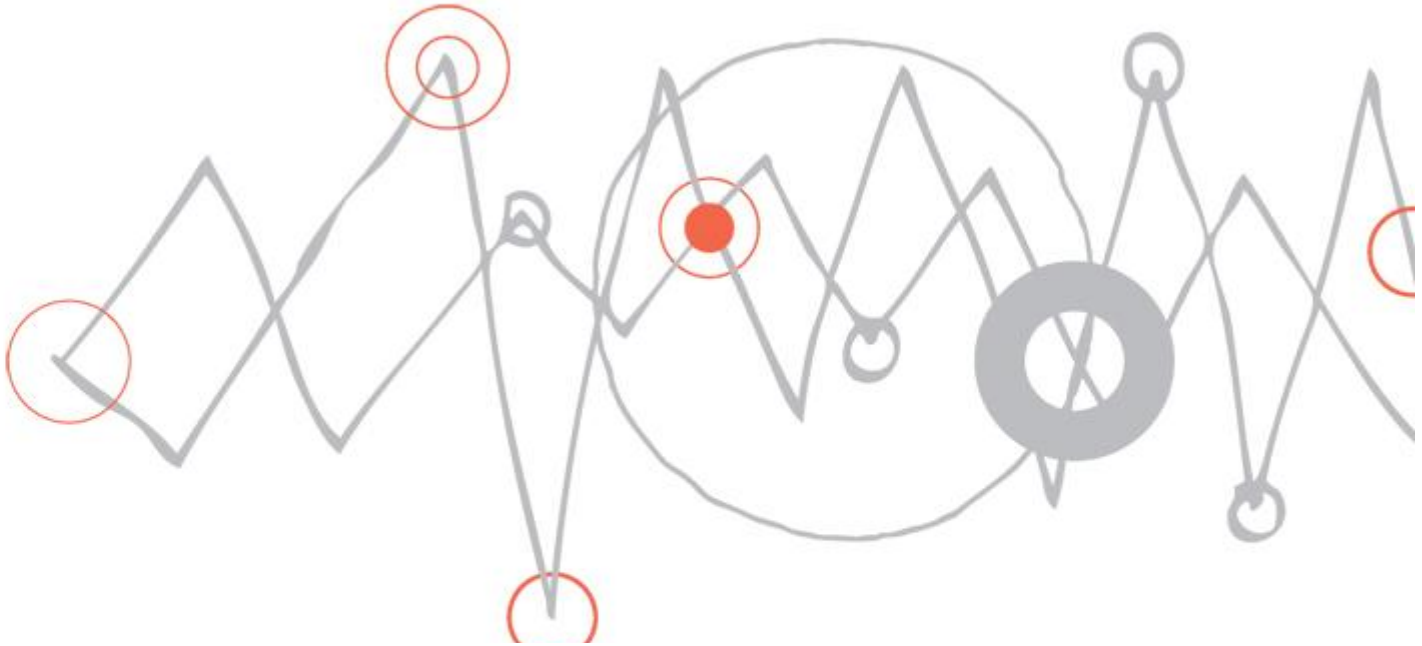


On the Accuracy of Loss Reserving Methodology

CAE Spring 2011 Meeting

by Rocco Roberto Cerchiara

29 July 2011

TOWERS WATSON

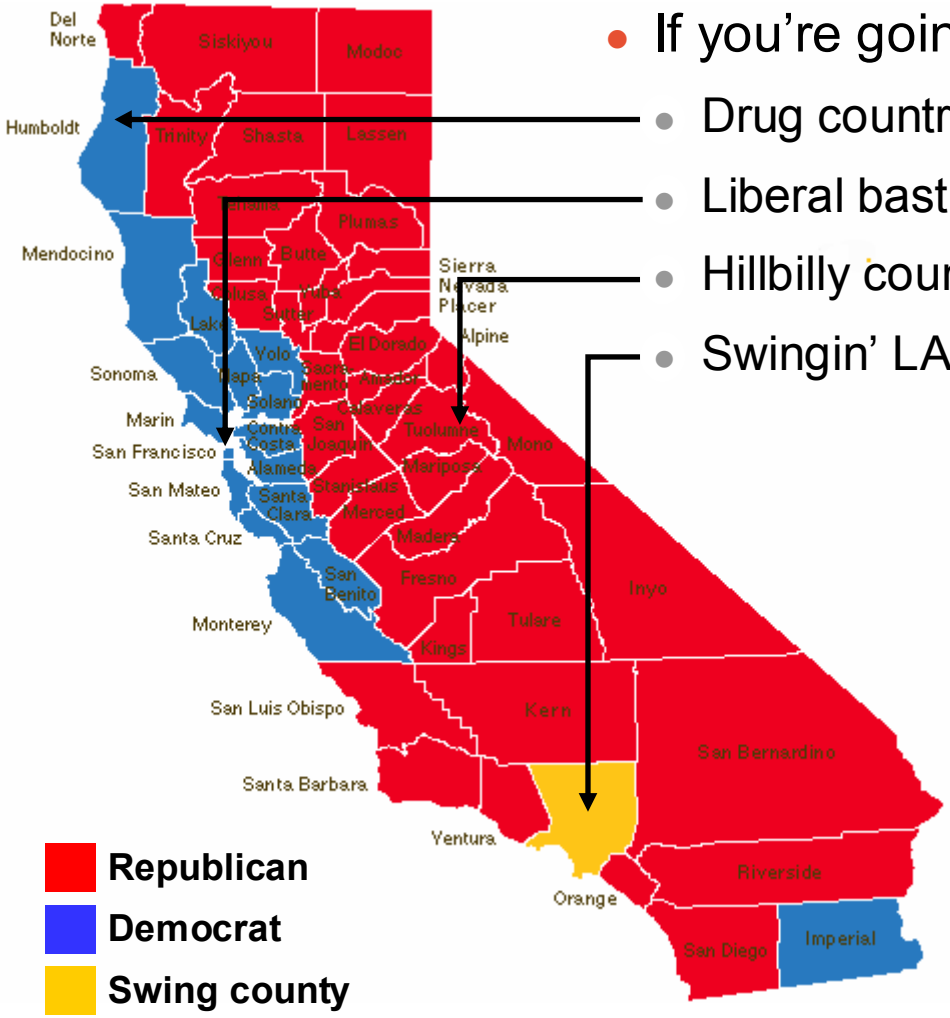
Outline

- Background
- General findings
- Specific findings – methods
  - Artificial intelligence
  - Berquist-Sherman methods
  - Independent/biased in opposite directions
  - Munich Chain Ladder and similar joint paid-incurred methods
  - Complex multivariate regression methods
- Specific findings – environments
  - Bubble in inflation
  - Economic downturn
- Further applications of the paper
- Questions

