



Technical Provisions in Reinsurance: The Actuarial Perspective

IAIS Reinsurance Subcommittee
Copenhagen
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on behalf of the International Actuarial Association (IAA)

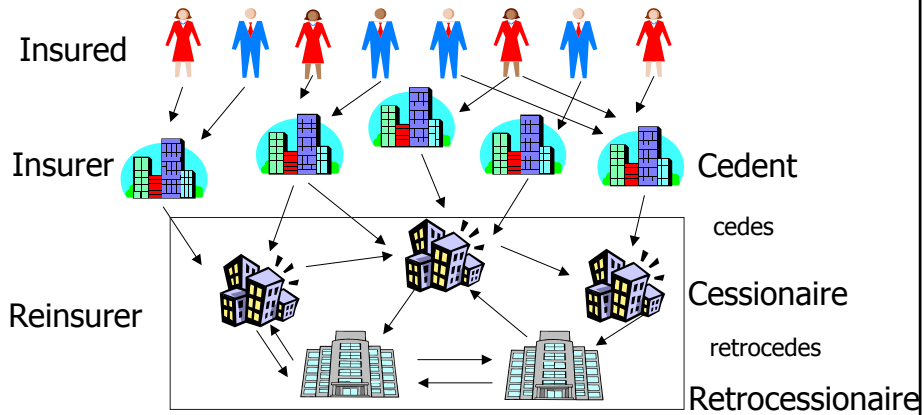


Purpose of this presentation

- Present techniques for setting technical provisions in reinsurance
- Explain challenges faced by reinsurers in doing so
- Give some practical examples
- Provide insight in solutions and how an appropriate actuarial process can support this



The universe of risk transfer

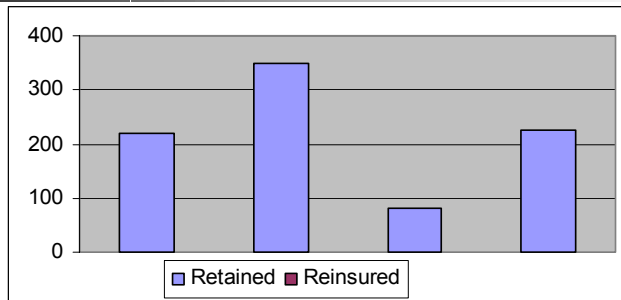


Reinsurance types

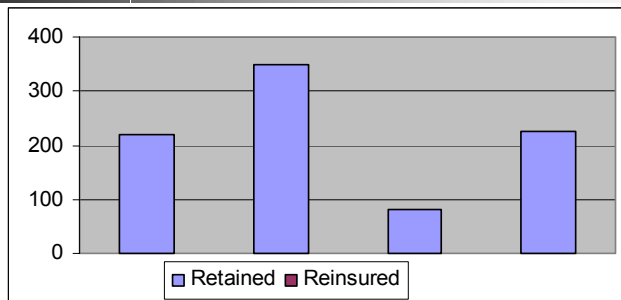
- **Treaty**
 - **Proportional**
 - Quota share
 - Surplus
 - **Non-proportional**
 - Excess of loss (XL)
 - Stop loss
- **Facultative**
- **Mix of the above and Alternative Risk Transfer (ART)**
- Features such as **Aggregates, reinstatements, loss corridors etc** as modifications and extensions



Quota share



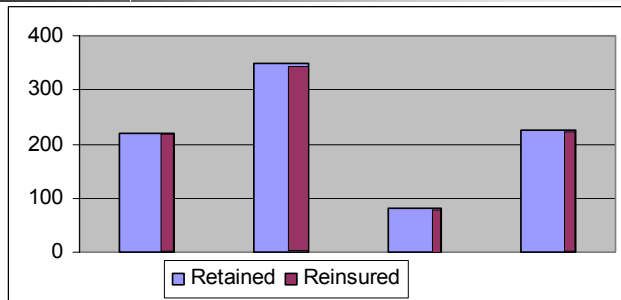
Quota share (20 %)



The reinsurer assumes a fixed percentage of (each and every) claim thereby sharing losses, or profits equally with the cedent.



