Introduction to Exposure Rating

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Agenda

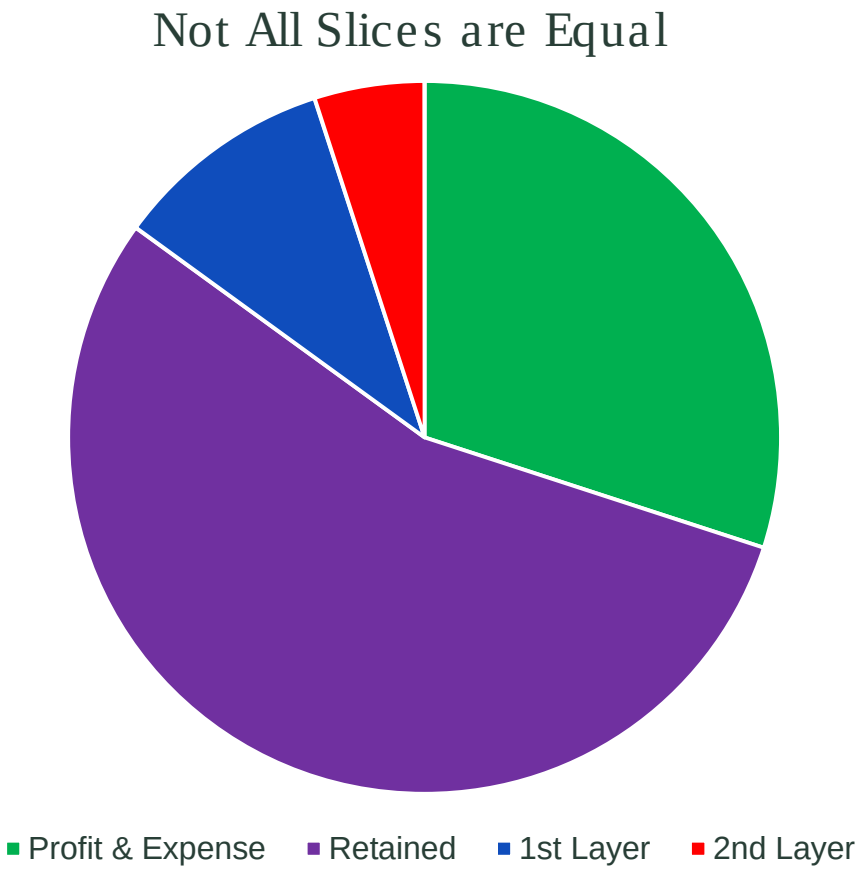
- Overview
- Liability
- Workers Compensation
- Property
- More Advanced Issues

Overview

What is Exposure Rating

- Similar to manual rating in primary insurance
- Each dollar of expected loss is allocated to losses by layer
- Uses industry data and/or reinsurer data to gauge the severity of loss
- Used as another view to the company's experience
- Based on the recent or expected book of business

Reinsurers Slice of the Pie



When Exposure Rating Works Well

- The company resembles the industry
- Experience is limited in volume to be relied on
- The past won't predict future well, due to company changes in
  - Classes
  - Limits
  - States
- Uses industry data and/or reinsurer data to gauge the severity of loss
- Used as another view to the company's experience
- Based on the recent or expected book of business

When Exposure Rating Works Poorly

- Industry curves are unavailable
- Exposure data is incomplete or unreliable
- The company is unique (typically a niche writer)
- Experience rating is very robust and stable

Steps of All Exposure Rating

- Obtain the subject premium for the line of business for the upcoming treaty year
- Determine the ELR of the line to calculate expected loss
- Segregate the premium by segment of similar severity
- Determine the Loss in each layer for each segment, using excess factors for each band
- Aggregate the losses for each segment
- Compare with experience rating