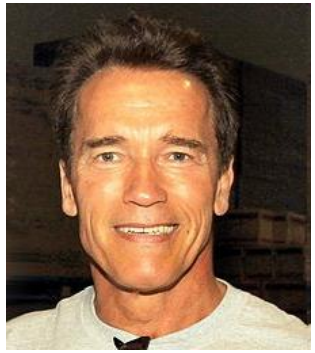
Background

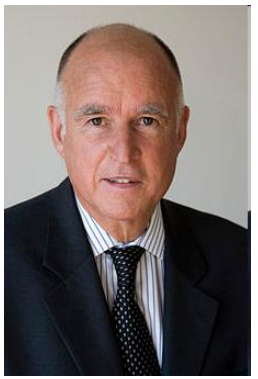
California – Politics and Workers' Compensation

California is an odd place…
An illustrated primer on golden state politics



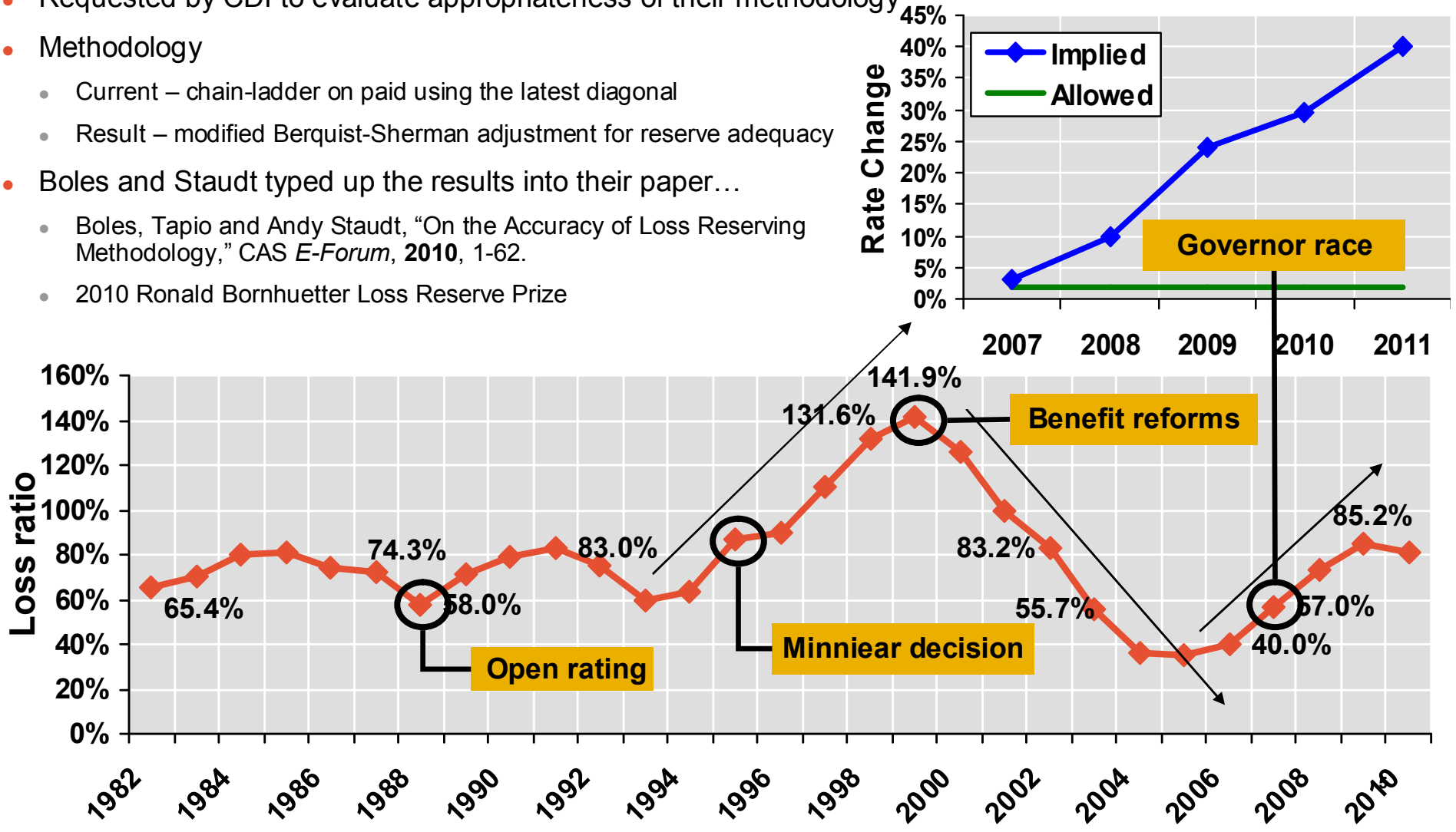
- If you're going to run for governor…
  - Drug country up in Humboldt
  - Liberal bastion of San Francisco
  - Hillbilly country
  - Swingin' LA - money, Hollywood, black and Hispanic





A short history of California Workers' Compensation

- WCIRB comprised of all WC writers in California
- Requested by CDI to evaluate appropriateness of their methodology
- Methodology
  - Current – chain-ladder on paid using the latest diagonal
  - Result – modified Berquist-Sherman adjustment for reserve adequacy
- Boles and Staudt typed up the results into their paper…
  - Boles, Tapio and Andy Staudt, "On the Accuracy of Loss Reserving Methodology," CAS *E-Forum*, **2010**, 1-62.
  - 2010 Ronald Bornhuetter Loss Reserve Prize



The goal of the work / paper is to identify the most (and least) accurate methods under a variety of environments

- We tested 27 methods (with several parameterizations) under 8 sets of environmental conditions
- Environmental changes include:
  - Bubble in calendar year inflation
  - Increase in frequency of serious claims (i.e., shift in claim types)
  - Increase in case reserve adequacy
  - Acceleration in claim settlement rates
  - Economic downturn
  - Combinations of the above

Our approach…
Why it is dangerous to talk mathematics in a room full of actuaries

- Some approaches
  - Mathematical proof is tedious
  - Performance testing is good, but has limitations
  - Parametric simulation can make assumptions which ‘assume’ the answer
- Our approach uses simulation based on perturbations of historical triangles with a ripple effect to take a prospective look

General findings

Some obvious, some interesting and some ….

