Pragmatic Reserving Working Party: Wrap-up and next steps

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Institute and Faculty of Actuaries

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1. **Wrap-up: The Ultimate View of Reserve Risk**
2. Next Steps: 1yr View and Reserving with R

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Wrap-up: The Ultimate View of Reserve Risk

Document currently to be submitted and reviewed by the GI ROC. It will be likely released as an **online book**, so that readers will be able to comment and contribute.

Main sections:

1. Introduction & Scope
2. Data
3. Models
4. Model Validation
5. Monte Carlo simulation

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Wrap-up: The Ultimate View of Reserve Risk

Two target audiences: **actuaries tasked with assessing reserve variability** and **more senior actuaries**, who need to review the reserve uncertainty.

1. **Ultimate vs 1yr View:** What is the difference? Why should we do both?

2. **Sources of uncertainty:** Why usually model error isn't considered? What are the sources of uncertainty in scope?

3. **Stochastic reserving process:** Why there is a need of keeping the traditional ABE process vs Stochastic Methods?

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Wrap-up: The Ultimate View of Reserve Risk

Collection of Best practice recommendations, based on experience and model requirements

1. **Statistical credibility, stationarity and segmentation**

2. **Treatment of outliers:** Should we include peaks in our data or smooth them? NatCat losses?

3. **Data history:** Is it always worth to consider all the data available independently from the LoB duration?

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Wrap-up: The Ultimate View of Reserve Risk

Walkthrough of the most used models in the market …

1. **Mack, ODP and Stochastic BF**, theory and practice (i.e. how to simulate them)

2. **Numerical examples and Excel template/R code** to play with

3. **Model Validation** (residual analysis / heat maps / scatterplots / p-p plots / model specific parameters)

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Next steps

We are planning to re-load the PSRWP with two new work streams:

1. The 1yr View
2. Reserving with R

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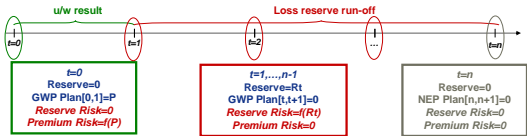16 June 2015   8

The 1yr View "paradox"

- Evaluation in $t=0$
- All the premiums earned only in $t=0+$ (no unearned premium reserves set)
- Business runs off until the end of payments
- **Market &other risks out of scope**

u/w result   Loss reserve run-off

$t=0$	$t=1,\dots,n-1$	$t=n$
Reserve=0	**Reserve=Rt**	**Reserve=0**
GWP Plan[0,1]=P	**GWP Plan[t,t+1]=0**	**NEP Plan[n,n+1]=0**
Reserve Risk=0	*Reserve Risk=f(Rt)*	*Reserve Risk=0*
Premium Risk=f(P)	*Premium Risk=0*	*Premium Risk=0*

- **Premium risk arises only in $t=0$**, due to the planning u/w for the period [0,1]
- **Reserve risk arises for all futures times** ($t=1$ to $t=n-1$), until the full run-off of the reserve in $t=n$

The 1yr View "paradox"

If we focus on Reserve Risk …

"Ultimate view"

$P(t)$, for future CY t

$$CDR_\infty = R_0 - \sum_{\text{future CY } t} P(t)$$

$$VAR(CDR_\infty) = VAR\left(\sum_{\text{future CY } t} P(t)\right)$$

"1y view"

$P(1)$

R_1

$$CDR_1 = R_0 - P(1) - R_1$$

$$VAR(CDR_1) = VAR(P(1) + R_1)$$

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The 1yr View "paradox"

Ultimate View

t=0	CDR(1)	CDR(2)	CDR(n-1)	n
	1yr View	2nd 1yr View	(n-1)th 1yr View	

We can simplify saying that the "1yr View" basically represents how much the actuary will change the reserves accordingly to one year of new observed experience …

COMMON ASSUMPTIONS (for Reserve Risk)

- Currently, it's generally accepted that "1yr View" **is lower/equal than** "Ultimate View"

- Under appropriate assumptions:

  "1st 1yr View" + "2nd 1yr View" + … + "(n-1)th 1yr View" ~ "Ultimate View"

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The 1yr View "paradox"

Let's now consider, in the example, a company that underwrites only a **very long tailed business** … so that it will use a BF method to derive the reserves, using an underlying Chain Ladder for the BF development pattern!

