Predictive Analytics in Life Insurance

Advances in Predictive Analytics Conference, University of Waterloo
December 1, 2017
Format of this session

Speakers:  
Jean-Yves Rioux - Deloitte
Kevin Pledge – Claim Analytics
Ian Bancroft – Sun Life
Eugene Wen – Manulife

Discussion and Questions
Beyond descriptive statistics

- Predictive analytics is the use of data to generate predictive insights in order to make smarter decisions that improve performance of businesses and drive strategy to outlast the competition. Analytics should go beyond description of the past and should provide actionable insights about the future. This discussion will educate you on the full potential of the application of techniques.
Overall methodology
... and why researching/understanding analytics is complex

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding Business Problem</td>
<td>Identify the key questions to answer, problems to solve, and business constraints</td>
</tr>
<tr>
<td>Data Collection</td>
<td>Collect and understand data and variable representations</td>
</tr>
<tr>
<td>Data Cleansing</td>
<td>Validate, standardize, and transform data</td>
</tr>
<tr>
<td>Analysis of Data</td>
<td>Analyze variables, distributions, correlations, and clustering</td>
</tr>
<tr>
<td>Model Selection</td>
<td>Identify appropriate modelling options based on business problem and data available</td>
</tr>
<tr>
<td>Variable Selection</td>
<td>Identify preliminary variables that appear to be significant predictors</td>
</tr>
<tr>
<td>Parameterization and Optimization</td>
<td>Train different models and variable combinations to determine the optimal model and parameters</td>
</tr>
<tr>
<td>Results Presentation and Implementation</td>
<td>Present results in a manner that can be understood by senior management of various technical backgrounds. Embed the predictive model into business processes</td>
</tr>
</tbody>
</table>
Predictive analytics applications

**Sales and Marketing**
- Build more effective, targeted marketing campaigns
- Identify customers likely to purchase products
- Provide appropriate product recommendations

**Agency Management**
- Recruit advisors most likely to become successful
- Optimize agent retention efforts
- Monitor performance of agents

**Underwriting**
- Identify best risks and strategically prioritize underwriting efforts
- Improve simplified underwriting and streamline underwriting processes
- Expand underwriting information using new sources

**Inforce Management**
- Profile and segment customers
- Identify and retain policyholders likely to surrender
- Design retention strategies and offer additional products to current customers
- Analyze customer satisfaction

**Pricing, Reserving, and Experience Studies**
- Develop accurate, competitive pricing and pricing structure
- Identify new experience drivers using augmented data
- Improve reserving accuracy
- Improve understanding of experience drivers

**Claims Management and Fraud Detection**
- Analyze claim frequency and severity
- Prioritize claims resources
- Identify likely fraudulent or rescinded claims

**Other applications**
- Provide insights using HR/workforce Analytics
Applications
1. Cross-selling/Up-selling
2. Risk-Based Segment Targeting
3. Distribution Partner/Client Matching
4. New Business Application Triage/Simplified UW
5. Underwriting Process Improvement
6. Underwriting Application Simplification
7. Customer Retention/Lifetime Value
8. Pricing Risk Score
9. Experience Studies Policyholder Behavior
10. Experience Studies Mortality
11. Fraud Detection
12. Workforce Analytics
Applications

1. Agency Management
2. Claims Management
3. Product Design
4. Direct to Consumer Targeted Marketing
5. Predictive Underwriting
• **CIA Predictive Modeling Committee**’s mission is to promote the application of the actuarial skillset to predictive modeling and to market actuaries as skilled experts in this field. More specifically the committee will:
  
  • a) Promote the role of actuaries in the predictive modeling field both within and outside the profession;
  
  • b) Identify needs for new research in the field of predictive modeling that will draw attention to the work of actuaries; and
  
  • c) Communicate existing research and case studies of work in the field through various media
  
  • d) Influence the Education Curriculum and CPD offering to include relevant predictive modeling techniques

• **CIA Predictive Modeling Committee**’s initiatives included:

<table>
<thead>
<tr>
<th>Promotion within/outside</th>
<th>Needs for research</th>
<th>Communication/Dissemination</th>
<th>Influence curriculum</th>
<th>Collaboration/ Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile Series in e-bulletin of Predictive Modelers (stories from actuaries and non-actuaries and their work in PM, start with committee members and then expand), target 3 within first year</td>
<td>Organize a webcast</td>
<td>Get on CPD sessions</td>
<td>(Ongoing) Connect with other organizations to coordinate/collaborate</td>
<td></td>
</tr>
<tr>
<td>Booklet about why and applications</td>
<td>Monitor CPD opportunities and inform the CIA for inclusion in the CPD opportunities e-mail</td>
<td>Provide input into the CIA curriculum in support of the alignment with the curriculum adopted by other organizations (CAS and SOA)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Organize a CIA event
- Web-based index of strong reference documents relating to Techniques and Applications (completed)
- Expand the Web-based index to include links to tools (completed)
Predictive Analytics in Life Insurance

Kevin Pledge
Claim Analytics

Advances in Predictive Analytics Conference
University of Waterloo
December 1, 2017
Predictive analytics success seen in P&C and other industries – life and health slow to adopt

Why was that?