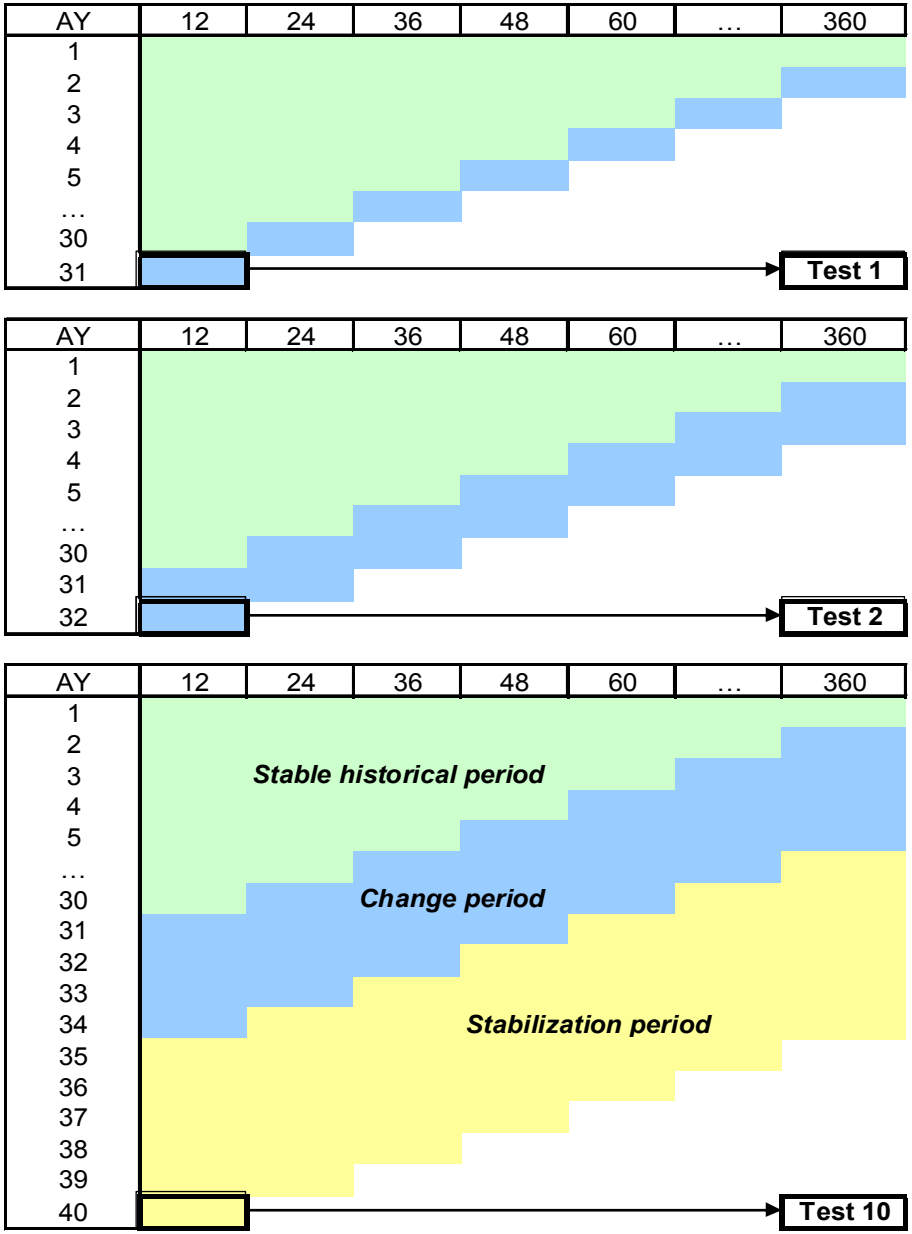
General findings

- Assigning grades to the methods
  - Chain-ladder approach is completely average
  - Methods which adjust data for historical irregularities are above average
  - Very technical GLM/multivariate regression methods are below average
- Periods with significant upheaval
  - Cannot be addressed with mechanical methods
- Accident year vs. calendar year effects
  - Accident year effects (like increases in frequency) don't affect most projection methods unless there is also a change in development patterns
  - Calendar year effects (like inflationary impacts on payments) distort all methods to a certain extent, in some cases for several years after
- Independence and bias
  - If you can't identify the best method with certainty, it is often helpful to know which methods are likely to be biased low and which are biased high
  - When in doubt consider multiple methods that are relatively independent

Specific findings – methods

Which methods work well when…

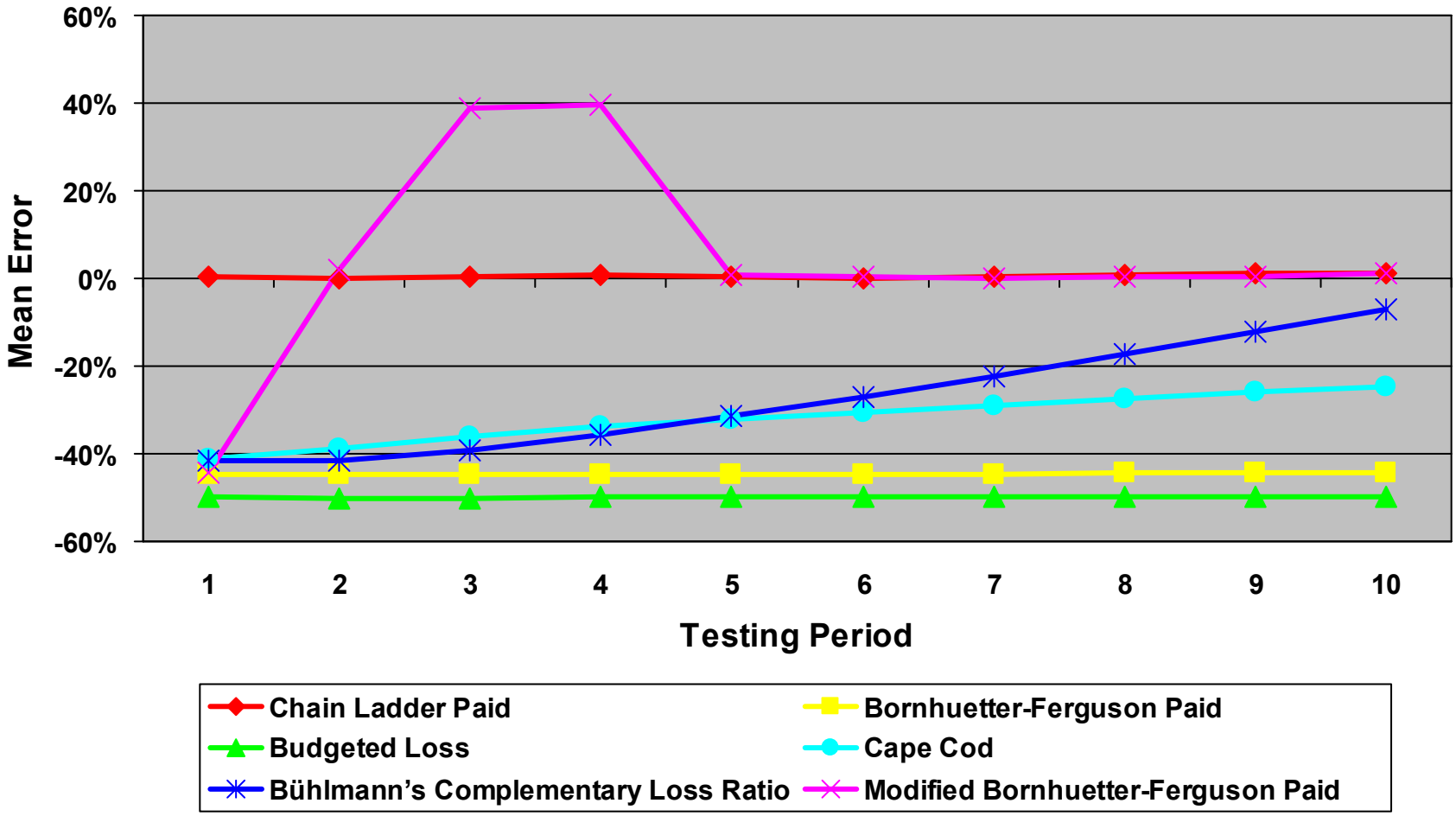
Description of the testing methodology



- Simulated 40 x 30 ‘rectangles’ (assume 360 months or 30 years is ultimate)
  - First 30 x 30 triangle is stable
  - Environmental change begins in year 31
  - Change lasts for 3 to 5 years (yrs 31 to 35)
  - Conditions stabilize thereafter (yrs 35 to 40)
- Begun testing in year 31
  - First test is 12-to-360 in year 31
  - Second test is 12-to-360 in year 32
  - …
  - Tenth, and final, test is 12-to-360 in year 40
- Previous winner of Ronald Bornhuetter Loss Reserve Prize empirically showed significant US WC tail development at 50 to 70 years using Oregon dataset dating back to turn of the last century