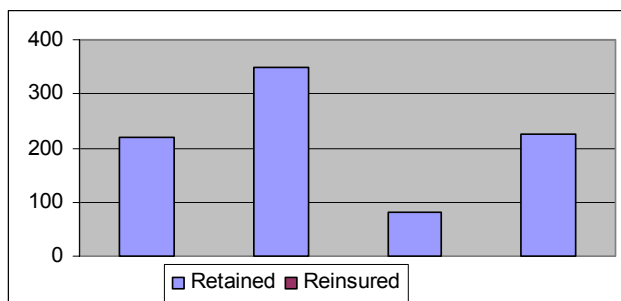
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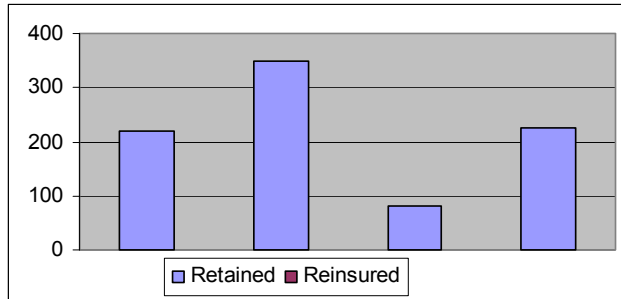
Excess of loss reinsurance





Excess of loss reinsurance

XL with priority = 100

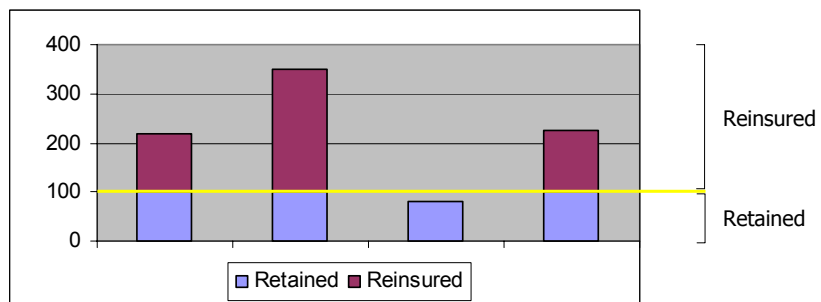


For each loss the reinsurer assumes the amount exceeding the agreed priority.



Excess of loss reinsurance

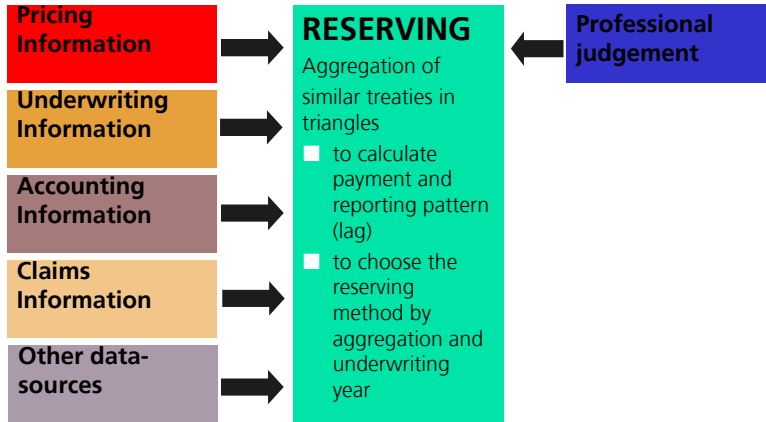
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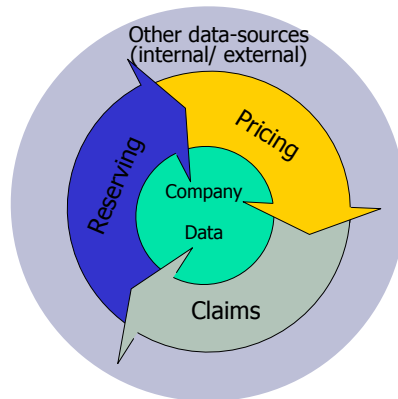


Reserving is not an isolated exercise



Reserving as a process

- Top-down and bottom up
- Feed-back to pricing and claims



- Feed-back to reserving and claims

- Analysis of trends
- Feed-back to reserving and pricing



Setting technical provisions

The estimation of loss reserves is an **inherently uncertain** process as it attempts to **reliably** give an insight into **future** claims emergence. This uncertainty can, but does not necessarily need to, be more pronounced in reinsurance than in primary insurance.

