D4 – Risk MI
Embedding within the business

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10 October 2013

Contents

• What is Risk MI?
• Target audience
• Embedding
• A case study
• Some top MI issues
• Possible solutions
• Useful tips and tricks
What is Risk MI?

• Risk Management Information:
Information provided to management which is used to manage the business efficiently and effectively.

Systems are typically set up to provide this information which are used to analyse and facilitate strategic and operational activities.

Target audience

• Key users include:
  - Senior management / Board
  - Underwriters
  - Actuarial
  - Regulators
  - Auditors

• Generally users will not be as familiar with concepts
• But what are their needs?
Target audience

• Approached a number of senior management within Arch with the following questions:

1. What do you look for in MI produced by the actuarial team?
2. Of the current MI, where would you like to see improvements?
3. What MI do you tend to use regularly?

A1.
- Crisp exhibits, ideally one-pagers with the ability to drill into detail when required
- Consistency of reports at committee meetings
- Accessible
- Trustworthy (i.e. correct)
Target audience

- Approached a number of senior management within Arch with the following questions:

1. What do you look for in MI produced by the actuarial team?
2. Of the current MI, where would you like to see improvements?
3. What MI do you tend to use regularly?

A2.
- Additional types of reports, including increased flexibility of the output generated
- Further detail on LOB drill downs
- Less focus on low category risks
- More controls in place

Target audience

- Approached a number of senior management within Arch with the following questions:

1. What do you look for in MI produced by the actuarial team?
2. Of the current MI, where would you like to see improvements?
3. What MI do you tend to use regularly?

A3.
- Actual vs plan comparisons (claims and premiums)
- Large claim and premium movements in quarter
- Triangles
Embedding

- Useful information
- All in one place
- Presented, so that
  - Easy to follow
    - One pagers
    - Consistent use of colour
    - Maximise use of space
  - Automatically highlighting key points
    - Conditional formatting
- Recognisable
  - Regular presentations
    - Board, Reserve Committee, Risk Committee, Management Committee
  - Similar style & format

Embedding

- Flexible
  - Slicers
- Adjustable levels of detail
  - Drill down
- Automated
  - Reporting tool
  - Data feeds
A case study: Arch MI tool

- MI project was initiated in January 2012
- The aim was to improve the existing MI dashboard by upgrading the systems and allow more flexibility and automation
- Objectives:
  - One central hub
  - Audience specific:
    - Management (High level – Top down)
    - Head underwriters (Medium level – Top down by LOB)
    - Assistants (Low level – Bottom up)

A case study: Arch MI tool

- Implementation
  - Web page
  - SQL server reports in MI tool
  - SQL server reports in Excel
  - Cube reports in Excel
- Embedding
  - Communication / getting buy-in early on from staff
  - Ideally have permanent staff on implementation team
  - Regular meetings with team of key underwriters
  - Wider training
  - Ultimately have experts in each team
- Feedback
  - Largely positive
  - Engagement with the tool varies for each team
  - Some individuals struggle with Excel
Arch MI tool

Screenshots – Front page

Note: figures are fictional and do not represent Arch’s actual view

Arch MI tool

Screenshots – Claims summary

Note: figures are fictional and do not represent Arch’s actual view
Some top MI issues

- Reserving
  - Monthly A vs E
  - Trends: exhibits to show movements
  - Top down: highlighting key areas to dig into
  - Drilling down into the detail

- Capital
  - Capital results: Capital Dashboard
  - Trends in key risks: bubbles and ghost bubbles tool
  - Tail dependency: how to describe

Reserving MI

Actual vs Expected

<table>
<thead>
<tr>
<th>&lt;Line of Business&gt;</th>
<th>KPI flag:</th>
<th>Year: 2013</th>
<th>KPI incurred threshold:</th>
<th>Month: 3</th>
<th>Financial Month: 4</th>
<th>KPI IBNR threshold:</th>
<th>%</th>
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<tr>
<td>Incurred: ITD AvE % of Expected</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2004</td>
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<td>0%</td>
<td></td>
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<td>2010</td>
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<td>2011</td>
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<td>0%</td>
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<tr>
<td>2012</td>
<td>0.0%</td>
<td>100%</td>
<td>0%</td>
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<tr>
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<td>0.0%</td>
<td>100%</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| IBNR: ITD AvE remaining % of Ultimate | | | | | | | |
| 2004 | -3.8% | 100% | 0% | | | | |
| 2005 | -0.4% | 100% | 0% | | | | |
| 2006 | 0.0% | 100% | 0% | | | | |
| 2007 | 0.0% | 100% | 0% | | | | |
| 2008 | 0.0% | 100% | 0% | | | | |
| 2009 | 0.0% | 100% | 0% | | | | |
| 2010 | 0.0% | 100% | 0% | | | | |
| 2011 | 0.0% | 100% | 0% | | | | |
| 2012 | 0.0% | 100% | 0% | | | | |
| 2013 | 0.0% | 100% | 0% | | | | |

