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Fundamentals of LTD Rating

**Agenda**

Why is LTD Rating Difficult
The Components of LTD Loss
Why Accurate Pricing is Important
Summary
Questions

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Top Six Reasons why the actuaries can’t get it right

6. High Product Complexity (Plan and contract differences)

5. Limited exposure Information (self-accounted plans)

4. High level of underwriter discretion
   - Loss of tracking and control

3. Loss takes a long time to develop (Reserves may not be accurate)

2. Loss experience is volatile
   - Many time-dependent and correlated external influences
   - Hard to distinguish systematic from random
Fundamentals of LTD Rating

Number One Reason why the actuaries can’t get it right

1. Irrational Marketplace

Some Companies …
- are aggressively trying to grow their block
- are subject to underwriting cycles
- have poor underwriting control
- lead with other products (dental, life, etc)
- have old and/or invalid rates
- etc.

Actuaries have to design rates that will function in that environment

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Fundamentals of LTD Rating

LTD Premium =

\[
\text{LTD Premium} = \text{Number of Claims} \times \text{Avg Monthly Benefit} \times \text{Cost per Benefit} / \text{Target Loss Ratio}
\]

- Incidence Rate
- New Claim Reserve
- Expense and Profit

All four components of the pricing “Equation” have different risk dynamics
LTD Rating: Claim Incidence

Sample Public Filed LTD Incidence Rates by Age, Gender, and EP
*** Rates are per 1,000 lives per year ***

Distribution of New Claim Diagnoses by Gross Monthly Benefit

Source: 2016 SOA GLTD Experience Study

Smith Group - February 20, 2018
LTD Rating: Claim Incidence

Distribution of New Claim Diagnoses by Age

- Diabetes
- Ill-defined
- Digestive
- Respiratory
- Maternity
- Nervous System
- Mental and Nervous
- Circulatory
- Injury
- Other Musculo
- Back
- Cancer

Source: 2016 SOA GLTD Experience Study

But Age and Benefit are related (Correlated)
What is really driving the effect?
LTD Rating: Claim Incidence

Percentage of New Claims with Cancer

Less than 15% of the benefit effect is “explained” by age

Source: 2016 SOA GLTD Experience Study

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Common models of LTD have LTD incidence depending on:

- Age
- Elimination Period
- Gender
- Salary

What other variables does LTD incidence depend on?

- Occupation
- Education
- Marital Status
- Job Happiness
- Health
- Plan Design
- Smoker
- With STD

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**LTD Rating: Claim Size**

**Question:**
You have a group of 1,000 lives with an average monthly benefit of $2,050 and average age of 42

Do you expect the average claim size to be $2,050 with an average age of 42?

**Answer:** No!
The answers depend on how likely each person is to go out on claim.

**Use incidence-weighted averages**

<table>
<thead>
<tr>
<th>Age</th>
<th>Lives</th>
<th>IncRate</th>
<th>GMB</th>
<th>CB</th>
<th>L<em>1/1000</em>G*CB</th>
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</thead>
<tbody>
<tr>
<td>27</td>
<td>100</td>
<td>2.067</td>
<td>1,000</td>
<td>20</td>
<td>4,135</td>
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<tr>
<td>32</td>
<td>100</td>
<td>2.338</td>
<td>1,500</td>
<td>25</td>
<td>8,767</td>
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<tr>
<td>37</td>
<td>200</td>
<td>2.575</td>
<td>2,000</td>
<td>30</td>
<td>30,902</td>
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<tr>
<td>42</td>
<td>200</td>
<td>2.992</td>
<td>2,500</td>
<td>35</td>
<td>52,367</td>
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<tr>
<td>47</td>
<td>200</td>
<td>3.687</td>
<td>2,500</td>
<td>40</td>
<td>73,742</td>
</tr>
<tr>
<td>52</td>
<td>100</td>
<td>4.800</td>
<td>2,000</td>
<td>45</td>
<td>43,200</td>
</tr>
<tr>
<td>57</td>
<td>100</td>
<td>6.652</td>
<td>2,000</td>
<td>40</td>
<td>53,216</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
<td>3.437</td>
<td>2,050</td>
<td>34</td>
<td>266,329</td>
</tr>
</tbody>
</table>

Average Age 42.0
Benefit Weighted Average Age 43.2
Incident Weighted Average Age 45.0
Claim Cost Weighted Average Age 46.9

What is the expected average age?

Total Claim Cost: 266,329 = 3.437 * 2,100 * 36.9

Cost = # of Claims * Expected Avg Benefit * Expected Avg Cost per Benefit
**LTD Rating: Cost per Benefit (Duration)**

Question: You have a block of 1,000 new claims with a benefit of $2,500 and a benefit-weighted average age of 45 (at the end of the EP)

1. What is the maximum cost? (Per claim? Per Benefit?)
2. What is the expected cost?

**Answer to 1:**
Cost = 1,000 * $2,500 * 20 * 12 = $600M
Cost per Claim = $2,500 * 20 * 12 = $600K
Cost per Benefit = 20 * 12 = 240

What reduces the expected cost for question 2?

