

# CAS Simulator 2.0

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CAS Simulator 2.0

## Agenda

- Background
- Methodology

## Background

## What is CAS Simulator 2.0?

- A tool to simulate individual claims
- Fitting, simulation and reporting
- Reserve risk analysis
- Four claim classes:
  - ✓ Open claims (IBNER)
  - ✓ IBNR
  - ✓ Future claims (UPR)
  - ✓ Closed claim reopenings.
- R + EXCEL API
- Parallel Computing
- Open source



## Background

## A tool for reserve risk analysis

- Stochastic modeling that generates distributions
- Identifying sources of reserve volatility based on claim data
  - ✓ Claim type
  - ✓ Frequency
  - ✓ Severity
  - ✓ Report lag/settlement lag/reopening
  - ✓ Correlation
- Claim level details allow analysis at any chosen time horizon
- Validating other reserving methods
- Stress testing w.r.t. sources of volatility

## Background

## What is CAS Simulator 2.0?

Sponsored and managed by CAS Dynamic Risk Modeling Committee

Fernando Alberto Alvarado (Chair)

Steven L. Berman	Derek P. Cedar	Sara J. Hemmingson
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Ziyi Jiao	Ronald S. Lettofsky	Daniel W. Lupton
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Daniel M. Van der Zee	Wei Xie	Kun Zhang
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Built by ReservePrism

Robert Bear	Kailan Shang	Hai You
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## Methodology

Parodi, Pietro (2013). Triangle-free reserving : a non-traditional framework for estimating reserves and reserve uncertainty.

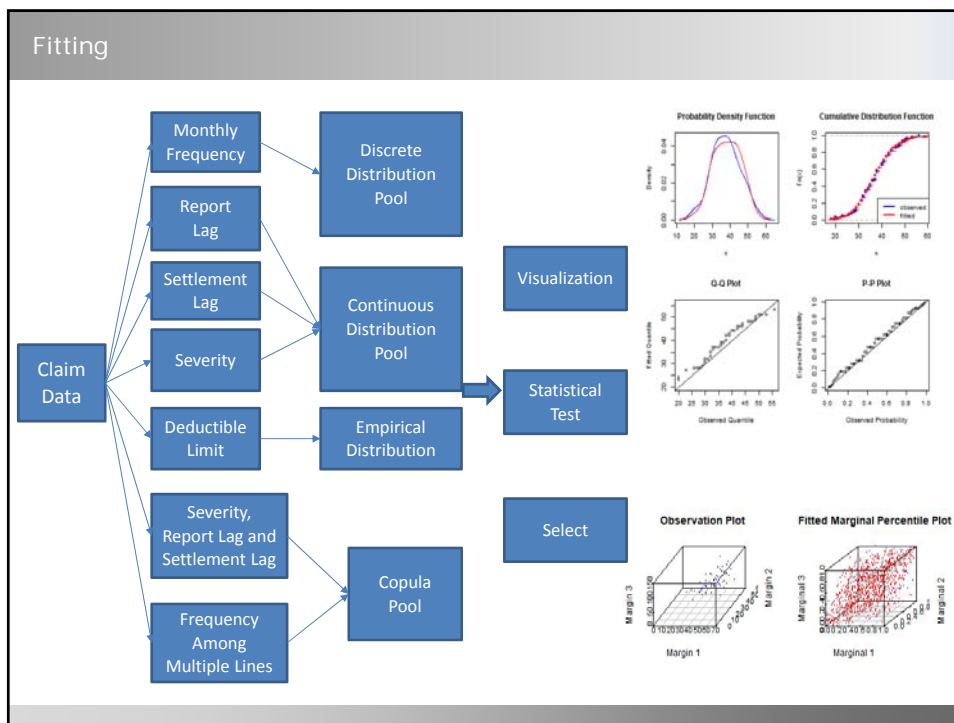
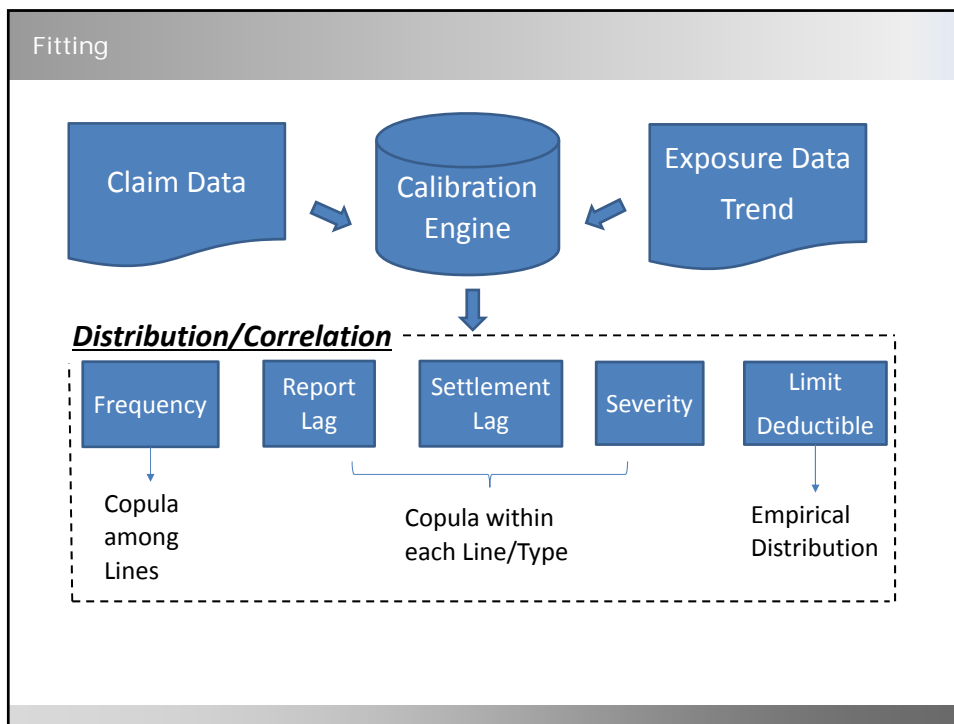
<http://www.actuaries.org.uk/documents/triangle-free-reserving-non-traditional-framework-estimating-reserves-and-reserve>