Long term nature of the business
Claim Analytics c.2000 saw an opportunity in claim management for group disability, based on expected outcome:

- **Resolve Quickly**: Don’t spend expensive resources
- **In Between**: Highest potential for return to work (a good claim manager will have biggest impact)
- **Permanent**: Expense management

Claim Scores
Return to Health

Highest potential for success with investment of proactive and solid CM strategies. Likely to have a longer duration and require more specialized resources and experienced CMs.

Low Touch

Require solid but generally straightforward CM strategies – often less complex claims with early RTW focused interventions.

Claim Scoring

Probability of RTW

Expense Mgmt

Alternate resolution strategies such as SSDI offsets and settlements should be considered as the likelihood of a solid outcome with investment of other resources is less likely.
Can this be applied to Short Term Disability?

Duration Management

Transition Management

Resource Allocation
Related models?

Claim Performance

Rehab

Claim Management

Benchmarking

Use predictive models to compare companies
Summary & Final Thought

1. Need to show value (initially quickly)
2. Start simple and build from there
3. Revisit & Refresh – always check in with the business

Don’t limit yourself

New business
Underwriting

Fraud
Predictive Modeling

IAN BANCROFT, SUN LIFE FINANCIAL, DECEMBER 1ST, 2017
Description of SLF Modeling Teams

The Question....

Should we centralize or decentralize the modeling function into the Business Units (BU’s)?

ie develop one area of expert modelers.... but without business expertise, or should we move the modelers closer to the business?

Similar question to how to organize the actuarial function
Description of SLF Modeling Teams

The Answer....

We’ve placed most of our modelers into teams in the BU’s, and also have a small centralized team .... similar to our actuarial organizational structure

The make up of each modelling team depends on the needs of their work ..... eg a valuation predictive modeling team is very different than a fraud team

We spend a lot of time connecting across the different modeling teams to promote synergies and best practices
Diversity of Skills Required for Modeling Work

No one person can be an expert in all modeling techniques, data engineering, business knowledge, change management .... there is no “Ivory Tower” for modelers

Rather a team of people is needed

Good communication, collaboration skills are very important
Growing and Building Modeling Communities

As modeling becomes more “mainstream”, creating a modeling community across your organization becomes increasingly important. There is no one unique solution ...... things we are doing include:

- Annual analytics 1 day conferences
- Monthly deep dives with rotating speakers
- Bi weekly status meetings
- An internal competition (similar to Kaggle)
- Internal training courses

We frequently experiment with and adjust our processes to improve our solutions.
Predictive Analytics in Life Insurance

Eugene Wen, MD. DrPH.
VP - Group Advanced Analytics
Manulife

Advances in Predictive Analytics Conference
December 1, 2017
University of Waterloo
Let’s look back to history of analytics in insurance...
Before the term “Data Scientist” was coined, Actuary had served as THE “data scientist” of insurance industry for more than two hundred years.
…since the first Actuary

- Society for Equitable Assurances on Lives and Survivorship in London in 1762
- **The first actuary**: Edward Rowe Mores
- Role of actuary

- Business Analysts: underwriting, claim management, marketing, investment, finance, risk, strategy, IT, BI & reporting etc.

- Data Scientists
Our Advanced Analytics teams are organized in a **hub-and-spoke** model, supporting local and global needs.

Cindy Forbes,
EVP, Chief Analytics Officer,
former Global Chief Actuary,
Chair of Governors, University of Waterloo
Advanced Analytics in Manulife/John Hancock (2/2)

- Advanced Analytics teams consist of highly educated and specialized talent across the globe
  - Over 60 FTEs globally
  - Approximately 25 in Asia
  - 15 PhD’s among the team members
    - Programs include: Pattern Recognition and Machine Intelligence, Math & Statistics, Computational Physics, Machine Learning, Computational Neuroscience, Computer Science, Economics, Medicine
  - 20 Masters degrees among team members
    - Programs include: Systems & Engineering, Statistics, Management Analytics, Computer Science, Electrical Engineering, Finance and Information Systems
  - 7 MBAs
DATA SCIENCE Projects (1/2)

MODERNIZED UNDERWRITING
Buying a life insurance product can be a lengthy and time-consuming process. How can predictive analytics improve the underwriting approval process?

COMPUTER VISION
Our life insurance applicants must provide a lot of information to be underwritten for a policy. Can we improve this process by extracting features from a photo?

TEXT ANALYTICS
We have billions of customer service transcripts. How can we use this data to improve the customer experience?

FRAUD DETECTION
We have billions of transactions annually. The challenge for the data science team is to identify fraudulent transactions in all of the data.
Data Science Projects (2/2)

Predictive Underwriting
Can we develop a model that significantly reduces the time to underwrite a policy for qualified applicants?

Predicting Smoker Status
How can we identify those that are likely to be dishonest on their application form?

Purchase Process
How can we improve the life insurance purchasing process for our applicants?

Monitoring Experiences
Life experiences don’t occur often. How do we ensure our model is performing as expected going forward?

* Mortality Study/Liability/Next year payout
* LTC lapse after premium increase
* Segfund lapse
Thank You

Jean-Yves Rioux - Deloitte
Kevin Pledge – Claim Analytics
Ian Bancroft – Sun Life
Eugene Wen - Manulife

Any Questions?