Modelling the claims process
an alternative to development factor modelling

Session overview

1. Background
2. Introduce and explain a new (but simple) approach for deriving development models
3. Case studies from LCP and Barbican
Background

- Traditional chain ladder modelling has some limitations:
  - Requires sufficient past data
  - Assumes ‘one pattern fits all’
  - Fails to recognise changes in the underlying exposures, and processes for reporting and settlement
  - No direct links between various stages of the insurance claims process
    - But in reality payment patterns will depend on reporting patterns which will depend on exposure patterns etc.
  - Expert judgements made at relatively low levels
    - e.g. the removal of development factors

A new (but simple) approach

- Deconstruct the claims process into its component parts
- Build these parts back up into a working model
- Populate the model with assumptions or actual data where available

“The significant problems we face cannot be solved at the same level of thinking with which we created them”
- Albert Einstein
Deconstructing the claims process

<table>
<thead>
<tr>
<th>Time</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies underwritten</td>
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<tr>
<td>Exposure to claim incidents</td>
<td></td>
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<tr>
<td>Claims incurred</td>
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<td></td>
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<tr>
<td>Claims reported</td>
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<tr>
<td>Claims paid</td>
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</tbody>
</table>

Building the model - summary

- Business written
- Premium rates
- Earnings patterns
- Reporting delays
- Settlement delays
Building the model: the detail (1)

- Analyse the written premiums:

```
<table>
<thead>
<tr>
<th>U/W Month</th>
<th>Value of written premiums</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>2,000</td>
</tr>
<tr>
<td>3</td>
<td>4,000</td>
</tr>
<tr>
<td>4</td>
<td>6,000</td>
</tr>
<tr>
<td>5</td>
<td>8,000</td>
</tr>
<tr>
<td>6</td>
<td>10,000</td>
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<td>7</td>
<td>12,000</td>
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<tr>
<td>8</td>
<td>14,000</td>
</tr>
<tr>
<td>9</td>
<td>16,000</td>
</tr>
<tr>
<td>10</td>
<td>18,000</td>
</tr>
</tbody>
</table>
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Building the model: the detail (2)

- Allowing for premium rate changes, gives a written exposure profile:
Building the model: the detail (3)

### Exposure Profile

| Earnings Month | Exposure % | Earnings Month 1 | Exposure % | Earnings Month 2 | Exposure % | Earnings Month 3 | Exposure % | Earnings Month 4 | Exposure % | Earnings Month 5 | Exposure % | Earnings Month 6 | Exposure % | Earnings Month 7 | Exposure % | Earnings Month 8 | Exposure % | Earnings Month 9 | Exposure % | Earnings Month 10 | Exposure % | Earnings Month 11 | Exposure % | Earnings Month 12 | Exposure % | Total Exposure | Cumulative Exposure % |
|----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 1              | 0.1%       |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |
| 2              | 0.2%       |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |
| 3              | 0.3%       |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |
| 4              | 0.4%       |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |
| 5              | 0.5%       |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |
| 6              | 0.6%       |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |                 |            |

Building the model: the detail (4)

- Spread each month’s written exposure over the policy term using the selected earnings pattern:

  Monthly Earned Exposure % = Monthly Incurred Claims %

![Graph showing the relationship between earnings month and earned exposure percentage](image)
Building the model: the detail (5)

- Apply the reporting delay pattern to each month’s earnings:

![Chart showing the distribution of monthly reported incurred claims percentage.]

Building the model: the detail (6)

- Apply the settlement delay pattern to each month’s reported claims:

![Chart showing the distribution of monthly paid claims percentage.]

Real life case study – the problem

- Produce estimates of ultimate claims and expected cash-flows for a new GAP account
- Multi-year policies
- Earnings patterns are distinctly non-uniform
- Forecasts required on an underwriting year basis
  - Business began partway through a financial year
  - and ended partway through the following year

Real life case study: our prediction
Real life case study: actual experience

Looking at the business as a whole
Some of the benefits…

• Projections can be made with little or no claims data
• Early warning management tools can be constructed
• Enables management to act or react faster
• Different years do not have to follow the same pattern
• Can allow for changes in exposure/reporting/settlement
• Insights into the business
  – how the business is earned
  – claims reporting and settlement processes
• Natural link between reserving management and exposure management
• Easy to produce models on different bases
  – eg underwriting year or accident year

Examples from Barbican

• Using Radar and Radar concepts
  – to derive reporting and settlement patterns
  – to adjust chain ladder development patterns
  – if you don’t have any development patterns
Reporting and settlement delays

Unincepted business
Payment patterns for OS and IBNR

Outstandings = IBNR =

Over/under-reserving

UK Liability Incurred and Paid Development Patterns

- 35% under-reserved
- 70% over-reserved
- 35% over-reserved
- No over-reserving
- Paid Claims
When you have no development patterns

Claim number development

Cumulative Claim Number

Development Month

2008 Other
2009 Other
2010 Other

When you have no development patterns

Claim number development

Cumulative Claim Number

Development Month

2008 Other
2009 Other
2010 Other
When you have no development patterns

Claim number development

Cumulative Claim Number
Development Month
Claim number development

2008 Other
2009 Other
2010 Other

When you have no development patterns

Claim number development

Cumulative Claim Number
Development Month
Claim number development

2008 Other
2009 Other
2010 Other
Conclusions from use at Barbican

- Useful for Solvency II
- Useful for Barbican as young managing agent
- Simple concepts
  - It may be nothing new?
  - But the better the data, the better the models

Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.
The views expressed in this presentation are those of the presenter.
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