Liability

Liability - an ILF Approach

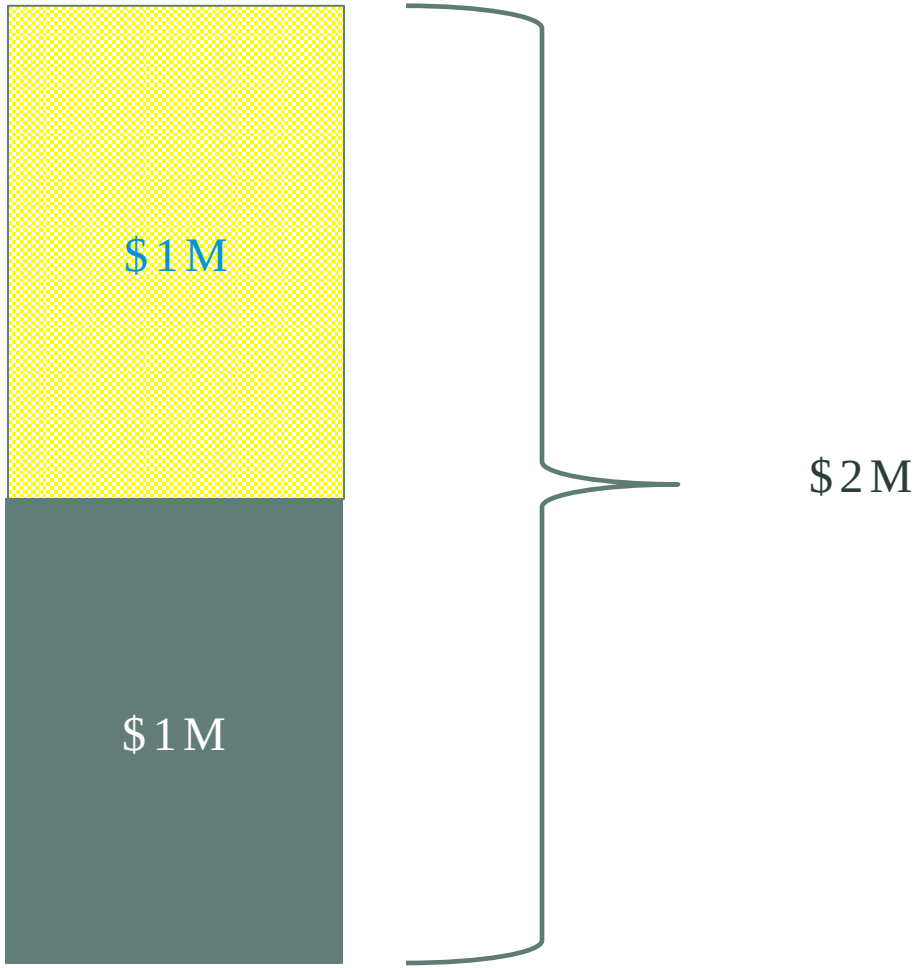
Most liability lines use Increased Limit Factors in their manual rating

- Examples: Auto Liability, General Liability, Professional Liability and Umbrella
- ILFs are typically loaded for risk in primary ratemaking (higher profit)
- For Exposure rating, we will be using pure ILFs, which just reflect the difference in loss severity

One Policy Example

- $2M Policy
- $1M x $1M reinsurance layer
- Policy Premium =$10,000

Limit	ILF
100,000	1.00
250,000	1.70
500,000	2.00
1,000,000	2.50
2,000,000	3.00



One Policy Example

- 2M Policy
- 1M x 1M reinsurance layer
- Policy Premium =$10,000

Limit	ILF
100,000	1.00
250,000	1.70
500,000	2.00
1,000,000	2.50
2,000,000	3.00

Step 1 – Calculate Total Expected Loss
$10,000 x 60% ELR = $6,000

Step 2 – Determine Base Expected Loss
Total EL/ ILF_{2M} = $6,000 / 3.00 = $2,000

Step 3 – Determine Layer Loss Cost
Base EL * (ILF2M – ILF_{1M}) = Layer Loss cost
$2,000 = (3.00-2.50) = $1000