Some methods learn, others don't

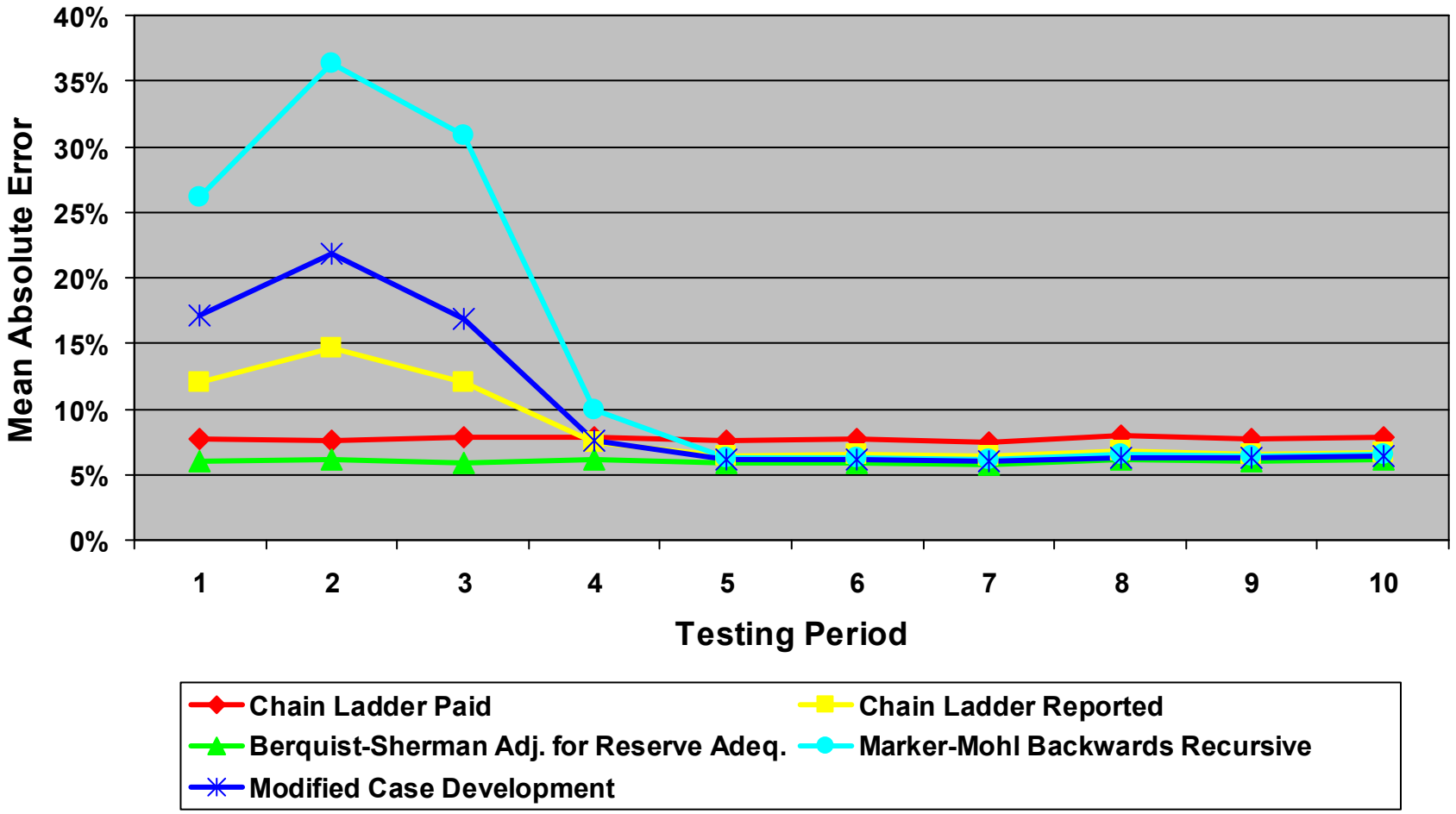
Environment: Sudden doubling of loss exposure without recognition



Note: Where applicable, parameters based on latest 3 years

Berquist-Sherman knew what they were talking about

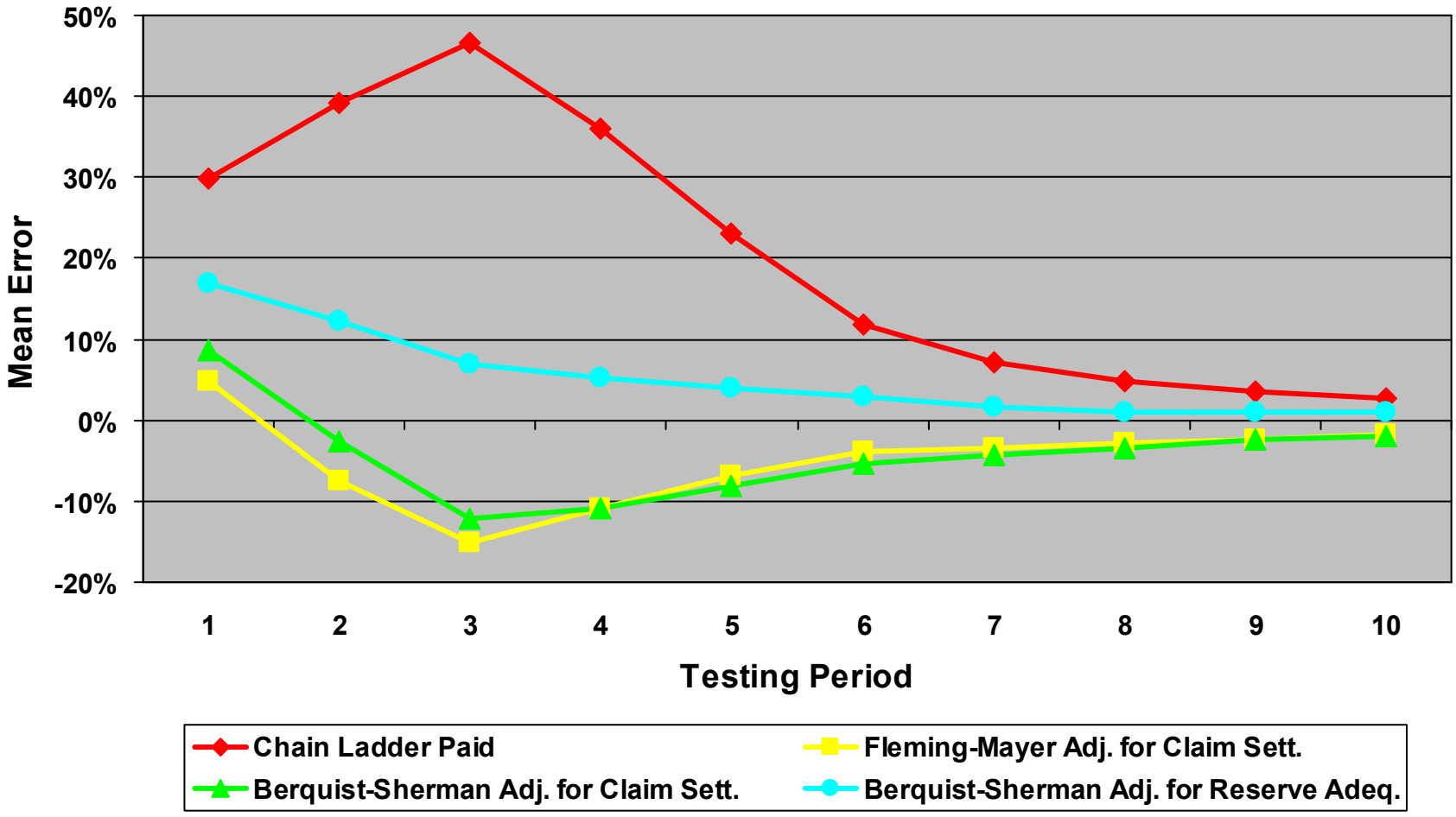
Environment: Increase in case reserve adequacy