Note: figures are fictional and do not represent Arch's actual view
### KPI Overview - AvE in Quarter

<table>
<thead>
<tr>
<th>Underwriting Year</th>
<th>AUAL Gross</th>
<th>AUAL Net</th>
<th>AICE Gross</th>
<th>AICE Net</th>
<th>LT IBNR</th>
<th>Current Q</th>
<th>IBNR % of Ultimate</th>
<th>LT IBNR % of Ultimate</th>
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<td>39.9%</td>
<td>18.3%</td>
<td>47.2%</td>
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<td>47.1%</td>
<td>20.0%</td>
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<td>76.3%</td>
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<td>2012</td>
<td>52.5%</td>
<td>18.3%</td>
<td>50.9%</td>
<td>31.0%</td>
<td>51.7%</td>
<td>20.0%</td>
<td>50.9%</td>
<td>77.0%</td>
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<td>18.3%</td>
<td>46.6%</td>
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<td>47.7%</td>
<td>20.0%</td>
<td>50.9%</td>
<td>77.0%</td>
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<td>2010</td>
<td>47.3%</td>
<td>18.3%</td>
<td>47.7%</td>
<td>31.0%</td>
<td>47.7%</td>
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<td>2009</td>
<td>43.5%</td>
<td>18.3%</td>
<td>43.5%</td>
<td>31.0%</td>
<td>47.3%</td>
<td>20.0%</td>
<td>50.9%</td>
<td>77.0%</td>
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<tr>
<td>2008</td>
<td>44.0%</td>
<td>18.3%</td>
<td>44.0%</td>
<td>31.0%</td>
<td>47.3%</td>
<td>20.0%</td>
<td>50.9%</td>
<td>77.0%</td>
</tr>
<tr>
<td>2007</td>
<td>47.3%</td>
<td>18.3%</td>
<td>47.3%</td>
<td>31.0%</td>
<td>47.3%</td>
<td>20.0%</td>
<td>50.9%</td>
<td>77.0%</td>
</tr>
<tr>
<td>2006</td>
<td>46.8%</td>
<td>18.3%</td>
<td>46.8%</td>
<td>31.0%</td>
<td>47.3%</td>
<td>20.0%</td>
<td>50.9%</td>
<td>77.0%</td>
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<tr>
<td>2005</td>
<td>48.9%</td>
<td>18.3%</td>
<td>48.9%</td>
<td>31.0%</td>
<td>47.3%</td>
<td>20.0%</td>
<td>50.9%</td>
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<tr>
<td>2004</td>
<td>44.8%</td>
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<td>47.3%</td>
<td>20.0%</td>
<td>50.9%</td>
<td>77.0%</td>
</tr>
</tbody>
</table>

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### Reserving MI One pager

- **Start with total gross and net ULRs**
- **Split by uw years**

### Change in loss ratios shown for each uw year
### Reserving MI

**One pager**

#### Total

<table>
<thead>
<tr>
<th>Underwriting Year</th>
<th>AUAL and AICE Gross</th>
<th>Net</th>
<th>AUAL and AICE Gross</th>
<th>Net</th>
<th>AUAL and AICE Gross</th>
<th>Net</th>
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<td>2007</td>
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<td>84.2%</td>
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<td>84.2%</td>
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<td>110%</td>
<td>13</td>
</tr>
<tr>
<td>2011</td>
<td>129.9%</td>
<td>19</td>
<td>129.9%</td>
<td>19</td>
<td>129.9%</td>
<td>19</td>
</tr>
<tr>
<td>2012</td>
<td>144.7%</td>
<td>24</td>
<td>144.7%</td>
<td>24</td>
<td>144.7%</td>
<td>24</td>
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<tr>
<td>2013</td>
<td>178.6%</td>
<td>31</td>
<td>178.6%</td>
<td>31</td>
<td>178.6%</td>
<td>31</td>
</tr>
</tbody>
</table>

#### Currency splits

- **AUAL and AICE Gross**
- **Net**

#### Cat / Non-Cat splits

- **AUAL Gross**
- **Net**

#### Short / Long tail splits

- **AUAL Gross**
- **Net**

#### Company / Syndicate splits

- **AUAL Gross**
- **Net**

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**Note:** figures are fictional and do not represent Arch’s actual view

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26/09/2013
Reserving MI
IBNR exhibit

Note: figures are fictional and do not represent Arch's actual view

Company vs Syndicate

Reserving MI
Line of business drill down

Note: figures are fictional and do not represent Arch's actual view
**Capital MI**

**Capital dashboard**

<table>
<thead>
<tr>
<th>Metropolitan Capital £m</th>
<th>Diversified Capital £m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 Plan GBP (End)</td>
<td>600</td>
</tr>
<tr>
<td>2014 Plan GBP (Start)</td>
<td>600</td>
</tr>
</tbody>
</table>