General Formula

$$\text{Base EL} * (\text{ILF}_{\text{Top}} - \text{ILF}_{\text{Bottom}}) = \text{Layer Loss}$$

- Drawing a picture is good to see what you are doing when you may be unsure
- Top of layer is the lower of the policy limit and the upper limit of the reinsurance
- Deductibles/SIR can make a big difference in the calculation

Treaty Calculation

- Works just like the one policy example, but over all policies
- Like policies can be grouped (same limits and ILF structure)
- Easily automated via spreadsheets or other computer systems
- Generally assume that loss ratios are uniform by limit

Treaty Calculation - Example

State	Premium	%
IL	1,000,000	33.3%
NY	2,000,000	66.7%

Limit	Premium	%
1,000,000	2,000,000	66.7%
2,000,000	1,000,000	33.3%

Table	Premium	%
1	1,000,000	33.3%
2	1,500,000	50.0%
3	500,000	16.7%

State	Limit	Table	%
IL	1,000,000	1	7.41%
IL	2,000,000	1	3.70%
IL	1,000,000	2	11.11%
IL	2,000,000	2	5.56%
IL	1,000,000	3	3.70%
IL	2,000,000	3	1.85%
NY	1,000,000	1	14.81%
NY	2,000,000	1	7.41%
NY	1,000,000	2	22.22%
NY	2,000,000	2	11.11%
NY	1,000,000	3	7.41%
NY	2,000,000	3	3.70%

Different Variables In The ISO Plan for Commercial Auto and General Liability

- State – several states have their own set of ILFs, smaller states are grouped based on similar severity
- GL Table Assignments – each class code has a table assignment
  - For example Amusement Parks 10020 is 2B
- Prem/Ops Products have tables 1, 2 and 3 Products/Completed Ops have Tables A, B and C
  - For example, Amusement Parks is class 10020 is assigned tables 2B, so table 2 for Prem/Ops and B Products
- Commercial Auto is split by vehicle type (Light & Medium, Heavy, Extra Heavy, Zone Rate and All Other

