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Learning Without Bounds

Project Learning Goals

- Extract, summarize, and analyze the data needed for a loss development study:
  - Earned Premiums
  - Paid Loss Triangle
  - Reported Loss Triangle
- Extract a claim listing needed to fit a size of loss distribution
- Employ multiple approaches to the same problem and make informed choices between results of different approaches

Project Requirements

- Pretend you work for Imagine Insurance and your boss has asked you to provide analysis to support a reinsurance transaction being considered
  - You have a large book of long-tailed US casualty business with policy limits up to $5,000,000 per occurrence
  - Imagine Insurance is considering purchasing excess of loss reinsurance for the layer $4,000,000 excess of $1,000,000
  - Management would like an estimate of the percentage of total losses that would be ceded under this reinsurance coverage
  - You have 10 years worth of detailed policy and claim data in your dataset to use for this analysis

Simplifying Assumptions

- The book has been very stable
- There are no exposure, frequency, or severity trends
- There have been no changes in coverages or limits written
- The book contains no Worker's Compensation exposures
- There have been no changes in claims handling processes
- The severity distribution for this book is known to be best modeled by the Lognormal distribution

- In P&C and Health, individual claims “develop” over time
  - Lag from time of occurrence until claim reported
  - Lag from time claim reported until final settlement
  - Larger and more complicated claims tend to have longer lags and more volatile development
- Key actuarial task is to estimate the ultimate value of collections of claims based on available data

Actuarial Concepts: Development Triangles

Accident Years Ending	Cumulative Amounts at Various Ages of Development (Months)									
	12	24	36	48	60	72	84	96	108	120
12/31/2005	1	2	3	4	5	6	7	8	9	10
12/31/2006	1	2	3	4	5	6	7	8	9	
12/31/2007	1	2	3	4	5	6	7	8		
12/31/2008	1	2	3	4	5	6	7			
12/31/2009	1	2	3	4	5	6				
12/31/2010	1	2	3	4	5					
12/31/2011	1	2	3	4						
12/31/2012	1	2	3							
12/31/2013	1	2								
12/31/2014	1									

- Various distribution functions are used to model loss severity, most have heavy right tails
- Limited Expected Value (LEV) function can be used to model the relative costs of layers of losses
- LEV for a pdf f(x) limited to d is:
  - $E[x \wedge d] = \int_0^d x f(x) + d \int_d^\infty f(x)$