Pricing Insurance
Without Data

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November 2, 2020
Agenda

1. Basic concepts of pricing
2. Sources of data
3. Focus groups and surveys
4. Stochastic models
Basic concepts

- Pricing for different products may involve:
  - Different data
  - Different models or formulas
  - Different margins

- BUT
  - The PROCESS is the same!
Pricing/Data feedback loop

1. Gather data
2. Set Assumptions
3. Calculate
4. Validate and Adjust
5. Adjust
6. Gather data
7. Set Assumptions
8. Calculate
9. Validate and Adjust
10. Adjust
11. Gather data
12. Set Assumptions
13. Calculate
14. Validate and Adjust
15. Adjust
16. Gather data
17. Set Assumptions
18. Calculate
19. Validate and Adjust
20. Adjust
Components of Gross Premium

Gross Premium = Net Premium + Expenses + Profit margin

Net Premium = Risk Premium + Risk/Security Margin

Risk Premium = “expected cost of claims”

Expenses:
- Start up and development costs
- Marketing and Distribution
- Operating costs
- Taxes

Profit margin:
- Profit Margin
- Surplus and equity build up (self insured programs)
Components of Gross Premium

Gross Premium = Net Premium + Expenses + Profit margin

Risk Premium = "expected cost of claims"

Risk Premium

Incidence rate or likelihood of insured event

Expected amount of insurance claim
Sources of data

- Focus Groups and Surveys
- Industry Data
- Distribution Partner
- Public Data
Possible solutions

- In face of data problems, pricing specialists may:
  - Use incomplete data or data from other similar populations, adjusting for various actuarial factors
  - Downside: this may result in subjective adjustments

...not ideal – not going to result in pricing that best reflects population

- Conduct MARKET RESEARCH
Market Research Examples

- By Lisa Morgan and John D. Meerschaert, February 2010

- David Dror, Microinsurance Academy, New Delhi
Agenda

- Basic concepts of pricing
- Sources of data
- Focus groups and surveys
- Stochastic models
Deterministic or Stochastic Models?

- **Deterministic** = assumptions are set as fixed estimates, such as the mean of a set of data
- Result is a single number

<table>
<thead>
<tr>
<th>Distribution of Claims</th>
<th>Frequency</th>
<th>Distribution</th>
<th>Amount of Claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>0</td>
<td>50%</td>
<td>$10</td>
</tr>
<tr>
<td>30%</td>
<td>1</td>
<td>40%</td>
<td>$50</td>
</tr>
<tr>
<td>6%</td>
<td>2</td>
<td>10%</td>
<td>$150</td>
</tr>
<tr>
<td>4%</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.54</td>
<td>Average</td>
<td>40</td>
</tr>
</tbody>
</table>

Risk premium per person = 0.54 x 40 = $21.60
x Expected number of insureds = 500

Expected claims for 500 insureds = $10,800 + Margin for uncertainty = ?
Stochastic processes have random variables.

Monte Carlo is a way to simulate stochastic processes.

### Distribution of Claims

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<tr>
<td>4%</td>
<td>3</td>
</tr>
</tbody>
</table>

- Distribution: 50% $10
- 40% $50
- 10% $150

Expected number of insureds 500
Desired confidence 90%

Run 1000 simulations producing a range of results

- Aggregate claims, average $10,800
- Aggregate claims, 90% confidence $11,232
- Risk premium per person with margin $22.46 = $11,232 / 500
Monte Carlo Advantages & Disadvantages

- Gives an idea of the range of outcomes
- Tells you how much margin is needed
- Scenario test with alternative plan designs
- Can be done in Excel

- Disadvantages
  - May give a false sense of confidence in results
  - May not simulate 100-year events
Today’s survey questions
In the past 12 months....

- How many days of inpatient hospitalization?
- Did you have a child?
- How many x-rays or lab tests?
- How many outpatient treatments?
- How many visits to your general doctor?
- How many visits to a specialist?
- How many prescriptions?
- What was the total cost of prescriptions?
- How many emergency room visits?
## Monte Carlo Spreadsheet Example

### PLAN DESIGN

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductible</td>
<td>$250.00</td>
</tr>
<tr>
<td>Prescription copay</td>
<td>$20.00</td>
</tr>
<tr>
<td>Coinsurance after deductible</td>
<td>10%</td>
</tr>
<tr>
<td>Maximum benefit</td>
<td></td>
</tr>
<tr>
<td>Maximum out of pocket</td>
<td>$1,000.00</td>
</tr>
</tbody>
</table>

### COST ASSUMPTIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily hospitalization</td>
<td>$3,500.00</td>
</tr>
<tr>
<td>Childbirth</td>
<td>$400.00</td>
</tr>
<tr>
<td>X-ray &amp; labs</td>
<td>$250.00</td>
</tr>
<tr>
<td>Outpatient procedures</td>
<td>$500.00</td>
</tr>
<tr>
<td>Doctor visits, general</td>
<td>$200.00</td>
</tr>
<tr>
<td>Doctor visits, specialist</td>
<td>$350.00</td>
</tr>
<tr>
<td>Emergency room</td>
<td>$1,200.00</td>
</tr>
</tbody>
</table>
### Monte Carlo Spreadsheet Example

<table>
<thead>
<tr>
<th>Expected number of insureds</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired confidence</td>
<td>90%</td>
</tr>
<tr>
<td>Number of simulations</td>
<td>1,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PooledNetClaims</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,135,773</td>
</tr>
<tr>
<td>1,160,834</td>
</tr>
<tr>
<td>1,168,612</td>
</tr>
<tr>
<td>1,690,369</td>
</tr>
<tr>
<td>1,698,785</td>
</tr>
<tr>
<td>1,701,225</td>
</tr>
<tr>
<td>1,757,612</td>
</tr>
<tr>
<td>1,759,545</td>
</tr>
<tr>
<td>1,817,216</td>
</tr>
</tbody>
</table>

**Results**

<table>
<thead>
<tr>
<th>Median claim</th>
<th>$ 2,901.08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average claim</td>
<td>$ 2,906.34</td>
</tr>
<tr>
<td>90% confidence claims will be no higher than:</td>
<td>$ 3,182.39</td>
</tr>
</tbody>
</table>
Where to download spreadsheet

- www.globalinsuranceconsulting.com