There is a **variety of quantitative techniques/ models** to estimate the ultimate outcome of losses. These techniques have to be supplemented by **professional** and **managerial judgment**.



Setting technical provisions

- Models and their application are **mechanical in nature**
- Results of the models **can be misleading** if not interpreted carefully
- Application of models is only **starting point for discussions** with other departments followed by professional and management judgement



Setting technical provisions

“It is misleading to assume that a formulaic solution to setting technical provisions can be arrived at. Instead, an approach involving best practice guidance and placing responsibility on decision-makers to explain and fully document their work (is) preferable.”

Statement of Groupe Consultatif to European Commission, March 2002



Challenges in setting R/I reserves

- Setting technical provisions in reinsurance is more complicated than in insurance
- Seven Reasons:
 - Longer report lags
 - Reserves typically develop
 - Patterns differ greatly by contract type and LOB
 - Scarcity of industry data/statistics
 - Selected information provided by cedent
 - Heterogeneity of data received
 - Magnified importance of adequate reserve setting



Longer reporting lags

- **Lag:** time expiring between loss occurrence and report to insurer or reinsurer
- Delay due to loss filtering through insurer's system and periodic notification interval to reinsurers
(e.g.: - motor accident with severe bodily injury on Sept 25 (3Q)
 - notified to insurer on Oct 2 (3Q)
 - subsequent inquiries over 3 months to evaluate severity
 - reported to reinsurer in January (1Q next year)
- Danger of undervaluation of serious claims at early stage



Reserves often develop

- Economic and social inflation drive loss costs up (esp. for XoL business)
- Inflation makes losses trigger layers where they did not before
- **BUT:** This can often be accounted for by actuarial methods



Patterns differ greatly by contract type

- Difference by
 - Type of contract (Prop, NP)
 - Reinsurance line / LOB
(Life/Non-Life; Cat, Credit, Liability, Aviation , ...)
 - Specific contract conditions
(Aggregates, limits, instatements, loss corridors, ...)
 - By cedant
(Coverage, terms, conditions of original policies; information is "second hand", filtered, reporting standards differ by cedent)
 - By intermediary
(intermediaries use different "formats" to disseminate information)



Scarcity of industry data/statistics

- Due to differences mentioned before, data is heterogeneous, often "apples and pears"
- Homogenous data hard to collect by account, and particular on an industry basis
- Examples/attempts: RAA statistics in USA; Tillinghast's Global Loss Distribution study for GTPL and ML in Europe



Selected cedent information

- **Cedants typically filter data**
(eg. Loss figures only on claims in excess of attachment point, data transmission errors from erroneous data extraction, accident year statistics have to be converted to underwriting year)
- **Any delivered data has an inherent time lag**
- **No/little data on individual claims, sometimes upon requests**
- **Sometimes disruptive data**
(eg. change in claims handling & reserving practice)
- **R/I requires clear description of data**



Heterogeneity of data

- **Each cedant pays differently**
(fast/slow, partial/complete)
- **Each cedant sets reserves differently**
(what's a small claim, bulk reserves, reserve to limits/worst case, expected salvage & subrogation, ...)
- **Coding/interpretation: What's a loss, what is loss adjustment expense, what is a case reserve?**
- **System changes over time**



Adequate reserve setting

- Setting reserves is not a mechanic exercise, but a process of making informed decisions in light of the preceding 6 points
- Q/S driven by underlying rates and conditions (rate and terms changes)
- Allow for anticipated or observed trends and changes



Why reinsurance reserves do not have to be “riskier”

