Using data analytics to revolutionise underwriting

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Gwilym Morrison – Royal London

Use of predictive analytics in life insurance

For which of these applications are you currently using or developing a use (next two years) for Predictive Analytics?

<table>
<thead>
<tr>
<th>Category</th>
<th>Currently Using</th>
<th>In development (next two years)</th>
<th>Not currently using or developing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claims</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Refine Underwriting</td>
<td></td>
<td></td>
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<tr>
<td>Simplify Underwriting</td>
<td></td>
<td></td>
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<tr>
<td>Pricing</td>
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<tr>
<td>Sales &amp; Marketing</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Overall Use</td>
<td></td>
<td></td>
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</tbody>
</table>

Source: Gen Re Predictive Analytics Survey 2016
Machine learning

Machine Learning is a sub-field of Computer Science that allows computers to learn from data without being explicitly programmed.

Two traditions
# Methods compared

<table>
<thead>
<tr>
<th>Linear regression &amp; Generalised Linear Models</th>
<th>Machine Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires less computational power</td>
<td>Requires a lot of computational power</td>
</tr>
<tr>
<td>Easy to understand and explain</td>
<td>Tend to be “black boxes”</td>
</tr>
<tr>
<td>Tend to be limited to linear relationships</td>
<td>Can natively model non-linearity</td>
</tr>
<tr>
<td>Lends itself to smaller datasets</td>
<td>Usually requires a lot of data</td>
</tr>
<tr>
<td>Tend to give moderately accurate models</td>
<td>Can give very accurate models</td>
</tr>
<tr>
<td>Parametric: need to watch assumptions</td>
<td>Non-parametric: few/no assumptions</td>
</tr>
</tbody>
</table>

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# Machine learning Google trends

![Machine learning Google trends graph](attachment://machine_learning_google_trends.png)

<table>
<thead>
<tr>
<th>Date</th>
<th>Relative Search Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2013</td>
<td>20</td>
</tr>
<tr>
<td>Jan 2014</td>
<td>40</td>
</tr>
<tr>
<td>Jan 2015</td>
<td>60</td>
</tr>
<tr>
<td>Jan 2016</td>
<td>80</td>
</tr>
<tr>
<td>Jan 2017</td>
<td>120</td>
</tr>
</tbody>
</table>
Comparison of Learning Algorithm Performance

https://rpubs.com/m3cinc/Benchmarking_20_Machine_Learning_Models_Accuracy_and_Speed

Gordon Moore
Moore’s Law

Number of transistors on chip


Intel 4004

Intel 486

Intel Pentium

Apple A8

Cell Chip (Playstation 3)

Intel Quad Core

Battle of the “supercomputers”

1996

2006
The Second Half of the Chessboard

Support Vector Machines
Mortgage Market Trends

Mortgage Broker Market Challenges

- Mortgage Market Review
- Longer advice process
- Mortgage market buoyancy
- Increased broker share of market
- Less time to sell protection
Insurance

Why Underwrite?

- Approach is historic mainly
  - Ask 40+ medical questions
  - Refer for further evidence
- >75% Standard
- 5% Decline
- 20% terms
  - Rate – EM / p.m.
- Costly process
  - UW resources, IT, Medical expenses

Traditional UW
Inputs to Model

- Data
  - Mortgage-related fields
  - Salary
  - Occupation
  - Age
  - etc

The Model

- Divides the population into 20 equal vigintiles
- Higher differential the better

Risk Pots

Note: Indicative Numbers
Vigintiles by decision

Note: Indicative Numbers

The Model - viability

Claims Cost

Claims Cost less UW costs
What do we (RI) want to understand?

- Insurers can control
  - Underwriting costs
  - Commission paid
  - Application process
  - Broker behaviour?
- Reinsurers- can’t!

- Can we control Behaviour of the applicant?
  - Anti-selection

What are we prepared to take?

- What trust do we have in the model?
- How do we test the outcome?
- Who are we willing to take on risk?
- At what price?
- What further controls?
What a model can’t do

• Underwrite!
Small number of questions added

• Keep the number of qualifying applicants high
• Keep Price low
• Keep application procedure simple and quick
• Exclude Declines and Heavily Rated

The Model - Improved

Claims Cost
Claims Cost less UW costs
Claims Cost Less UW after Questions
Anti-selection

- Applicant
  - Knows his own health
  - May know what the application process is elsewhere

- Broker
  - Definitely knows what the process is elsewhere

Application Process as Risk Control

- Control of the sales force
  - If meet conditions for Streamlined product must offer this only
  - Don’t want the broker picking and choosing cases
  - Belief is however that ease of application will convince broker

- Risk of Anti-selection if free choice between Whole of Market and Streamlined
Next Generation Underwriting

Streamlined mortgage protection proposition
Proposition key features

- Small number of underwriting questions
- No additional underwriting
- Instant decisions
- No re-keying
- 70 to 80% eligible
- Favourable commercials

Results

- Pilot stage so too early to say
  - Positive signs in the mix of business coming through
  - Further evidence being gathered to prove concept is solid
- Press/Broker reception overwhelmingly positive
Trade Press Coverage

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