Note: Parameters based on latest 3 years

Two methods every reserving actuary should know

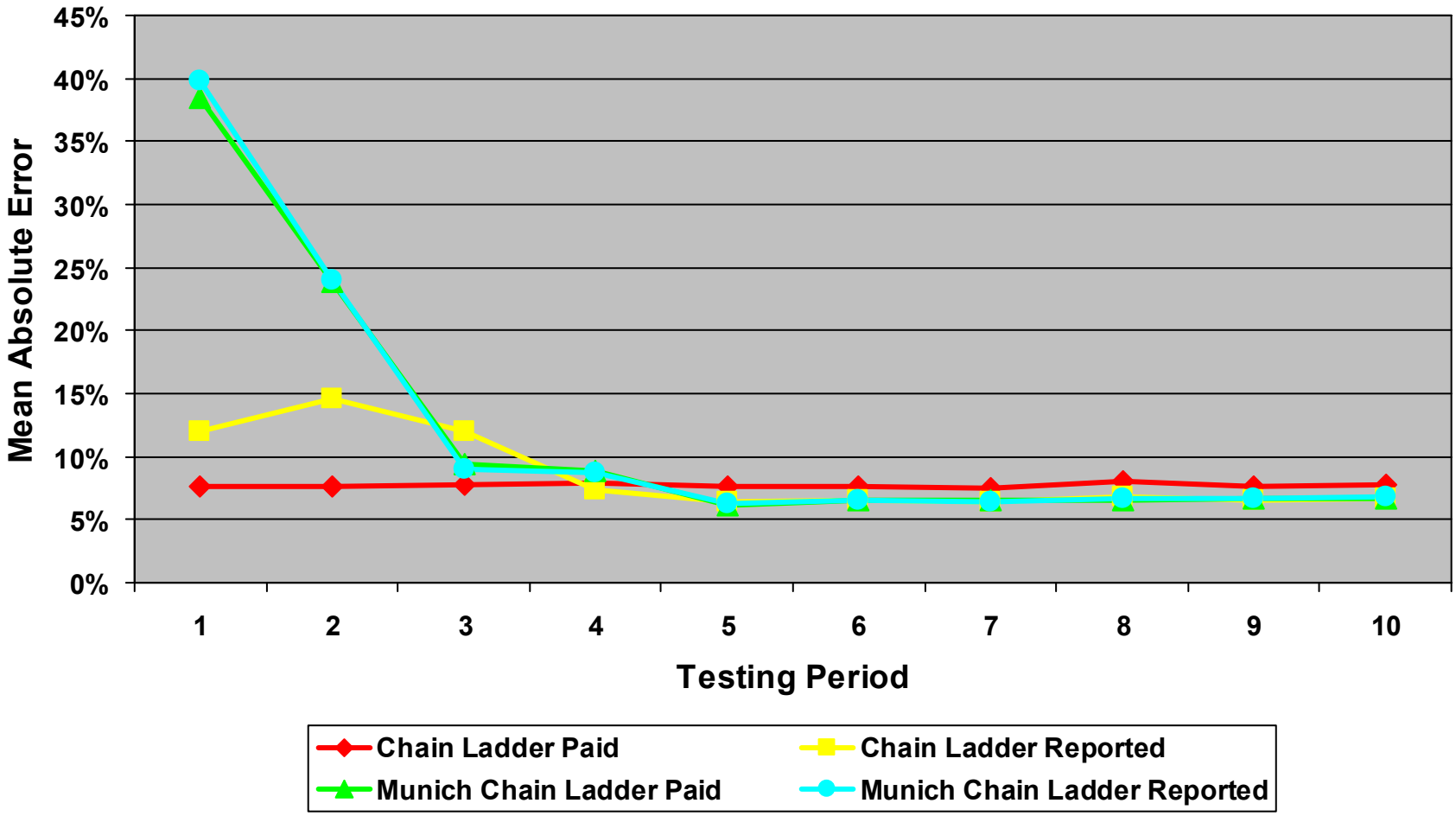
Environment: Acceleration in claim settlement rates