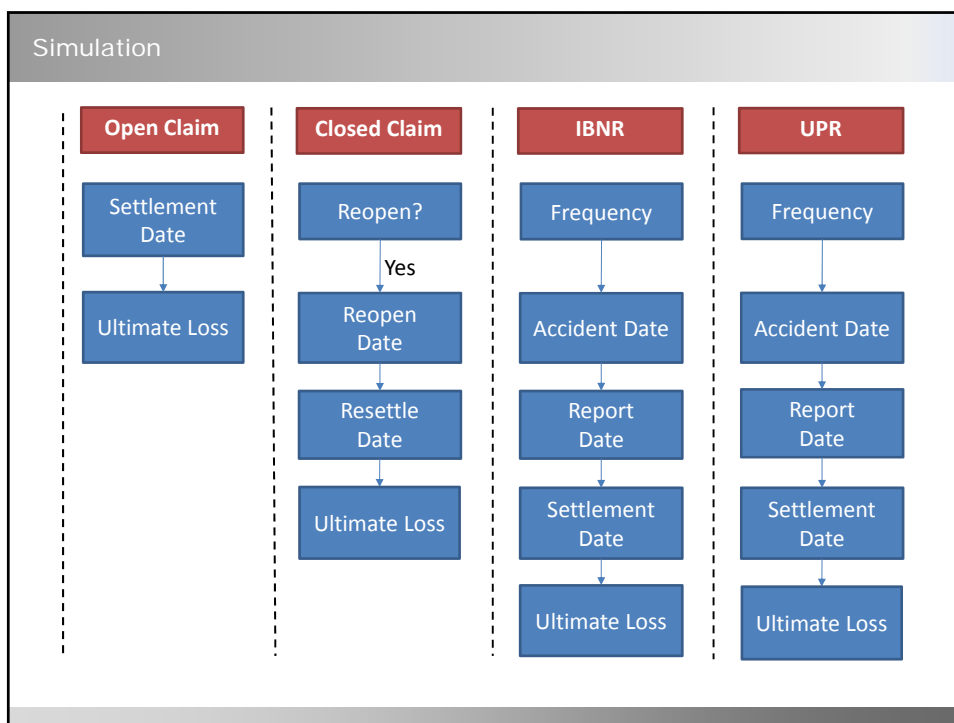
We enhanced it by adding the following:

