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Measuring Loss Reserve Uncertainty

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- What is Loss Reserve Uncertainty (LRU)?
- Why is it important to measure LRU?
- What are the pitfalls in measuring LRU?
- How can these pitfalls be avoided?
- How does our method work?
- How do we know that it is accurate?
- What are the advantages of this method?
- What are the limitations of this method?

1. What is Loss Reserve Uncertainty (LRU)?

- **Loss Reserves:** estimates of the total future payments needed to settle claims on accidents that have already occurred
- **LRU:** a measure of potential loss reserve development – paying out more (or less) than was estimated
 - Includes both **process risk** and **parameter risk**
- **The Proposed Measure of LRU:** the coefficient of variation of the reserve = the standard deviation of the reserve as a percent of the estimated reserve

2. Why is it important to measure LRU?

Issues

- Estimating surplus adequacy
- Capital allocation and pricing
- Managerial feedback: is this deviation significant?
- Reinsurance

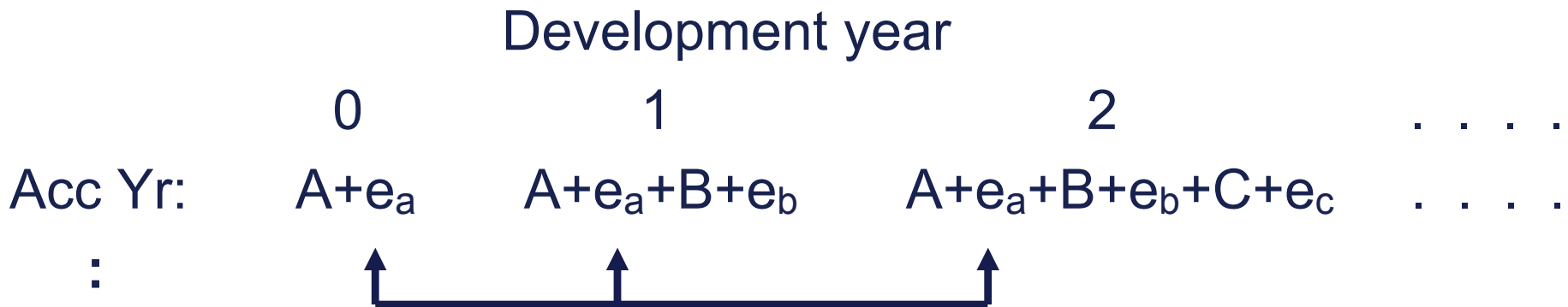
Audiences

- Management
- Rating agencies and regulators
- Analysts and investors
- Management: actuary, CFO, CEO
- Management
- Management

3. What are the pitfalls in measuring LRU?

- **Data:** paid loss triangles

Pitfall 1: Correlated disturbances created by cumulative data



Pitfall 2: Heteroskedasticity: $\sigma(e_a) \neq \sigma(e_b) \neq \sigma(e_c)$

These pitfalls may have little effect on estimates of reserves, but they **totally distort estimates of LRU**

4. How can these pitfalls be avoided?

- Avoid **Correlated disturbances** by **decumulating data**
 - Incremental paid losses make DY's independent of one another
- Avoid **Heteroskedasticity** (unequal error σ 's) by **analyzing development years separately**
 - Alternative approaches make strong and unverifiable assumptions about development year standard deviations
 - The risk in doing so is assuming what we are trying to measure
- Other pitfalls are addressed in the paper

5. How does our method work?

Table 3: Accident Year x Development Year Incremental Paid Losses

Accident Year	Development Year									
	0	1	2	3	4	5	6	7	8	9
0	624	971	471	300	193	126	80	53	42	35
1	695	808	473	319	201	135	96	57	47	
2	668	809	491	295	184	115	83	63		
3	696	844	515	302	194	148	107			
4	770	900	555	358	239	162				
5	690	825	536	384	231					
6	544	777	537	332						
7	563	792	497							
8	593	823								
9	621									

- Start with an Acc Yr x Dev't Yr incremental paid loss triangle
- Use DY0 to fit and forecast paid losses in future dev't years
- Use Salkever (standard textbook) method to forecast each future loss payment and its standard error, and to estimate variance-covariance matrix of forecast errors for each DY
- Aggregate results to obtain LRU by Dev't Yr, Cal. Yr, & Total

6. How do we know that this method is accurate?

Validation Procedure:

- We simulated (to ultimate) 10,000 stochastic loss reserve triangles, for each of several specified sets of parameters
 - Exponential decay for paid losses
 - Specified σ 's of losses for each development year
- We applied our method (automatically) to each triangle to generate estimates of reserves and of LRU
- **The estimates obtained were (on average) virtually identical to the known parameters of the simulation, both for estimated reserves and for loss reserve uncertainty**

7. What are the advantages of this method?

- It is **dramatically simpler** than most rival methods. (The paper includes critical Excel code)
- It **avoids severe statistical problems** with rival methods
- It is **based on a standard econometric method**, in use for thirty years, that is advocated by leading textbooks
- It has been **thoroughly validated** via simulation
- It **enables comparisons of different lines of business within a firm**
- It **enables comparisons of a line of business across multiple firms**
- It is **scalable**, so that LRU can be applied to reserves estimated by other methods

8. What are the limitations of this method?

- The method permits a gradual speedup or slowdown in payme patterns over time, but otherwise **assumes a stable past and future environment** with regard to
 - Underwriting criteria
 - Exposure types
 - Reinsurance parameters
 - Legal and Regulatory environments
- **Estimating the tail is difficult** with this method as with others
- It necessarily **relies on public data**, and so **does not reflect claims-level data** available only to the firm

9. How can I learn more about this method?

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