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**LTD Rating: Cost per Benefit (Duration)**

<table>
<thead>
<tr>
<th></th>
<th>Cost/ Benefit</th>
<th>Percent Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum</strong></td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>4% Discount Rate</td>
<td>166</td>
<td>-31%</td>
</tr>
<tr>
<td>Chance of Recovery</td>
<td>70</td>
<td>-58%</td>
</tr>
<tr>
<td>Chance of Death</td>
<td>54</td>
<td>-22%</td>
</tr>
<tr>
<td>Chance of SS</td>
<td>35</td>
<td>-36%</td>
</tr>
</tbody>
</table>

Based on Typical LTD Block (90 and 180 day EP’s)
Expected Liability < 15% of Maximum Liability
Investments, Recoveries, Deaths, and SS all play important roles
LTD Rating: Cost per Benefit (Duration)

Chance of staying on claim varies by EP, Age, and Diagnosis
Example: Consider 180-Day MS or Cancer Claims

Chance of remaining on claim by benefit duration

0% 10% 20% 30% 40% 50% 60% 70% 80% 90%

MS-Age32 MS-Age52 Cancer-Age32 Cancer-Age52

1 Year 2 Year 5 Year 10 Year

Source: 2016 SOA GLTD Experience Study

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LTD Rating: Cost per Benefit (Duration)

Chance of remaining on claim by Diagnosis

Nervous System
Diabetes
Respiratory
Circulatory
Ill-defined
Back
Other
Other Musculo
Digestive
Injury
M & N
Cancer
Maternity

0% 10% 20% 30% 40% 50% 60% 70%

5 Years
2 Years

Source: 2016 SOA GLTD Experience Study

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Underwriting Reserve Question

You have an experience rated case with a large claim. The reserve indicates an expected duration of 105 months. The claim specialist indicates an expected lifetime of 6 months.

Question: Does it make sense to adjust reserve?
LTD Rating: Putting it all together

Premium = Incidence * Claim Size * Cost per Benefit * Expenses and Profit

- Age
- Gender
- Salary
- Occupation, Industry
- Region
- Plan Design w/STD
- Contrib Status
- Case Size
- Physical Health
- Mental Health
- Marital Status
- Smoker Status
- Weight/Height
- Work Ethic
- Environment
- Household Debt
- Credit score
- Job Security/turnover
- Job Empowerment
- Sense of Entitlement
- Quality of Management
- Etc, etc

Chance of Different Claim Durations (180 Day EP: 40 year-old Male)
LTD Rating: Rating Difficulties

No positive feedback to counteract poor experience
Correlated variables with time-sensitive dependencies
Numerous multiplicative rate factors
Low frequency, high volatility product

Low Frequency, high volatility Product

100 claims in a rate cell is considered highly credible: ~30K LYE

<table>
<thead>
<tr>
<th>100 Claims in Rate Cell</th>
<th>500 Claims in Rate Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>+/- 10%</td>
<td>+/- 10%</td>
</tr>
<tr>
<td>48%</td>
<td>11%</td>
</tr>
<tr>
<td>+/- 15%</td>
<td>+/- 15%</td>
</tr>
<tr>
<td>28%</td>
<td>2%</td>
</tr>
<tr>
<td>+/- 20%</td>
<td>+/- 20%</td>
</tr>
<tr>
<td>15%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

What is the probability that the rate is correct, but observed experience differs by more than 15%?

If you believe a cell with 100 claims, there is a good chance your rate factor will be wrong.

Rating Conundrum: This still may be the “best” selection
LTD Rating: Interpreting Experience

Manual much worse than Experience: What can this be telling you?
1. The employer may have had a string of good years… long-term average not reflected in experience: commonly high benefit amounts and no claims. (could just be good luck)
2. Your SIC code or occupations may not be correct, may be blue-collar content assumed in manual
3. Group can be aging… older age expectations not in experience
4. There is something unique about this employer. What is it?
   - Employees value their jobs, Employers value their employees
   - Employees are empowered with a sense of ownership
   - Pro-active attitude towards preventing disability
   - Favorable Rehab or RTW practices
   - Were there layoffs or down-sizing during experience period?

LTD Rating: Interpreting Experience

Manual much better than Experience: What can this be telling you?
1. Could just be poor luck… check incidence of high claims
2. Your SIC code or occupations may not be correct, may be blue-collar content assumed in manual
3. There is something unique about this employer. What is it?
   - Stressful, unhealthy work environment
   - Bad management, disempowered workers
   - Culture of entitlement
   - High turnover, low job security, financial instability
   - Little accommodation for disability, bad RTW program
   - STD on the front-end

All external risk items are more important for shorter EP’s
Experience Rating Bias – Based on Stochastic Modeling with 15 claims and 100,000 scenarios

Most likely outcome is 15% below the average outcome
“Good” experience gets a discount even though most likely
Poor experience is discounted as unlucky, even though expected in the average

LTD Rating: Summary

1. Determining appropriate manual rates is difficult
2. There are different risk dynamics for incidence, claim size, and claim duration
3. Experience is strongly influenced by uncontrolled external factors and by random events (luck)
4. There is a good chance that “best” estimate of loss for a given case is wrong, but still may be the best selection over many cases
5. Talk to your peers and business partners
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