BAS 2020 Block Dental Case Competition

Team 28
Wilson Yu, Yunqi Shi, Boyang Wan, Hengyuan Qi
1. Probability Model
2. Profit & Revenue Optimization Strategies
3. Final Strategy
4. Implications
Probability Model
Logistic Regression

The logistic function

- Probabilistic model
- Binary dependent variable
- Linear method
Considerations For Factors

- Strong Association
- Independent Factors
- High Accuracy
Considerations For Factors

- Strong Association
- High Accuracy
- Independent Factors

Loss Ratio + Rate Increase
Probability Model

- Probability of Win
  - Loss Ratio
  - Rate Increase

- Rate Increase
  - Low
  - High
Profit & Revenue Optimization Strategies
Revenue = Premium × Probability

Profit = (Premium - Claims) × Probability
### Expected Loss Ratio, Claim & Premium Based on Two Strategies

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expected Loss Ratio</strong></td>
<td>86%</td>
<td>84%</td>
<td><strong>81%</strong></td>
</tr>
<tr>
<td><strong>Expected Premium</strong></td>
<td>$102m</td>
<td>$98m</td>
<td><strong>$95m</strong></td>
</tr>
<tr>
<td><strong>Expected Claim</strong></td>
<td>$88m</td>
<td>$83m</td>
<td>$78m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expected Loss Ratio</strong></td>
<td>71%</td>
<td>60%</td>
<td><strong>53%</strong></td>
</tr>
<tr>
<td><strong>Expected Premium</strong></td>
<td>$87m</td>
<td>$74m</td>
<td><strong>$64m</strong></td>
</tr>
<tr>
<td><strong>Expected Claim</strong></td>
<td>$62m</td>
<td>$45m</td>
<td>$34m</td>
</tr>
</tbody>
</table>
Final Strategy
Blend of 2 Strategies

Maximize Revenue

Set Loss Ratio = 70%

Weights

Profit Max

Revenue Max

0% + 10%

......

39% + 90%

......

100% + 0%

......

100% + 100%

......

90% + 90%

......

61% + 61%

......

39% + 100%

......

10% + 10%

......

0% + 0%
<table>
<thead>
<tr>
<th>LR Bands</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0,25]</td>
<td>-2.3</td>
<td>-2.3</td>
<td>-2.2</td>
</tr>
<tr>
<td>(25,50]</td>
<td>0.4</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>(50,70]</td>
<td>3.3</td>
<td>3.5</td>
<td>3.6</td>
</tr>
<tr>
<td>Benchmark: LR = 70%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(70,100]</td>
<td>9.2</td>
<td>9.0</td>
<td>8.8</td>
</tr>
<tr>
<td>(100,150]</td>
<td>17.2</td>
<td>16.1</td>
<td>15.3</td>
</tr>
</tbody>
</table>
Win Rates of Rate Bands

Win Rate

Rate Bands

Stable

Decline

Decline

(-100,0) 0 (0,2) (2,4) (4,6) (6,10) (10,15) (15,20) (20,9001)

16
<table>
<thead>
<tr>
<th>LR Bands</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0,25]</td>
<td>-2.3</td>
<td>-2.3</td>
<td>-2.2</td>
</tr>
<tr>
<td>(25,50]</td>
<td>0.4</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>(50,70]</td>
<td>3.3</td>
<td>3.5</td>
<td>3.6</td>
</tr>
<tr>
<td>Benchmark: LR = 70%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(70,100]</td>
<td>9.2</td>
<td>9.0</td>
<td>8.8</td>
</tr>
<tr>
<td>(100,150]</td>
<td>17.2</td>
<td>16.1</td>
<td>15.3</td>
</tr>
</tbody>
</table>
Implications to Management

- Large Rate Increase
- Fewer Clients
- Low Market Share
- Less Potential

- Large Rate Increase
- Rejecting Customers
- Moral Concern
- Reputation Decline
Implications to Management

Large Rate Increase  Fewer Clients  Low Market Share  Less Potential

Revenue Maximization
Implications to Management

Accepting Customers \[\xrightarrow{}\] Revenue Maximization

- Large Rate Increase
- Rejecting Customers \[\times\]
- Moral Concern
- Reputation Decline
Implications
Trade-off?

Revenue

Loss ratio
Model Improvements

Win Rate

Loss Ratio

Current Rate Increase
Model Improvements

Current Rate Increase

Channel

Loss Ratio

Previous Rate Increases

Win Rate

Win Rate

Loss Ratio

Current Rate Increase

Channel

Previous Rate Increases
Strategy Improvement

Current

- 3 Weights
- Fast

Proposed

- 15,000+ Rate Increase
- Flexible
Other way to reduce loss ratio?

- New Product
- Underwriting Guideline
Thank you!

Q & A