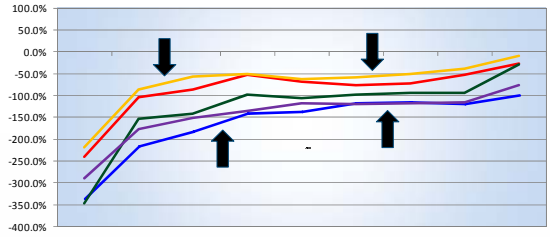
Median Skill – Other Liability – Occurrence



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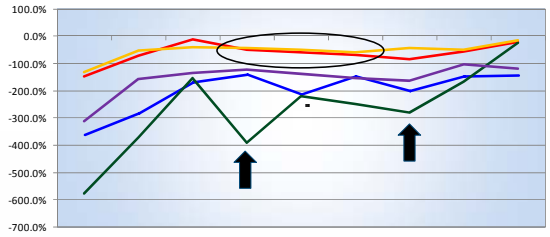
Median Skill – Medical Liability – Claims-Made



12

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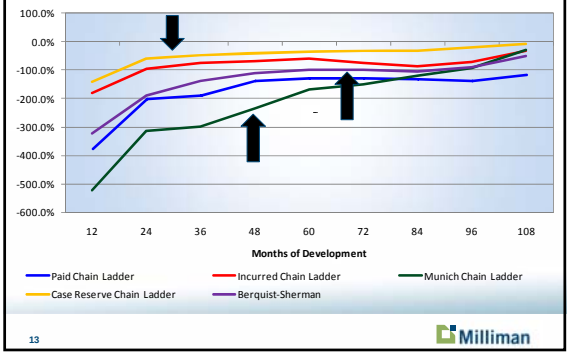
Median Skill – Small Companies



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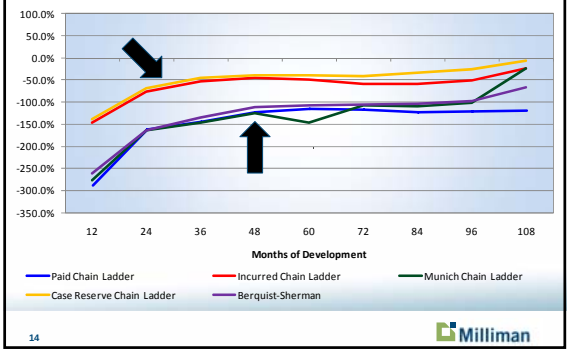
Median Skill – Medium Companies



14

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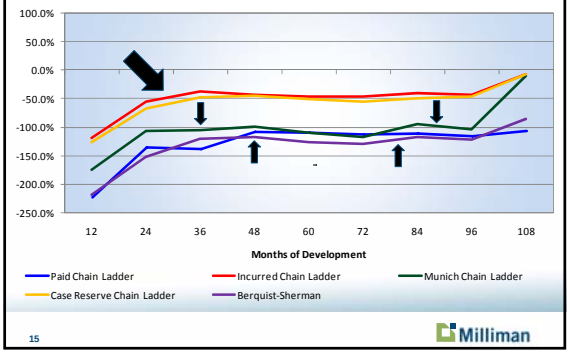
Median Skill – Large Companies



15

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Conclusion #1: Consider Different Methods

- Two most common reserving methods:
  - Incurred chain ladder
  - Paid chain ladder
- Case development outperforms incurred at later evaluations
  - Definition of "later" varies by line of business
- Munich chain ladder outperforms paid
  - Exceptions: small companies, medical professional liability
  - Downside: highly correlated with incurred chain ladder
- Munich chain ladder outperforms Berquist-Sherman
  - Exceptions: small companies, medical professional liability

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Conclusion # 2: Consider Different Weighting

- Typical weighting schemes
  - 50/50 Incurred/paid chain ladder methods
  - 75/25 Incurred/paid chain ladder methods
- Analysis suggests
  - Most weight to incurred and/or case methods
  - Weight should increase when correlation with other methods is greater
- Methods not considered here
  - Frequency/severity, pure premium, hindsight severity, etc.
  - Can expect these to be less correlated with LDF methods
  - May be more valuable than we think for that reason

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Other Considerations

- Accompanying Oral Discussion
  - This document is not complete without the accompanying oral discussion and explanation of the underlying information and concepts as well as any interpretational limitations.
- Limited Distribution
  - This document should not be distributed, disclosed or otherwise furnished, in whole or in part, without the express written consent of Milliman.
- Data Reliance
  - We have relied upon data from National Underwriter Insurance Data Services from Highline Data, without audit or independent verification. We have performed a limited review of the data for reasonableness and consistency and have not found material defects in the data. If there are material defects in the data, it is possible that they would be uncovered by a detailed, systematic review and comparison of the data to search for data values that are questionable or relationships that are materially inconsistent. Such a review was beyond the scope of our analysis.