Note: Parameters based on latest 3 years

Double the data, double the error

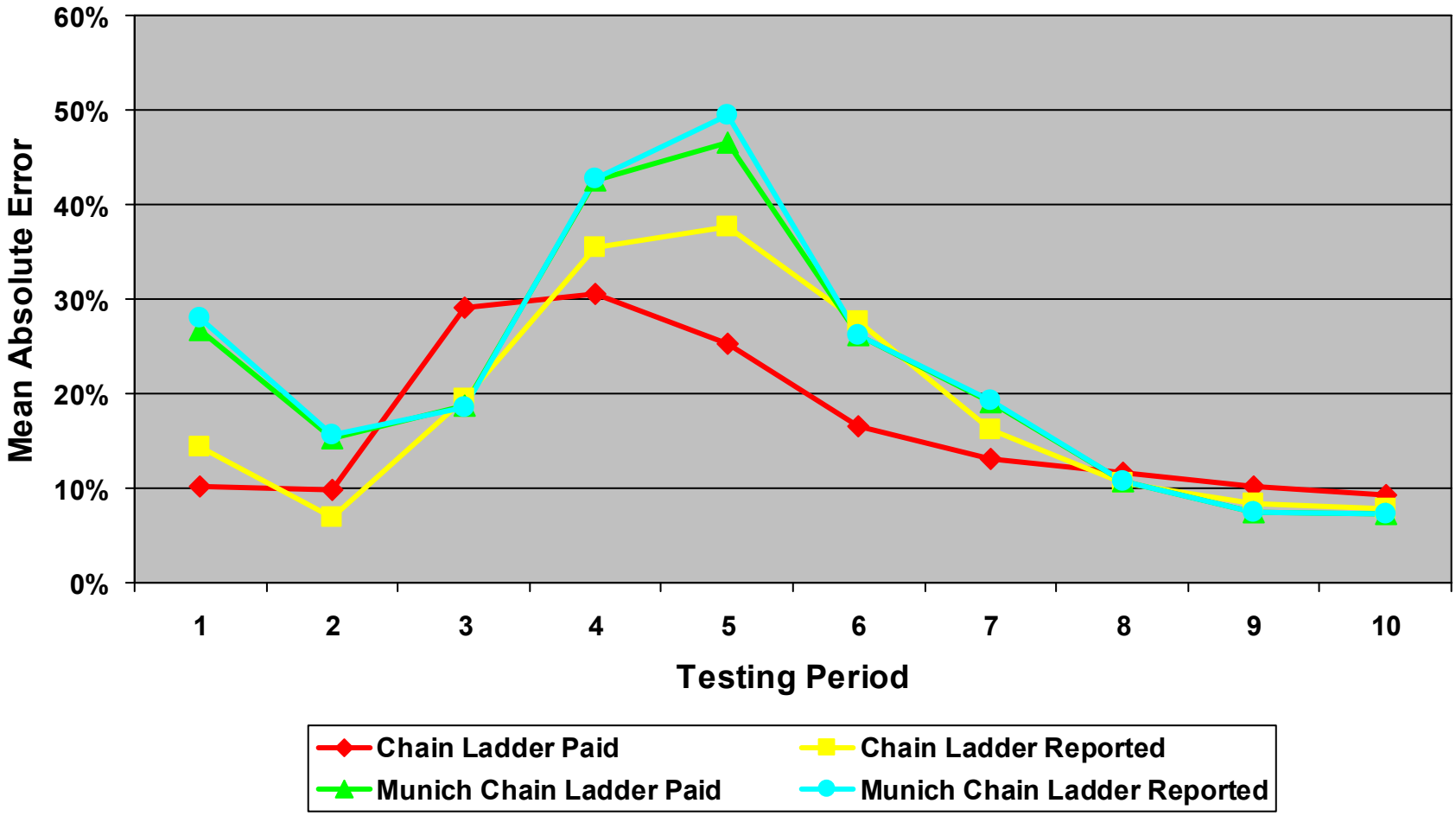
Environment: Increase in case reserve adequacy