- Advanced Claim Fitting
- Frequency copula
- Copula among severity, report lag and settlement lag
- Limit and deductible
- Probability of no claim by development year,  $P(0)$
- Conditional loss distribution for open claim loss development
- Closed claim reopenings

Methodology Documentation:

<http://www.reserveprism.com/Simulator2/doc/Simulator2Methodology.docx>





Open Claim Simulation

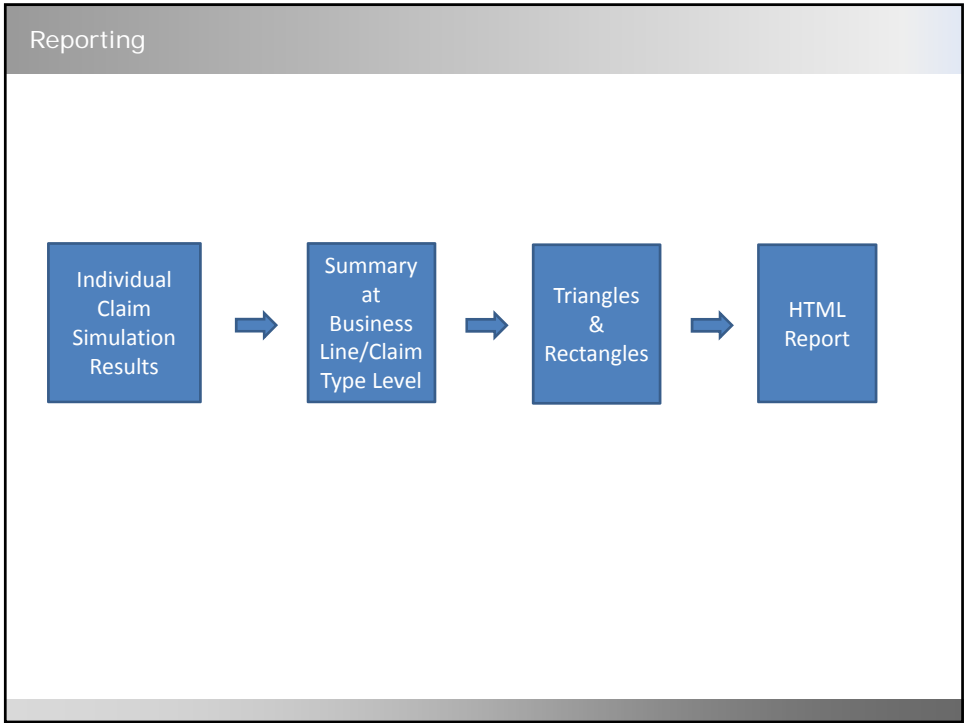
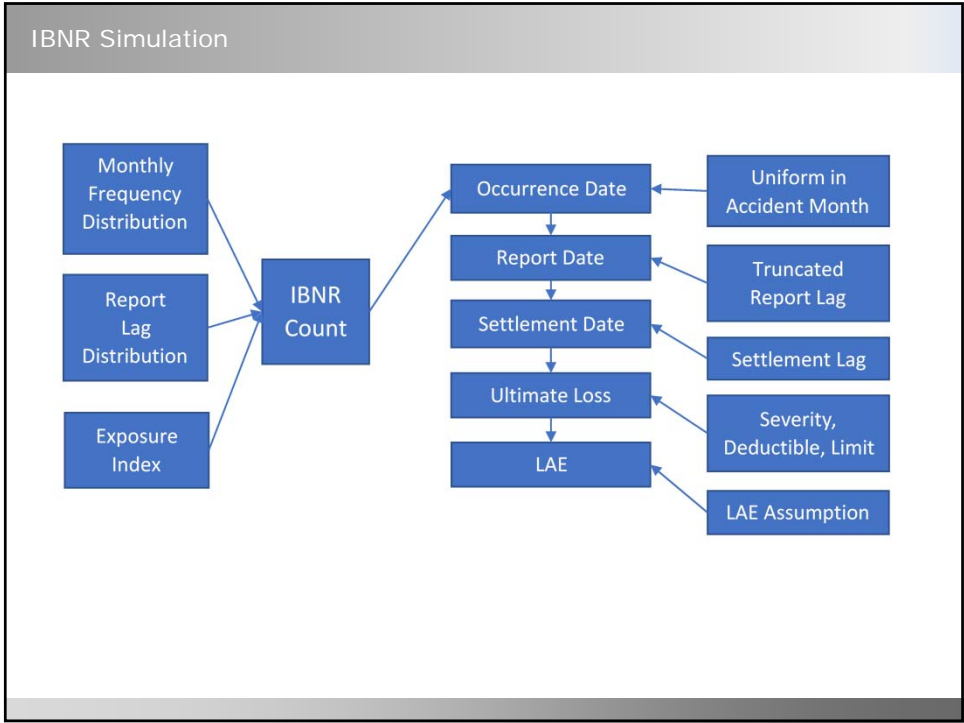
### Loss Development Options

