Capital Modelling: A *business* perspective

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You have the biggest and best capital tool

- What do you do with it?
- Does it work properly?
- Do you know what it can do?
- Can it provide you with what you need?
- Will it get you to where you need to go?
- Do you know its limitations?
How does it work?

• Technical perspective
  – Set parameters
  – Measure risk
  – Model dependencies
  – Validate assumptions
  – Regulatory requirements
  – …
  – Endless list!
What next?

• Time, resource and money invested in an internal model
• Currently only meets regulatory requirements
• Some use it for reinsurance purchase
• There is limited use of the model

• It’s time to think about…
  – the value it can add
  – while not forgetting the risk a steady state can cause
What can it do for me?

- Business perspective
  - Regulatory requirements
  - Understand overall risk/reward
  - Tactical decisions
  - Test Strategic ideas
  - Risk appetite
  - Understand limitations/failings
Who can benefit from it?

- Risk Management
- Capital Team
- The Board
- The Business:
  - Underwriting
  - Reinsurance
  - Finance
- Internal Audit
To summarise...

**SII - Business As Usual...**

- Major model change
- Continued regulatory compliance
- Basic model use
- Data governance

**Added Value**

- **Model Use** – get more out of the model
  - Board awareness – to ensure better model use
  - Other stakeholder buy-in – get more people to use it
- **Risk of Model Drift**
  - Model not updated to reflect changing risk
  - E.g. Change in business mix or widening of T&Cs
- **Model Validation**
  - Can it be improved to help with model use or model drift?
Model use

Stakeholder management

- Understand their needs
- Modify output to meet the need
- Communicate in their language

Why the internal model?

- Provides an aggregate view of business
- Models relationship between classes and risks
- Outputs/results are already there…no extra work needed
Model drift – what is it?

Model drift

• Model not representative of risk
  – Same parameters
  – Different risk
  – Falsifiability checks might be the solution

• Marginal changes to the model
  – Attritional changes over a number of years
  – Nose to tail validation might be the solution
Internal model validation – nose to tail

- Data analysis
- Clean and adjust
- Check for consistency
- Parameterisation
- Consistency with risk profile
- Identify data driven changes
- Expert judgement/ENIDs
- Validate outcomes
- Sensitivity tests: I and II
- Stress and scenario tests
- Benchmarking
- Backtesting
Some examples…

We have talked about the potential…

• of using the model
• preventing model drift
• improving validation

How do we do it in practice? Some examples provided for…

• Premium risk
• Reserve risk
• Operational risk
PREMIUM RISK – MODEL USE
Identify the need

- Risk vs. reward
- Credit rating
- Underwriting strategy

- ROC/capital allocation
- Reserving analysis/ULRs

- ULR/dependency
- Pricing
- Reserving analysis

- RI optimisation/AAL/ROC
- Underwriting

Board
Underwriter
Other actuarial teams
Strategy

Institute of Actuaries
Communicate that outcome

Stakeholder
- Communication

Claims distribution
- ULR
- AAL
- Profit
- Payment pattern
- Adverse development

Capital
- ROC/ROE
- Capital allocation
- Reserve deterioration

Aggregate view of risk
- Diversification
- Risk metric/appetite
Model use - example

Stakeholder – underwriter

- Multi-year policy modelled two ways – 1) linear and 2) mirroring the risk
- #1 means linear CoC
- #2 means CoC increases over time consistent with increase in exposure
- Which one is better?
- More importantly, what would the underwriter want to see?
- How can the output be altered to be of any use?
PREMIUM & RESERVE RISK: MODEL DRIFT & VALIDATION
Case study

Syndicate A has been operating for 5 years. The internal model has been approved every year by Lloyd’s, without any major issues. The PRA have not raised any concerns either.

Changes in market condition has led to some changes in business strategy over the years. But there has been no major change in any one year.

Parameterisation has not changed and 25 classes are grouped into 8 modelling classes.

Why should syndicate A change their process?
How can the risk of model drift be identified?
Can validation help?
Where to start?