- **Again:** reinsurance actuaries know of the seven challenges
 - they have known them for long
 - they know how to deal with it methodologically and via professional judgment
 - Historically, they usually developed the reserving methods which the primary companies picked up later




Why reinsurance reserves do not have to be “riskier”

- Most important **advantage** of reinsurers
 - R/I have a much **broader overview**, usually globally
 - For example, they see not on ONE motor account in a country (like a primary insurer), but MANY accounts and practices
 - Because of this, they are **able to anticipate emerging trends** much earlier than primary insurers
 - This is also the reason why reinsurers usually perform an advisor and consulting task to insurers



Reserving requires 2 elements

- Premiums
reflect exposure and volume
- Losses
information on claims materializing
- **LOSS RATIO = LOSSES / PREMIUMS**
- Both are a function of losses* !!!
 Both need to be estimated !

* Premiums are often loss sensitive, eg. Reinstatements, sliding scales,



Premium elements

- **Premium elements are:**
 - Written Premium (WP)
 - Written Premium Accruals (WPA)
 - Earned Premium (EP)
 - Unearned Premium Reserves (UEPR)
 - Commission (are disregarded for simplicity)



Premium elements

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 - Written Premium (WP)
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 - **Earned Premium (EP)**
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Reserves must be set in respect to exposed risks, ie. the earned portion

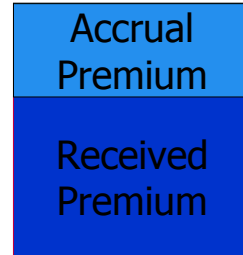


Written premium accrual

Written Premium Accrual =

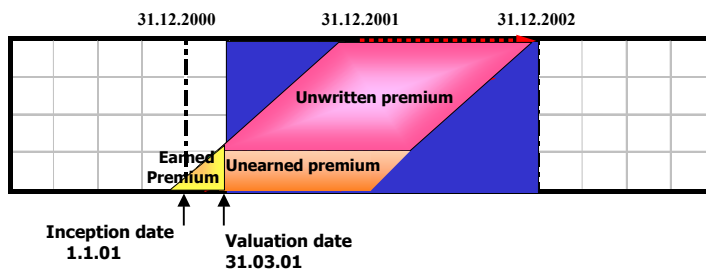
Written Premium

- Received Premium



Premiums : An Example

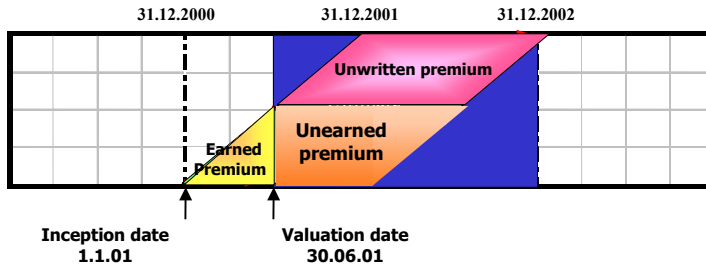
12 Months treaty, 12 Month underlying Policy,
Risk Attaching Base
Valuation Date : 31.03.01





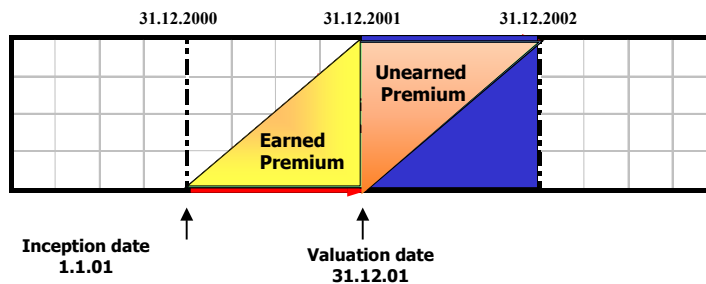
One quarter later ...