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Skill Calculations – Sample Companies

APPENDIX – PART I

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Sample Company

- Monoline medical professional liability insurer
- $70 million in net earned premium annually
  - $60 million claims-made
  - $10 million occurrence

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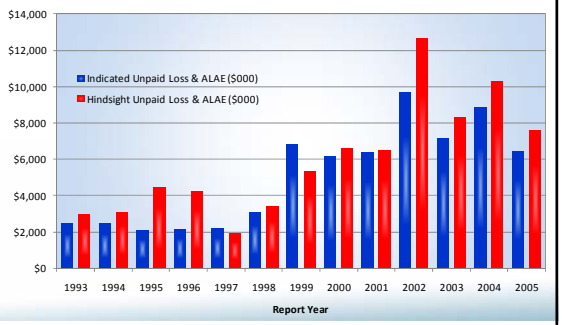
Incurred Chain Ladder Method at 48 Months



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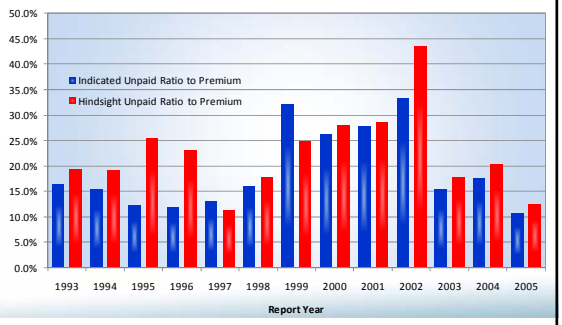
Incurred Chain Ladder Method at 48 Months



22

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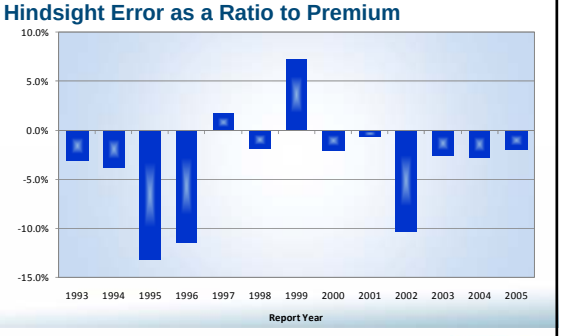
Incurred Chain Ladder Method at 48 Months
Hindsight Error as a Ratio to Premium



23

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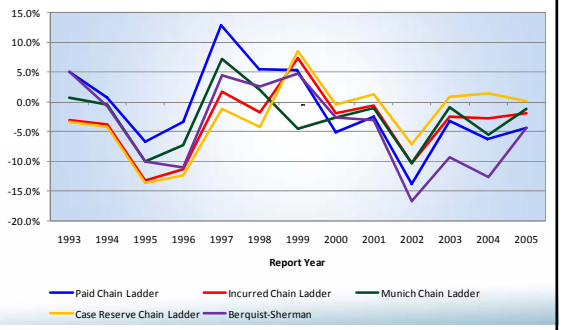
Method Error at 48 Months of Development



24

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Anomaly

- 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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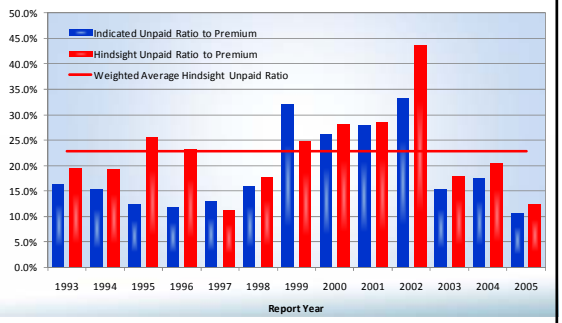
Weighted Average of Hindsight Unpaid Ratios