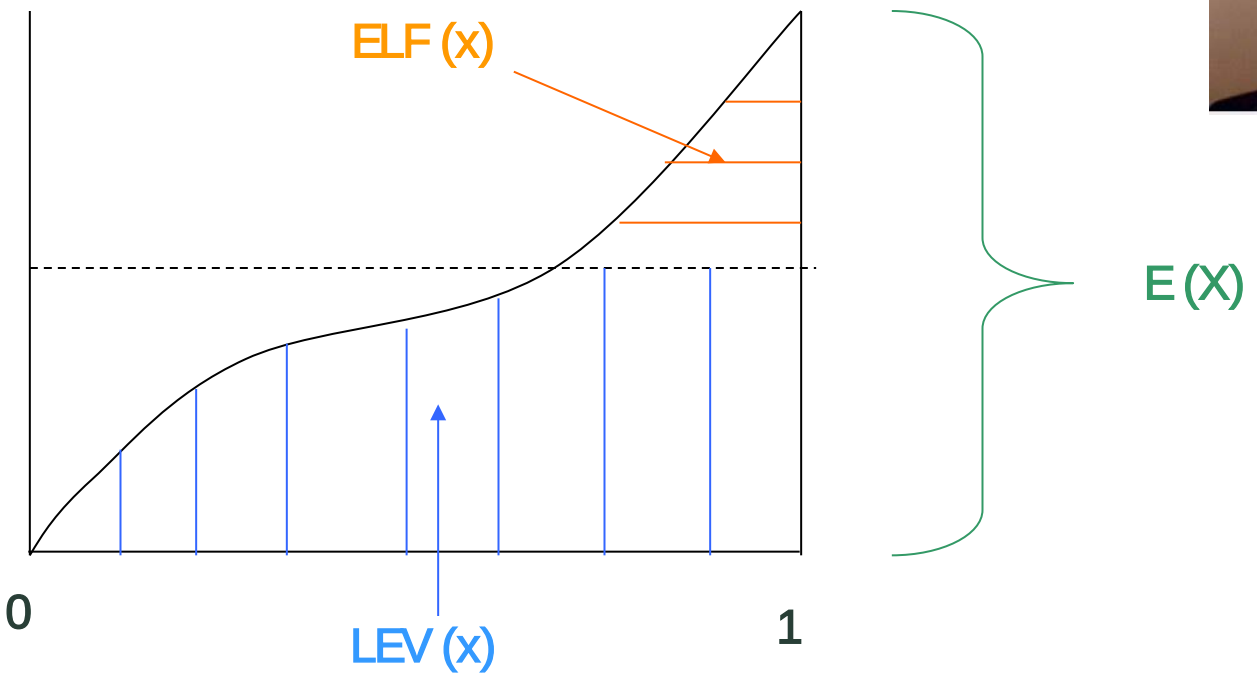
Workers Compensation

Excess of Loss Factors (ELFs)

- Instead of ILFs, NCCI uses ELFs for WC
- ELF(x) = 1 – [LEV(x)/ E(X)]

  = 1 – Loss Elimination Ratio at x

  The "x" is an entry ratio, so E(X) is, by definition, unity.



Terminology

- “Injury Type” : Description of the seriousness of a WC injury
- “Average Cost per Case” (ACPC) : Average severity
- “Entry Ratio” : Ratio to the ACPC
- “Hazard Group” (HG) : Set of classes with similar severity distributions. Groups are 1-7 in CA and A-G
- “Excess Loss Factor” : Ratio of expected losses in excess of an entry ratio to the overall losses
- ELFs vary by state due to costs and benefit levels that vary state to state
- ELFs vary by HG due to ACPC and distribution of injury types by HG

Example of Calculation of ELFs – Background of Calculation

Injury Type	ACPC	Entry Ratio @ 1M	ELF(1M)	Inj Type Weight
Fatal	250,000	4.00	0.2385	3%
PT	1,000,000	1.00	0.5677	11%
Major PP	250,000	4.00	0.1395	44%
Minor PP	50,000	20.00	0.0001	16%
TT	10,000	100.00	0.0000	21%
Med Only	500	2,000.00	0.0000	5%
Overall			0.1310	100%

Simple Example – One State, One HG

- Subject Premium = $10,000,000
- Suppose we're pricing the $1M xs $1M layer
- Ground-up Expected Loss Ratio = 60%
- Ground-up Expected Loss = $6,000,000
- ELF(1M) = 0.13; ELF(2M) = 0.06
- Losses in the layer = ELF(1M) – ELF(2M) = 7.0%
- 7.0% of the total losses are in this 1M xs 1M layer
- Exposure Loss Cost = $6,000,000 * 7.0% = $420,000

Property

Property – different from casualty

- Property doesn't have ILFs or ELFs
- Casualty losses are generally thought of dollars first, as above to limit.
- Property losses are more thought as what % is damaged.
- Property exposure rating has been traditionally rated using first loss scales
- Property exposure is not concentrated on a handful of limits
- HO first loss scales – Salzmann, Ludwig, PSOLD+
- Commercial scales – Lloyds, Swiss Re, Munich Re, PSOLD

First Loss Scales

- Can be applied on various values
  - TIV : Total Insured Value
  - TSI : Total Sums Insured

  } Based on values of some combination of building, contents, business interruption

  - PML: Probable Maximum Loss
  - MFL: Maximum Foreseeable Loss

  } Based on underwriting judgment

- Can be based on all-perils or certain perils

First Loss Scales – Example 1

% of TIV	% of Loss
0.0%	0.0%
10.0%	20.0%
20.0%	36.0%
30.0%	50.0%
40.0%	61.0%
50.0%	70.0%
60.0%	78.0%
70.0%	85.0%
80.0%	91.0%
90.0%	96.0%
100.0%	100.0%