12 Months treaty, 12 Month underlying Policy,
Risk Attaching Base
Valuation date : 30.06.01



At the end of the year

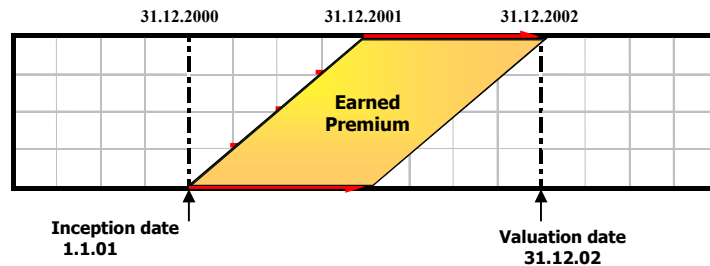
12 Months treaty, 12 Month underlying Policy,
Risk Attaching Base
Valuation date : 31.12.01





Two years after writing the policy

12 Months treaty, 12 Month underlying Policy,
Risk Attaching Base
24 months after the inception



Loss elements

■ **Loss side :**

- Paid losses
- Reported case reserves
- Additional case reserves (ACRs)
- Incurred but not reported losses (IBNR)
- Ultimate Losses, or Ultimate Loss Ratio
- Combined Ratio (ie. including commissions)



IBNR - Reserves

- IBNR is composed of two elements:
 - "IBNYR": Incurred Claims but not **yet** recorded
 - "IBNER": Incurred but not enough reported (i.e. the difference between the unpaid amounts recorded by the claim file, ie. case reserve, and the estimated total loss liability as of a particular valuation date).



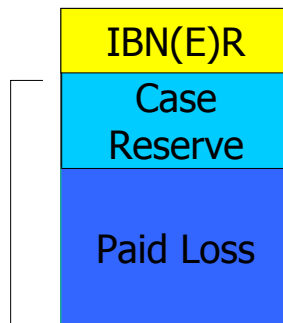
IBNR - Reserves

Estimated Ultimate Loss =

Unreported Loss

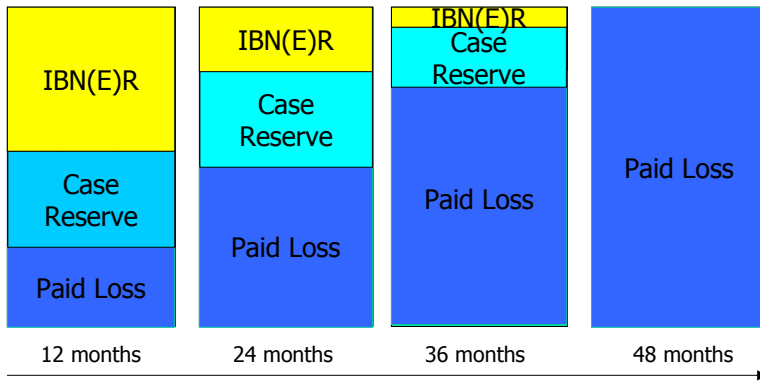
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Reported Loss

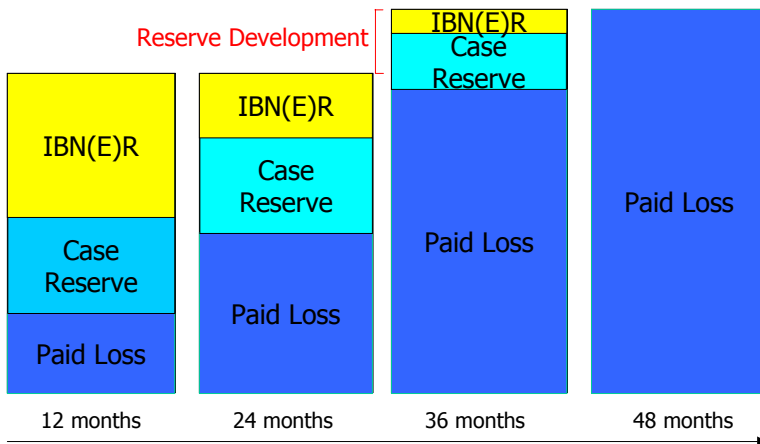




Estimating expected ultimate losses



Revising estimated ultimate losses upwards over time





How to find out: the reserve process

- Regular **reserve analyses**
- General approaches:
 - Bottom up: evaluating & reserving each transaction
 - Top down: traditional actuarial triangle approach
- Both methodologies ideally reconcile, otherwise in-depth analysis
- **External** independent checks done by auditors or regulators per year end



Slicing and dicing the portfolio

- Analysis by reasonable partition of portfolio into homogeneous segments
 - eg partition by
 - type and line of business ("LOB")
 - region
 - currency
 - client
 - profit center, etc.