Exploratory analysis - questions

- Solvency II – accuracy, completeness and appropriateness
- Is it still appropriate to model attritional and large claims together?
- Do the claims behave differently at different thresholds?
Premium risk - data manipulation

Segmentation
- Attritional
- Large loss – threshold analysis
- Frequency/severity
- Usually lowest attachment point

Adjustment
- Inflation/premium rate
Premium risk - data analysis

Exploratory analysis

- Trends/clustering
  - ULR for attritional losses
  - Frequency/severity for large losses
- Data exclusion
- Allowance for events not in data
- Possible relationship with other classes

18 October 2017
Premium risk – fitting

Distribution fitting

• Fit a distribution (method of moments/MLE)
• Statistical analysis (AIC/BIC/K-S/A-D)
• Graphical analysis
  – ULR for attritional losses
  – Frequency/severity for large losses
• Data exclusion
• Allowance for events not in data
• Possible relationship with other classes
Reserve risk – data

Exploratory analysis - questions

• Classes were grouped into divisions. Does the segmentation still hold?
• Analyse the mix of classes within a division to assess changes in mix
Reserve risk - attritional claims

Analysis

• Analyse LDFs at different percentiles
• If the behaviour is different then consider a grouping by loss categories
• In this case it doesn’t look significantly different
Reserve risk - large individual claims

Analysis

• Consider large claims IBNER emergence (e.g. Murphy McLellan)
  – Group claims with similar development period
  – Analyse LDF distribution for each development period
  – Compare to attritional LDFs

• Similar characteristics would validate existing modelling approach
How does it help?

How is it different from the current process

• In principle, not much! Regulatory requirements still met
• Ensures current view of risk is consistent with the business written
  – Thus prevents model drift

Also...

• Expands the scope of validation

How does it benefit anyone?

• Board gains confidence…better/wider use
• More efficient process…adds value
OPERATIONAL RISK
Model Use

• Understand risk within operations
• Not ignore a key element of business that should be managed
• Risk ranking:
  – to prioritise process improvements; or
  – the implementation of additional operational controls.
• Preparing a business case:
  – Project cost vs decrease in risk
  – Increase in potential risks
  – Impact on current operational risk or other risk categories
• What is it that truly matters?
Think of a scenario, any scenario…

Current Issues
- Cyber risk and data security
- Geopolitical risk
- Outsourcing
Model Drift

- Scenarios which are imagined events
- Statistical methods, assuming constant drivers
- Registers assuming single characteristics
- Emerging risks by spotting events

Scenarios derived from risk profile
- Models based on system drivers
- Descriptions of risk profile taken holistically
- Emerging risks spotted early from system

Scenarios | Risk Register | Causal
Model Validation

• Relationship between risks
  – Brexit > Outsourcing > Organisational Change > Regulation > Conduct of business

• Relationship between risk categories
  – Hurricanes > Resource Stretch > Reserving
  – Data security > reputational damage > desperate for income > premium risk

• Completeness
  – Looking through the right lens

• Expert Judgement adapting to limitations of historic data

• Consider the causes as well as the outcomes
THE FUTURE
### Primary Colour Palette
- Dark Blue: R17, G52, B88
- Gold: R217, G171, B22
- Mid Blue: R64, G150, B184
- Light Grey: R220, G221, B217
- Pea Green: R121, G163, B42
- Forest Green: R0, G132, B82
- Bottle Green: R17, G179, B162
- Cyan: R0, G156, B200
- Light Blue: R124, G179, B225
- Violet: R128, G118, B207
- Purple: R143, G70, B147
- Fuscia: R233, G69, B140
- Red: R200, G30, B69
- Orange: R238, G116, B29

### Secondary Colour Palette
Get more out of the model…

• Embed validation in the modelling process
• Ensure the model is consistent with risk written
• That would provide confidence to the stakeholders
• And would allow better use of the model
• When communicated in an appropriate manner
Use it well...
Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.