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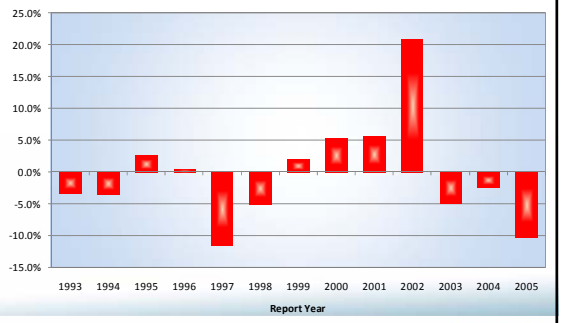
Anomaly at 48 Months of Development



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Skill – Incurred Chain Ladder Method

28

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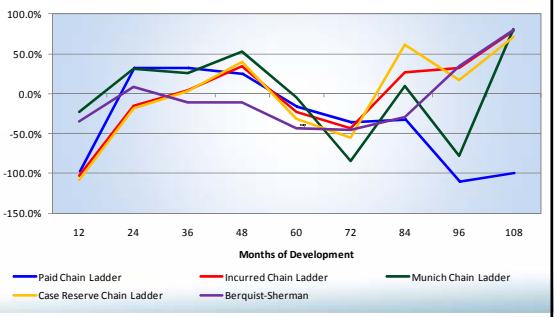
Skill – The Five Methods



29

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Effect of Correlation – Sample Companies

APPENDIX – PART II

30 September 23, 2010

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Sample Company #1 – Method Skill

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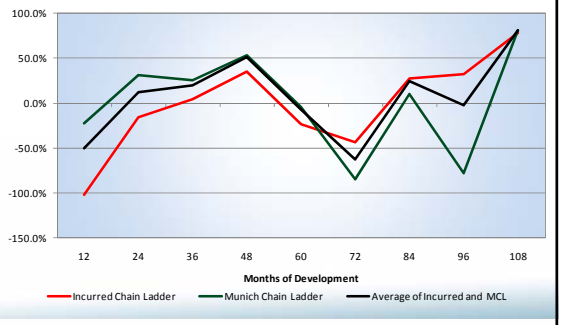
Sample Company #1 – Method Skill



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Sample Company #2

- One of nation's largest insurers
- Multi-line writer
- Known for Personal auto liability
  - > $10 billion in premium annually
  - Used as example here

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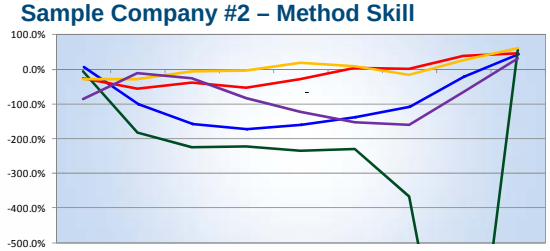
Sample Company #2 – Method Skill



34

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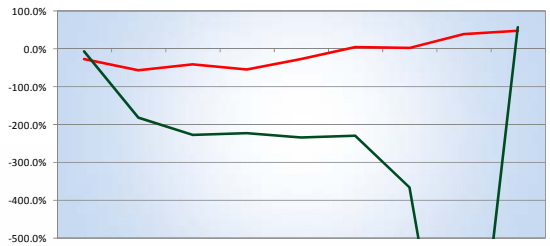
Sample Company #2 – Method Skill



35

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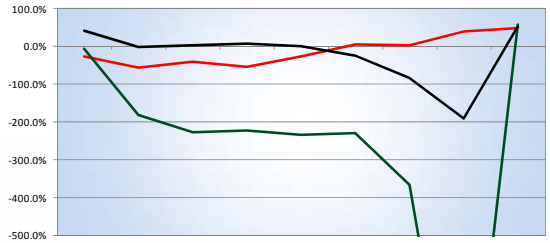
Sample Company #2 – Method Skill



36

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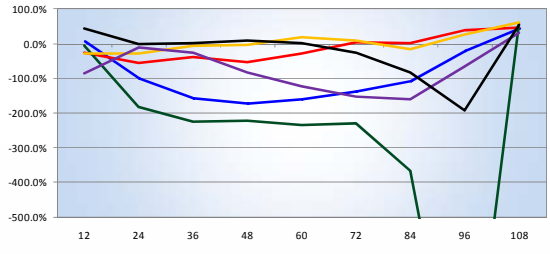
Sample Company #2 – Method Skill