Traditional reserving methods

- Common reserving methods:
 - (Pricing) Loss Ratio
 - Chain Ladder (Paid & Incurred)
 - Bornhuetter-Ferguson (Paid & Incurred)
- Frequently used alternatives/extensionations
 - Cape Cod Method
 - Berquist Sherman Method
 - Benktander Method
 - Thomas Mack Model
 - Reserving by scenarios (Non-Traditional)



Lag factors are used to project EstUltL

- The reinsurer depends on the ceding company to regularly (annually, quarterly) release premium and loss information affecting the reinsurer.
- The time between the release of this information from the ceding company to the reinsurer is called **time Lag**, the %-increase the **lag factor** and the aggregation **Loss Development Factors (LDF)**



Loss Development Factors/ Lag Factors

- There are 2 types of loss development factors/Lags:
 - **Paid Loss LDF/Lag :**
Developed from (underwriting year) paid loss triangles
 - **Incurred LDF/Lag :**
Developed from (underwriting year) incurred triangles
- In order to develop these triangles contracts have to be grouped into homogeneous partitions
- Incurred and Paid loss triangles are developed by partition and by underwriting year.



Expected Loss Ratio Method

- Generates an Expected Ultimate loss based on Pricing Expectation
 - $\text{Ultimate Loss} = \text{Ultimate Premium} * \text{ELR}$
 - $\text{Unreported Loss (IBNR)} = \text{Ultimate Loss} - \text{Reported Losses}$
- Assumes that Ultimate losses and Reported Losses are totally uncorrelated
- Is assumed to be valid for "green" years for which loss experience as of the valuation is not yet deemed credible.



Loss Development Method

- The loss development method totally ignores pricing information and evaluates the contract ultimate loss based entirely on the loss experience of the contract and expected further loss development.
- Ultimate Loss =
Reported Loss * Loss Development Factor
- Can be calculated on Paid or on Incurred basis



Bornhuetter Fergusson Method

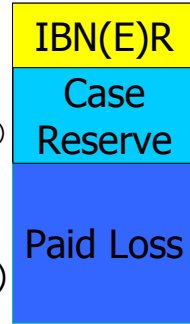
- This method weights **actual** loss experience as of the valuation date with pricing **expectations**
- The weight is given by the lag :
 - 100% lag = we believe 100% what is booked, no more development,
 - 0% lag = we believe 100% what the U/W indicated or what was priced
- Calculated IBNR are totally uncorrelated with the loss experience of the contract



How to estimate IBNR

Unreported Loss ($IBNR_t$) =

- 1. Expected Ultimate Loss – Reported Losses t
--> **Expected Loss Ratio Method**
- 2. Reported Loss t * Loss Development Factor (t,inf)
– Reported Loss t
--> **Loss Development Method
(Chain Ladder Method)**
- 3. Expected Ultimate Loss * (% not yet reported t)
--> **Bornhuetter Ferguson Method**