Note: Parameters based on latest 3 years

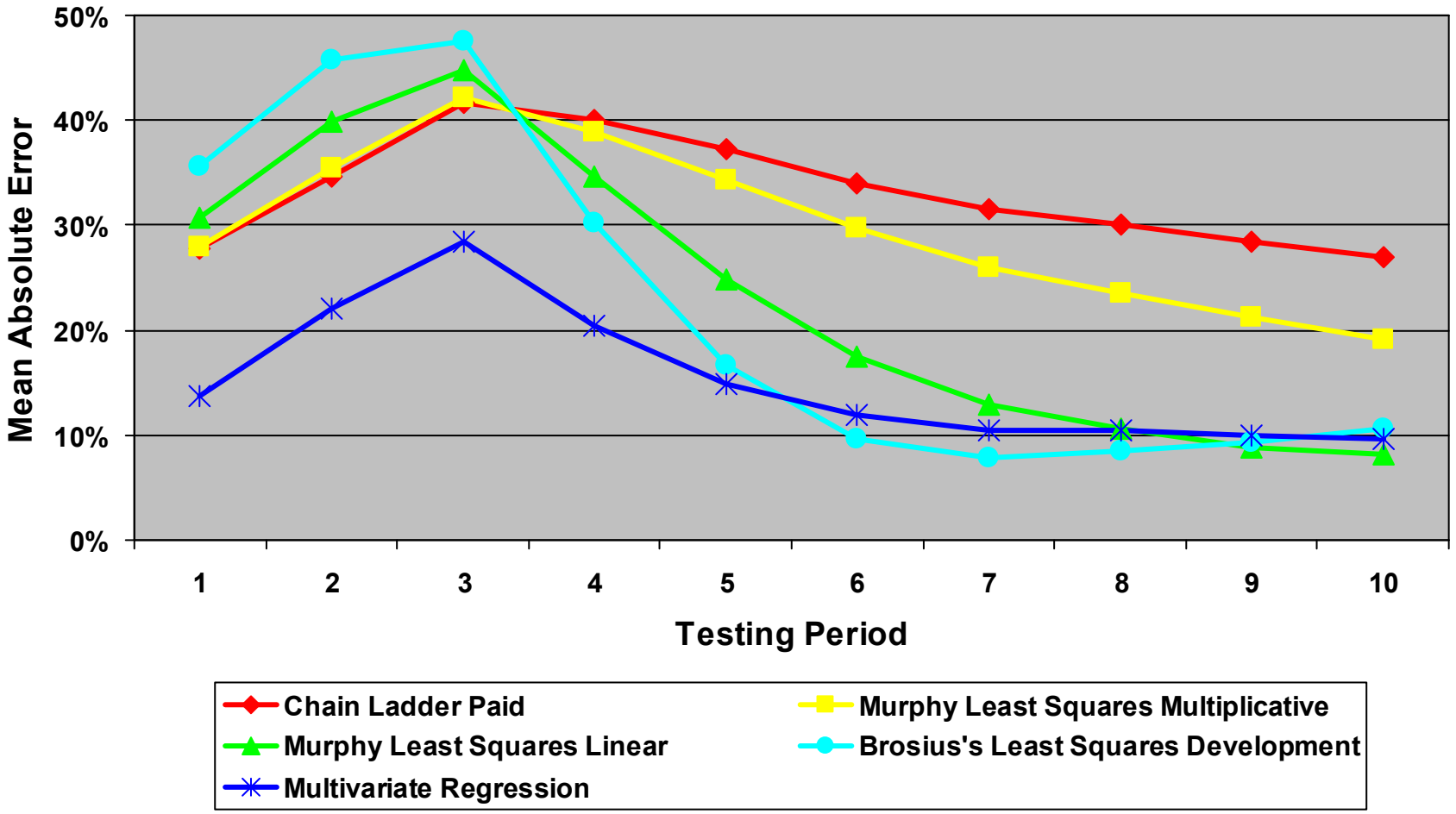
Double the data, double the error

Environment: Bubble in calendar year inflation



Note: Parameters based on latest 3 years

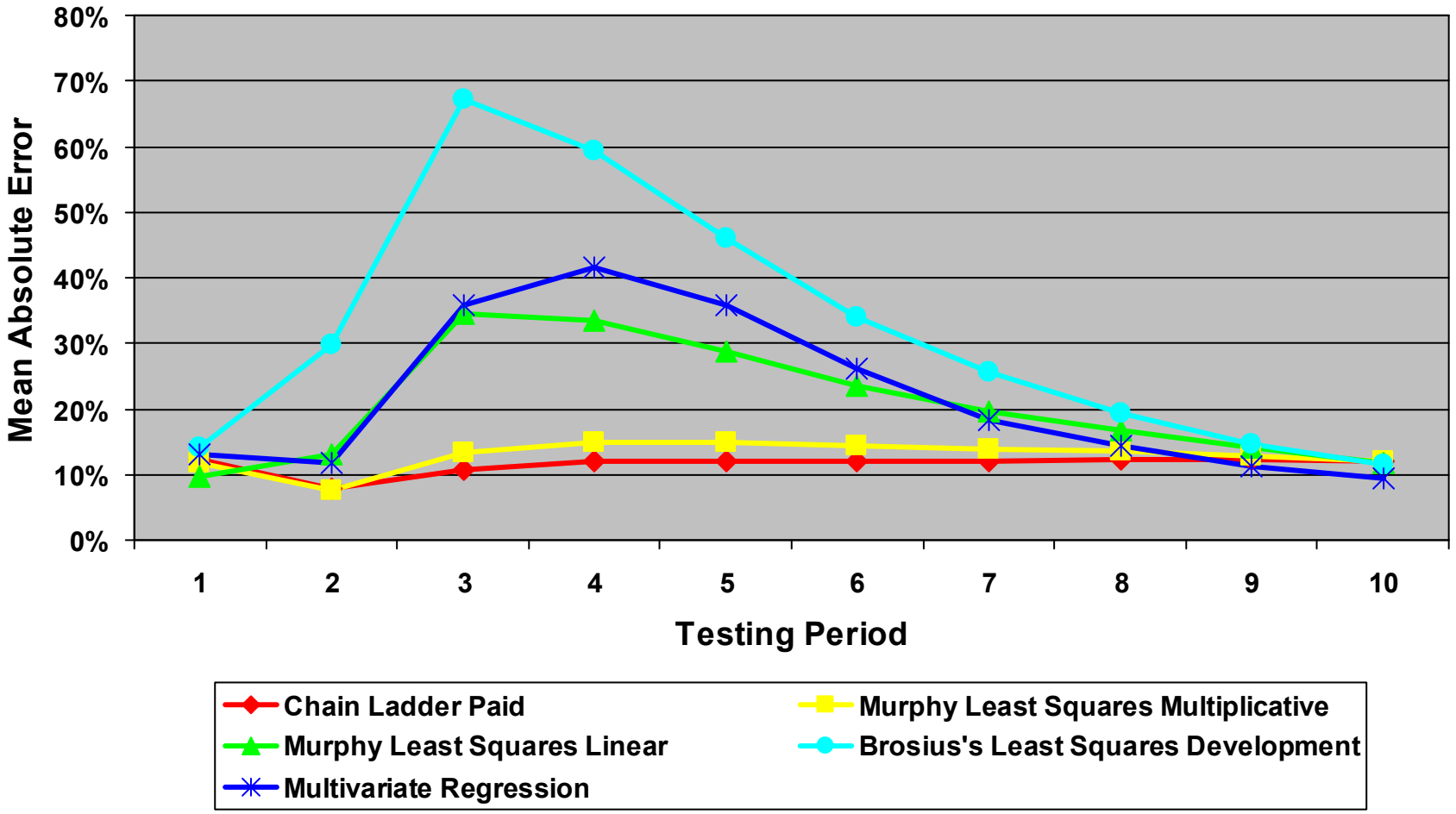
Regression methods: More variables, more jagged edges
Environment: Acceleration in claim settlement rates