- Year-to-year development factors  
 $10,000 \times (1.15 + 0.043 \times e_1) \times (1.1 + 0.088 \times e_2)$ 

Current Development Year	Year-to-Year Development Factor	
	Mean	Standard Deviation
1	1.200	0.059
2	1.150	0.043
3	1.100	0.088
4	1.050	0.100
5	1	0

Available Distribution:

  - Gaussian
  - Lognormal
  - Gamma
- GLM
  - identity(Linear Function):  $Cumulative\ Development\ Factor = \alpha + \beta_1 d + \beta_2 l + \beta_3 os + \dots + \epsilon$
  - exponential(Loglinear Function):  $Cumulative\ Development\ Factor = \log(\alpha + \beta_1 d + \beta_2 l + \beta_3 os + \dots + \epsilon)$
  - log(Exponential Function):  $Cumulative\ Development\ Factor = e^{\alpha + \beta_1 d + \beta_2 l + \beta_3 os + \dots + \epsilon}$
  - inverse(Reciprocal Linear Function):  $Cumulative\ Development\ Factor = \frac{1}{\alpha + \beta_1 d + \beta_2 l + \beta_3 os + \dots + \epsilon}$
- Conditional loss distribution based on paid loss or incurred loss



<https://www.casact.org/research/lsmwp/index.cfm?fa=software>

- + Current Projects
  - Actuaries Climate Index
  - CAS Research Prizes
  - Committees and Working Parties
  - Committee Resources
- + Past Projects
- + Research Databases
  - Research Resources
  - Suggest a Project
  - Idea Share

HOME | RESEARCH | CAS - SOFTWARE FOR THE LOSS SIMULATION MODEL WORKING PARTY

## LOSS SIMULATION MODEL AND DOCUMENTATION

CAS Loss Simulator 2.0 is an open source R package (casosim.zip), helping actuaries perform transaction data fitting and claim-level loss reserving. It comes with an Excel Front End to assist users with an easy to use interface.

1. [How to Run Loss Simulator 2.0](#) (Read this first; advanced users download product from step 2)
2. [Loss Simulator 2.0 Excel](#) (You only need this file to run)
3. [R Source Code](#) (DIY code for advanced R users)
4. [Loss Simulator 2.0 Architecture](#)(PDF)
5. [Loss Simulation 2.0 Methodology](#)
6. [R Package Example](#) (Run R package directly)
7. [Validation Report](#)
8. [Download a testing claim data](#)

For questions or comments, please contact:  
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For technical issues, please contact Hai You ([hyou@reserveprism.com](mailto:hyou@reserveprism.com))

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### THE CAS ROUNDTABLE



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By Malika Bender

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# Q&A