| U.Y. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 1992 | 7'155 | 7'382 | 7'383 | 7'428 | 7'952 | 8'018 | 8'035 | 8'143 | 8'097 | 8'117 |
| 1993 | 3'486 | 3'917 | 3'948 | 4'341 | 4'202 | 4'185 | 4'337 | 4'493 | 4'548 | |
| 1994 | 13'805 | 13'765 | 14'073 | 15'572 | 15'533 | 15'851 | 15'787 | 15'786 | | |
| 1995 | 33'152 | 34'431 | 33'656 | 33'566 | 33'497 | 33'301 | 33'329 | | | |
| 1996 | 5'627 | 5'852 | 5'470 | 5'542 | 5'355 | 5'445 | | | | |
| 1997 | 11'689 | 12'146 | 11'930 | 11'206 | 10'926 | | | | | |
| 1998 | 3'443 | 3'916 | 3'263 | 3'176 | | | | | | |
| 1999 | 5'509 | 5'662 | 5'398 | | | | | | | |
| 2000 | 7'666 | 6'734 | | | | | | | | |
| 2001 | 9'673 | | | | | | | | | |
| Lags | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | |
| 1992 | 1.032 | 1.000 | 1.006 | 1.071 | 1.008 | 1.002 | 1.013 | 0.994 | 1.002 | |
| 1993 | 1.124 | 1.008 | 1.100 | 0.968 | 0.996 | 1.036 | 1.036 | 1.012 | | |
| 1994 | 0.997 | 1.022 | 1.106 | 0.997 | 1.020 | 0.996 | 1.000 | | | |
| 1995 | 1.039 | 0.978 | 0.997 | 0.998 | 0.994 | 1.001 | | | | |
| 1996 | 1.040 | 0.935 | 1.013 | 0.966 | 1.017 | | | | | |
| 1997 | 1.039 | 0.982 | 0.939 | 0.975 | | | | | | |
| 1998 | 1.137 | 0.833 | 0.973 | | | | | | | |
| 1999 | 1.028 | 0.953 | | | | | | | | |
| 2000 | 0.878 | | | | | | | | | |
| Averages: | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 | 6-7 | 7-8 | 8-9 | 9-10 | tail |
| All Simple | 1.035 | 0.964 | 1.019 | 0.996 | 1.007 | 1.009 | 1.016 | 1.003 | 1.002 | 1.000 |
| All weighted | 1.025 | 0.978 | 1.014 | 0.998 | 1.004 | 1.002 | 1.009 | 1.001 | 1.002 | 1.000 |
| 3yr Simple | 1.015 | 0.923 | 0.975 | 0.980 | 1.011 | 1.011 | 1.016 | 1.003 | 1.002 | 1.000 |
| 3yr weighted | 0.982 | 0.948 | 0.964 | 0.989 | 1.004 | 1.002 | 1.009 | 1.001 | 1.002 | 1.000 |
| All x Hi/Lo | 1.043 | 0.976 | 1.018 | 0.985 | 1.007 | 1.002 | 1.013 | 1.003 | 1.002 | 1.000 |
| Avg of Avg | 1.020 | 0.958 | 0.998 | 0.989 | 1.007 | 1.005 | 1.013 | 1.002 | 1.002 | 1.000 |
| Selected: | 1.020 | 1.000 | 1.000 | 1.000 | 1.004 | 1.002 | 1.009 | 1.001 | 1.002 | 1.000 |
| Cumulative | 1.039 | 1.019 | 1.019 | 1.019 | 1.019 | 1.015 | 1.013 | 1.003 | 1.002 | 1.000 |



Synopsis: Estimated Ultimate Loss

- Loss estimate for the entire life of the treaty, ie. the amount expected spent by the time the contract is “dead”
- Based on :
 - Underwriting/Pricing information (Expected Loss)
 - Loss experience as of the valuation period (Paid loss, Case reserve,...)
 - Development information for partition (lag factor)
 - Ultimate Premium (ie. including reinstatements, APs, ...)
- $\text{Ultimate Loss Ratio} = \text{Ultimate Losses} / \text{Ultimate premiums}$
- Usually, for each method done on a paid and incurred basis



Summary

- Setting technical provisions is a blended process of
 - understanding the data
 - applying and comprehending the mechanics of each method
 - carefully interpreting the results
 - balance/validate results with insight from claims, u/w, accounting and management
 - making a professional judgment as to the adequate technical provision



Summary

- Setting reserves in reinsurance poses the challenge to appropriately and reliably estimate future claims in emergence in an environment with scarce and/or late data
- It is more of a challenge in reinsurance than in primary insurance, but reinsurers
 - have developed methods to deal with it
 - can compare/anticipate trends much better than insurers due to their much broader overview
- There is no general recipe to setting technical provisions
- There is no universally applicable method or tool, and there should not be one as it can not replace professionalism