(1)   (2)   (3)

$$BF\_Ultimate = CL\_Ultimate \cdot weight + (1 - weight) \, BF\_priori\_ultimate$$

(1) Its uncertainty is usually a very high number – we know that the ODP/Mack models don't work well for undeveloped origin years …

(2) … but this doesn't matter, as it's weight, depending on the latest paid, is roughly zero (**assumed ~0 payments observed during the first year**)

(3) All the uncertainty is driven by the *BF_priori_ultimate*, which is a kind-of pricing uncertainty (i.e. related to the Premium Risk, but here more related to exposure/risk uncertainty)

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The 1yr View "paradox"

Two main views on the *BF_priori_ultimate uncertainty*:

(A) "Only claims driven"	(B) "Claims and pricing driven"
The prior won't be updated after 1yr because we won't observe anything, thus its uncertainty in the year is 0. It focuses only on Reserve Risk and emerging claims experience.	The prior will have initially a similar uncertainty to the pricing uncertainty (Premium Risk) and later mitigated with the emerging claims experience. We are considering the u/w risk as a whole.

FAQ …

Is the Market Value Margin helping to solve this?	**No, it isn't.** Simply because, under Solvency 2, it's a *cost of capital* measure, not a risk capital requirement
Will the "Common assumptions" of the "1yr View" hold in the (B) case?	**No they won't**, because they are only related to Reserve Risk, whilst (B) blends Premium and Reserve. Besides (B) avoids that the company will be under-funded in the future …
Could it be that the WP will conclude that maybe the "1yr View" framework won't hold in this case and an alternative needed?	Yes – it could be ☺

Aim of the **Working Party** will be to explore the above and find some solutions for the industry!!

Reserving with R

Main objective will be to link as much as possible the "theory" to the "practice":

1. Give to the users the possibility to "try and learn" whilst they go through the theory;
2. Suitable for students (no costs implied)

And …

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Why R?

1. Rich language for statistical modelling and data manipulations
2. Very active user base, which publishes many extension
3. Many interfaces to data bases and other applications
4. Established framework for End User Computing
5. Code written in text files, allowing effective knowledge transfer
6. Built in functions to create reproducible research reports
7. Access to academic research and talent
8. Embraced by blue chip companies like Microsoft, Oracle, SAP

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The ChainLadder package

R package providing methods and models, including:

- Mack chain-ladder, Munich chain-ladder and Bootstrap models
- General multivariate chain ladder-models
- Loss development factor fitting and Cape Cod models
- Generalized linear models
- One year claims development result functions
- Utility functions to:
  - convert tables into triangles and triangles into tables
  - convert cumulative into incremental and incremental into cumulative triangles
  - visualise triangles

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Package vignette

Claims reserving with R:
ChainLadder-0.2.0 Package Vignette

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March 4, 2015

Abstract

The ChainLadder package provides various statistical methods which are typically used for the estimation of outstanding claims reserves in general insurance, including those to estimate the claims development results as required under Solvency II.

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Output of MackChainLadder

- Test model assumptions
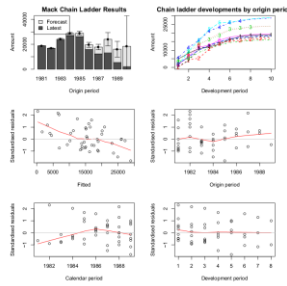
Contribution welcome!

- Visit the ChainLadder project site:
  - **https://github.com/mages/ChainLadder**

- Read:
  - **Computational Actuarial Science with R**
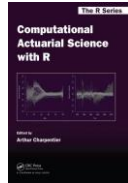
R in Insurance
Amsterdam, 29 june 2015

On the day after this event, June 30th, the workshop
"Rob in Insurance"
will be organized by the University of Amsterdam, on the
occasion of the 65th birthday of professor
Rob Kaas.

www.rininsurance.com

Questions   Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.

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