## Reserve Variability Calculations Chain Ladder, R, and Excel

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CANE Meeting

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## Overview

Reproducibility

Powerful Tools

ChainLadder Package

Example in Excel with R in the background

Example in R

MS Office and R

### Love/Hate Relationship?

### Love/Hate Relationship?





North American Actuarial Journal

### **Powerful Combination**





http://www.r-project.org/



http://rcom.univie.ac.at/

## ChainLadder Package hosted on Google Code

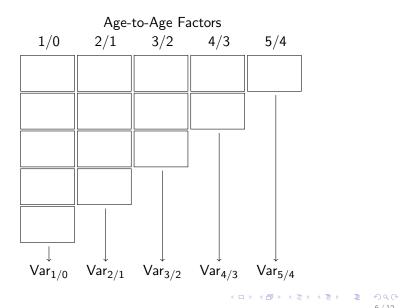
- Reserving functions
  - MackChainLadder
  - MunichChainLadder
  - BootChainLadder
  - MultiChainLadder
- Utility functions for triangles
- Visualization
- Demos

🍘 chainladder - Project Hosting on Google Code - Windows Internet Explorer	
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Outring Installation Installation Outring Outring Used Intel Used Intel Idens	Activity: •• Medium Code license: GNU General Public License v2
	Labels: chainladder, Mack, Munich, R, GNU, Actuarial, Reserving, Insurance, IBNR, chain-ladder, Muthvariate
The new version 0.1.3-3 provides new MultiChainLadder functions and new demos, see demo	External links: Google motion charts with R

Project web page:

http://code.google.com/p/chainladder/

### Mack Chain Ladder Method



### Mack Chain Ladder in Excel and R

#### Example in Excel and **R**.

The Excel workbook used in the presentation is attached to this PDF file. In Adobe Reader go to View>Navigation Panels>Attachments to see the attachments.

## Mack Chain Ladder advantages/disadvantages

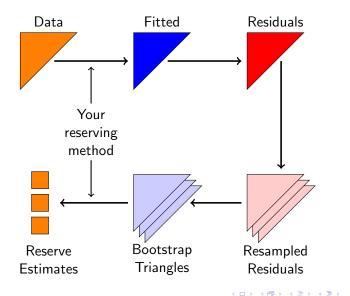
Advantages:

- 1. Easy to explain
- 2. Reserve variability linked to LDF variability
- 3. Easy to implement
- 4. Excel keeps track of the calculation dependencies

Disadvantages:

- 1. Sparse triangles can give you wild answers
- 2. Variance of tail factor hard to determine
- 3. Method provides only mean and variance

### Bootstrap Method



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### Bootstrap Chain Ladder in R

#### Example in **R**.

The R script used in the presentation is attached to this PDF file. In Adobe Reader go to View>Navigation Panels>Attachments to see the attachments.

### Bootstrap advantages/disadvantages

Advantages:

- 1. Non-parametric
- 2. Easy to apply and computationally simple
- 3. Empirical distribution of reserves

Disadvantages:

- 1. Computationally intensive (minor concern)
- 2. Not clear how many replications to do
- 3. Hard to reproduce answers (if you are not careful)
- 4. Tail factor variability

# Integrating MS Office and ${\bf R}$

- 1. Easy to use  ${\boldsymbol{\mathsf{R}}}$  graphics in MS Office
- 2. Easy to exchange data via the clipboard
- 3. **xlsReadWrite** package provides functions to natively read and write Excel files
- 4. Easy to connect with databases (ODBC)
- 5. RExcel and SWord embed R into Excel and Word
- 6. With StatConnector we can use R within MS Office VBA
- 7. With rcom we can manipulate MS Office from R