**Key drivers**

- **Risk severity ratings of operational risks**
- **Risk likelihood ratings of operational risks**
- The number of controls in place for each operational risk
- Dependencies between operational risks categories

**Operational Risk - AUAL Ultimate Basis**

- **Key metrics**
  - 2014 Plan GWP (£m): 500
  - 2014 Plan NWP (£m): 400

**Sensitivities (£m impact to standalone capital)**

- -20% to maximum operational loss: -2.0
- +20% to maximum operational loss: +2.0

**Capital Requirement (£m)**

- Percentile
  - 99.05%
  - 99.50%
  - 99.95%

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**Capital MI**

**Trend key risks**

- Challenge of showing key movements of risks over the year within the ORSA
- Particular example considers 5 risks and their movements since prior period
- Impact and likelihood ratings have 5 categories:
  - Low
  - Low/medium
  - Medium
  - Medium/High
  - High
## Capital MI
### Trend Key Risks

<table>
<thead>
<tr>
<th>Data</th>
<th>Current Period</th>
<th>Previous Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bubble Size</td>
<td>Y-axis class</td>
<td>Y calc</td>
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<tr>
<td>Solvency II fatigue</td>
<td>250</td>
<td>H</td>
</tr>
<tr>
<td>Changes in exchange rates</td>
<td>120</td>
<td>M</td>
</tr>
<tr>
<td>Unexpected Cat claim volatility</td>
<td>160</td>
<td>M-H</td>
</tr>
<tr>
<td>Regulatory breach</td>
<td>80</td>
<td>M-H</td>
</tr>
<tr>
<td>IT environment</td>
<td>20</td>
<td>L-M</td>
</tr>
</tbody>
</table>

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### Capital MI
#### Dependency

- Challenge of demonstrating tail dependency to senior management
- Particular example uses three random variables:
  - RV1 = Independent uniform distribution \( \sim U(0,1) \)
  - RV2 = Market Risk variable
  - RV3 = RI Migration variable \( \sim U(0,1) \)
    (chance of credit rating move)
- Wanted to show the tail dependency between market risk variable and the probability of a change in reinsurer credit rating
- Consider the upper tail to be top 15% percentile
- Consider the lower tail to be bottom 25% percentile

Updated Chart

Prior Period 0.8
Current Period 0.1

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26/09/2013
Capital MI Dependency – 0% correlation, no tail dependency

<table>
<thead>
<tr>
<th>Area</th>
<th>Number of simulations</th>
<th>Proportion of simulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>12,517</td>
<td>25.03%</td>
</tr>
<tr>
<td>Middle</td>
<td>30,049</td>
<td>60.10%</td>
</tr>
<tr>
<td>High</td>
<td>7,434</td>
<td>14.87%</td>
</tr>
<tr>
<td>Total</td>
<td>50,000</td>
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Single variable probabilities

<table>
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<tr>
<th>Area</th>
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<th>Proportion of simulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>3,155</td>
<td>6.31%</td>
</tr>
<tr>
<td>Middle</td>
<td>45,736</td>
<td>91.47%</td>
</tr>
<tr>
<td>High</td>
<td>1,109</td>
<td>2.22%</td>
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<tr>
<td>Total</td>
<td>50,000</td>
<td>100.00%</td>
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Joint variable probabilities

Also known as joint exceedance probability

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Capital MI Dependency – 33% correlation, with tail dependency

<table>
<thead>
<tr>
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<th>Impact</th>
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</thead>
<tbody>
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<td>25.00%</td>
<td>-</td>
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<tr>
<td>Middle</td>
<td>29,985</td>
<td>59.97%</td>
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<tr>
<td>High</td>
<td>7,516</td>
<td>15.03%</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>50,000</td>
<td>100.00%</td>
<td>-</td>
</tr>
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</table>

Single variable probabilities

<table>
<thead>
<tr>
<th>Area</th>
<th>Number of simulations</th>
<th>Proportion of simulations</th>
<th>Impact</th>
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<tbody>
<tr>
<td>Low</td>
<td>4,928</td>
<td>9.86%</td>
<td>56%</td>
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<tr>
<td>Middle</td>
<td>42,941</td>
<td>85.88%</td>
<td>(6%)</td>
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<tr>
<td>High</td>
<td>2,131</td>
<td>4.26%</td>
<td>92%</td>
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<tr>
<td>Total</td>
<td>50,000</td>
<td>100.00%</td>
<td>-</td>
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</table>

Joint variable probabilities

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Tips & tricks

- Make use of all space
- Colours have a purpose
- 3D versions of 2D charts add no value
- Avoid pie charts if precision is required
- Excel charting is limited
  - Add-ins
  - Code it yourself
- Use similar style or format -> recognisable

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