Note: Parameters based on all years

Regression methods: (Mis)understanding the loss process

Environment: Bubble in calendar year inflation



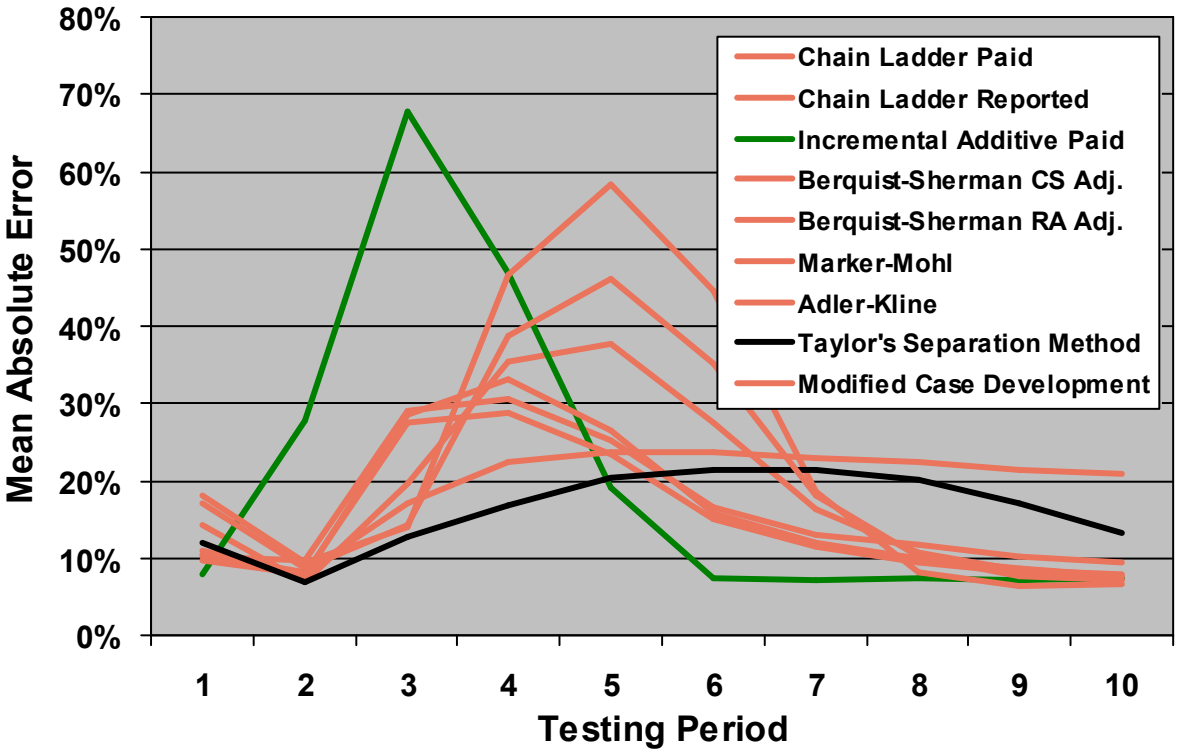
Note: Parameters based on all years

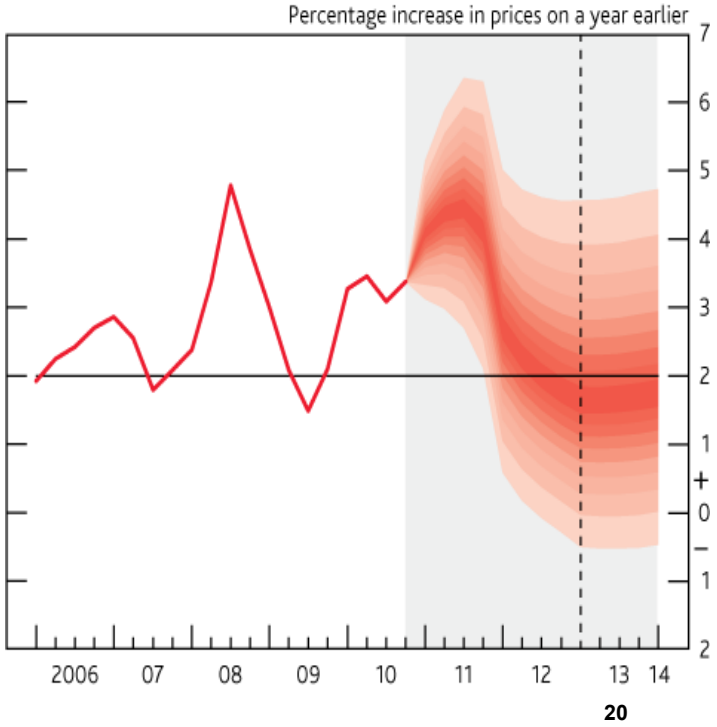
Specific findings – environments

Environments which are of particular relevance today

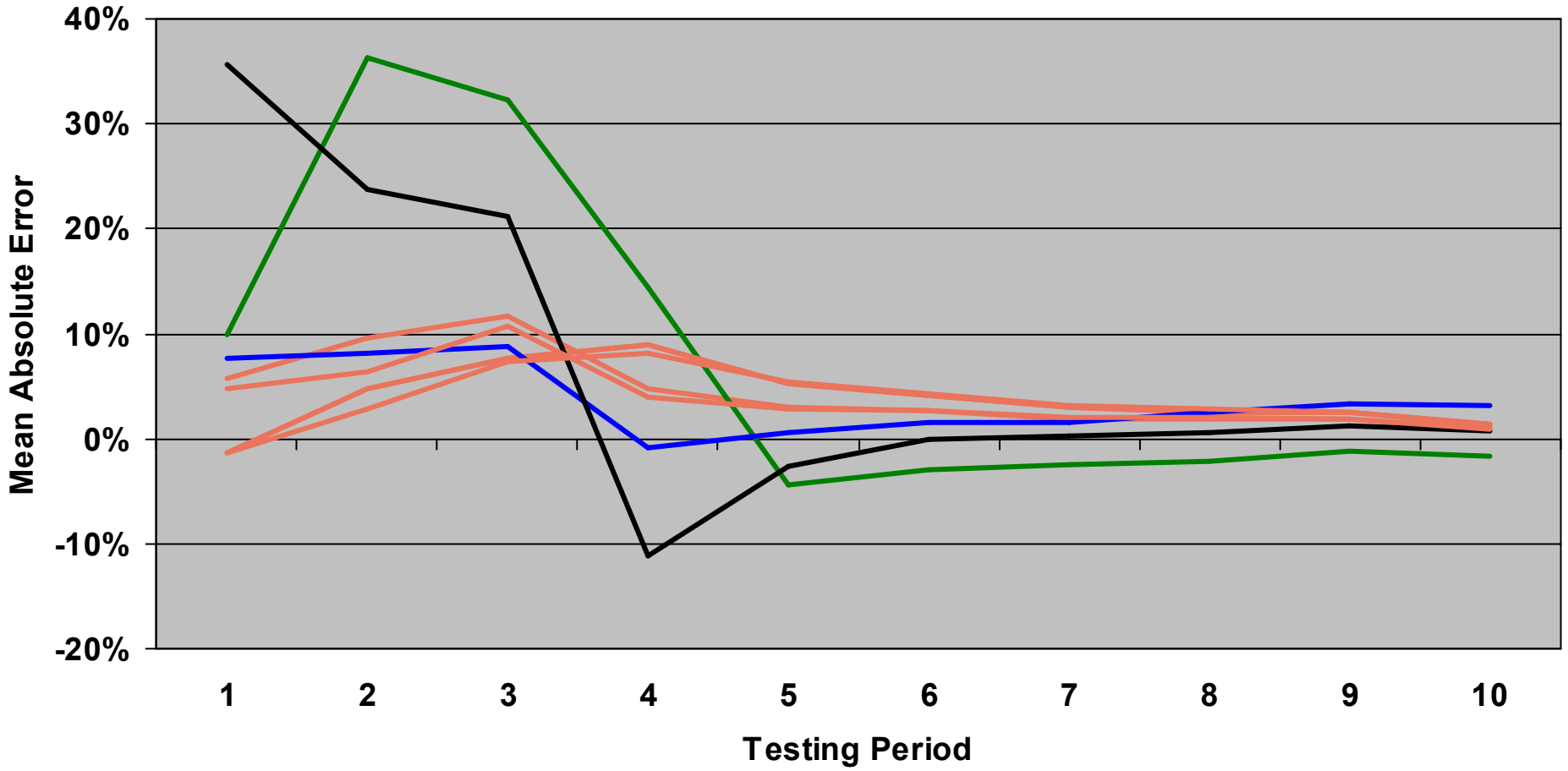
Bubble in the inflation rate

- No method is totally accurate as the bubble is unknown
  - But if you can predict the bubble…
- Otherwise…
  - Methods which attempt to adjust for inflation work well – Taylor
  - Incremental methods are incredibly responsive but incredibly unstable





Recession
When all heck breaks out, DON'T PANIC – the key is stability (and knowing where one's towel is)



Further applications of the paper

Performance Testing in the Italian Market

Further applications of the paper
Italian Market

- No Worker Compensation Insurance in Italy (Public Fund), but …

- This analysis could be applied with some adjustments to Long Tail LoBs as well

- MTPL (50% of GWP Italian market) - Many changes in rules and statistics to investigate
  - Inflation: for several years increase in average severity and decrease in frequency
  - The “Bersani legislation” specifies that for newly registered cars the no claims discount (NCD) offered to a policyholder must match that offered to the driver with the highest NCD level in the household. This likely to result in a general reduction of premiums across the market (not always)
  - “Indennizzo Diretto” : A new knock-for-knock claims handling process called the CARD system has been introduced within the Italian motor market in February 2007, with some changes made in 2008 and 2009 about the “forfait”. New claim classification
  - Recent significant increases in bodily injury awards made by the Milan courts
  - Increase in deductible
  - Modification of Bonus Malus system (work in progress)

Further applications of the paper
Italian Market

- Methods used in Italy with particular reference to MTPL and TPL
  - Fisher-Lange (with some adjustments – reopened claims, etc.)
  - Chain Ladder on Paid and Incurred
  - Taylor (not often)
  - Probably we are “on the average” but …

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