- TIV = $1,000,000
- Policy premium = $5,000
- ELR = 60%
- Ground-up Expected Loss =$3,000
- Layer = $500K xs $500K
- Layer is 50% ($500K) to 100% ($1M) of TIV
- 30% (100%-70%) of the loss for the building is greater than half the TIV
- 0% of the loss is greater than $1M
- Expected Loss = (30%-0%) x $3,000 = $900

First Loss Scales – Example 2

% of TIV	% of Loss
0.0%	0.0%
10.0%	20.0%
20.0%	36.0%
30.0%	50.0%
40.0%	61.0%
50.0%	70.0%
60.0%	78.0%
70.0%	85.0%
80.0%	91.0%
90.0%	96.0%
100.0%	100.0%

- TIV = $10,000,000
- Policy premium = $50,000
- Ground-up Expected Loss Ratio = 60%
- Ground-up Expected Loss = $30,000
- Layer = $1M xs $1M
- Layer is 10% ($1M) to 20% ($2M) of TIV
- 80% (100%-20%) of the loss for the building is greater than 10% the TIV
- 64% (100%-36%) of the loss for the building is greater than 10% the TIV
- Expected Loss = (80%-64%) x $30,000 = $4,800

Concerns with Early First Loss Scales

- Old first loss scale varied little to none by:
  - Construction
  - Occupancy
  - Protection
  - Exposure
- Before cat modelling was invented
- Underlying data was uncertain
- Some curves were “made up”
- Reversals
- ISO Solution – PSOLD and PSOLD+

PSOLD/ PSOLD+

- Used for Commercial Property/ Homeowners
- Based on fairly current industry data
- Varies based on
  - Construction
  - Occupancy
  - Protection
  - Exposure
- Can include or exclude some perils

Treaty Rating Challenges – Really Poor Data

Lower Limit	Upper Limt	# of Risks
-	100,000	962
100,001	200,000	918
200,001	300,000	889
300,001	400,000	753
400,001	500,000	748
500,001	750,000	679
750,001	1,000,000	447
1,000,001	2,000,000	423
2,000,001	3,000,000	365
3,000,001	4,000,000	288
4,000,001	5,000,000	204
5,000,001	10,000,000	153
10,000,001	20,000,000	7

- What is in Limit?
  - Building
  - Contents
  - Time Element
- What is Premium for each band?
  - Can assume rate per hundred
- Risk defined by location, policy, etc?
- Missing COPE information
- Some bands are very wide

Treaty Rating Challenges – Much Better Data

Lower Limit	Upper Limt	# of Risks	Premium	Average TIV
-	100,000	962	192,400	40,111
100,001	200,000	918	330,480	174,258
200,001	300,000	889	426,720	225,555
300,001	400,000	753	421,680	338,987
400,001	500,000	748	486,200	444,787
500,001	750,000	679	611,100	644,521
750,001	1,000,000	447	447,000	901,144
1,000,001	2,000,000	423	761,400	1,547,255
2,000,001	3,000,000	365	876,000	2,425,897
3,000,001	4,000,000	288	921,600	3,500,001
4,000,001	5,000,000	204	714,000	4,122,348
5,000,001	10,000,000	153	1,071,000	8,501,555
10,000,001	20,000,000	7	84,000	18,003,744

Occupancy	% of Prem
Offices	25.5%
Wood Manufacturing	16.9%
Restaurants	14.2%
Metal Manufacturing	13.4%
Churches	12.2%
Schools	7.8%
Gas Stations	5.0%
HPR	5.0%
Total	100.0%

- Limit profile is on TIV basis, by location
- Note: average TIV is not always close to middle of band
- Note: Premium per 100 of TIV decreases as limit gets higher
- We can rate each combination of occupancy and average TIV by band
- Assume occupancy and limit are independent – questionable assumption
  - $20M gas station, $100,000 HPR risk

More Advanced Issues

Other Concerns

- SIR and large deductible - complicated
- Property Shared and Layered business – very complicated
- ALAE – we ignored, but ALAE does not behave the same as loss
- Alignment with experience
  - same projected premium
  - same perils, exposures
  - If two methods are materially different, figure out why?

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