37

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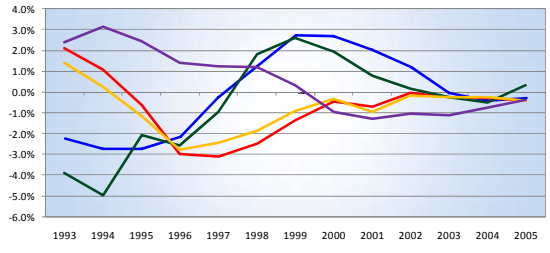
Sample Company #2 – Error as of 48 Months



38

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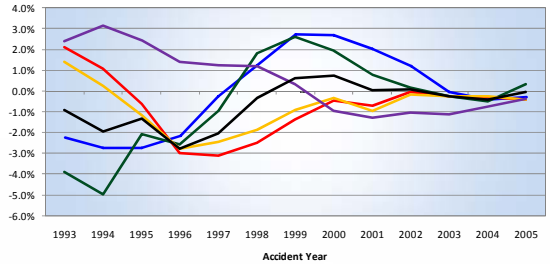
Sample Company #2 – Error as of 48 Months



39

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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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Effect of Correlation – General Results

APPENDIX – PART III

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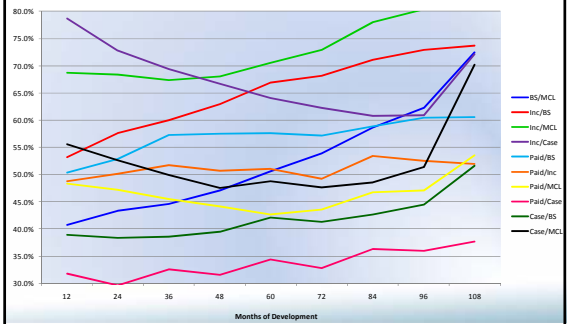
Average Correlation – All Lines of Business



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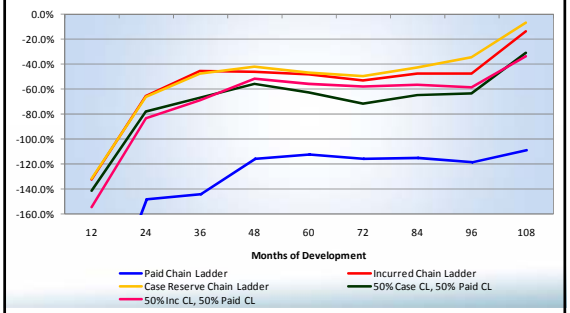
Skill Under 50% Weights: Inc/Paid & Case/Paid



43

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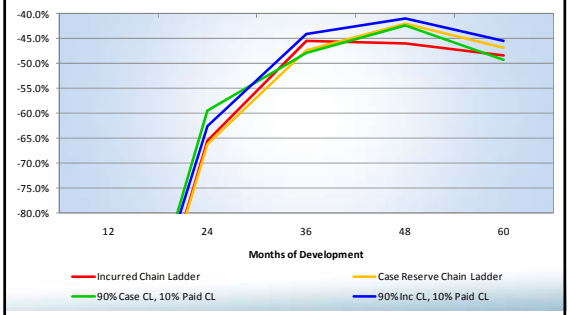
Skill Under 90/10 Weights: Inc/Paid & Case/Paid



44

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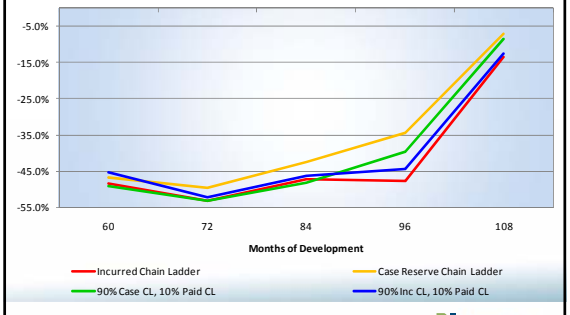
Skill Under 90/10 Weights: Inc/Paid & Case/Paid



45

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