



Underwriting Risk Measurement in Non-Life Insurance

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Measurement by line of business, (re)insurance firm & accident year

- Financial records → aggregate data
- Earned premium as *proxy* for exposure
- Runoff triangles:
 - cash-flows for benefits & ALAE
 - claims *provision*

Probability Models: Mirror for Measurement

- *Actuarial Ruin Theory*
 - Inspired by gambling
 - Mathematical beauty
 - Can we apply it?

- *Insurance as an economic activity*
 - The real, ever-changing world
 - Just mathematical statistics
 - Useful for solvency calibration

Fixed (un)known parameters

- Law of large numbers for large portfolios
- No correlation between lines of business
- No correlation between (re)insurance firms

Similar to gambling casino
Less relevant for insurance industry

Fluctuating parameters through time

- Due to economic & demographic conditions, changes in technology, weather, etc.
- No law of large numbers
- Correlation between lines of business
- Correlation between (re)insurance firms

Mean and variance premium risk

- Premium x
Aggregate loss y
- $E(y) = \beta x$
- $V(y) = \delta x + (\sigma x)^2$

Mean and variance in terms of loss ratio

- Loss ratio $q=y/x$
- $E(q)=\beta$
- $V(q)=\delta/x + \sigma^2 \approx \delta/x$ small portfolios
 $\approx \sigma^2$ large portfolios

Three approaches for solvency calibration

- ***Full specific***
All parameters firm-specific
- ***Partial specific***
Loss ratio parameters firm-specific
Dispersion parameters industry-common
- ***Non-specific***
All parameters industry-common

- Short time series: risk of overfitting?
- Needs correction for downward bias
- Fuzzy industry scatter in (x, SCR) -plane
- Needs wise calibration-choice

- (log)normal randomness
- Variance y proportional to x or x^2
- Dispersion: standard deviation or coefficient of variation
- Focus on goodness-of-fit in uppertail

- Similar methods as premium risk, where
 - total claims provision at financial year end takes the role of exposure x
 - aggregate loss incurred in financial year, for all runoff accident years, becomes y
 - loss ratio parameter $\beta = 1$
- Some chainladder related methods
 - Merz & Wüthrich (2008)
 - overdispersed Poisson

Joint Working Group Calibration Underwriting Risk Factors



Steps in the near future:

- Manual on methods (in process)
- Receipt of data by firm & line of business
- Data handling
- Application of methods
- Analysis of results
- Final report mid-March 2011



Thank you for your attention

Any questions?

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