Session 176 PD - Emerging Trends in Model Risk Management for Small Companies

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Model Risk Management
The Blue Sky Approach

Brody Lipperman, MAAA, CERA, FSA
Model Risk Management

To provide a framework around models that reduces the risks in a modeling process and enhances the reliability of the model’s results

- Key person risk
- Incorrect models/assumptions
- Errors in code or assumptions
- Technical errors
- Omission of relevant information
- Misuse of results
Overall Features

- **Segregation of duties**
  - Well defined roles
  - Developers and users are distinct
  - Changes require approval from one or more users

- **Secure locations for all data and executables**
  - Limited access to users who need it
  - Only as strong as the weakest point along the path
  - Create data marts for analysis and manipulation

- **Automated notifications, approval process, and reporting**
  - Automated notifications when approvals are needed to progress
  - After approval is received, process continues without any more manual intervention
  - Template reports are generated automatically and sent to appropriate users

- **Process logging**
  - Easily identifiable steps
  - Should include date/time, process step, run time, user id, and any manual notes
  - Includes model statistics for validation, set thresholds for alerts
Overall Features

- **User based segregation of duties**
  - Split across departments
  - Restrict available actions based on user id
  - People can have access to multiple roles

### Projections
- Proj Developer
- Proj User
- Proj Owner
- Chief Actuary

### Valuations
- Val Developer
- Val User
- Val Owner
- Chief Actuary

### Pricing
- Pricing Developer
- Pricing User
- Pricing Owner
- Chief Actuary
Overall Features

• Secure locations for all data and executables
  – Multiple environments with varying levels of security
  – Define security based on roles
  – Develop formal process to move between environments
Overall Features

- **Automated notifications, approval process, and reporting**
  - System to control the workflow of the entire process
  - Should be able to monitor multiple streams of work
  - Process for handling disapprovals

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Raw input files are available

Process to manipulate inforce has finished

Manual tables have been populated

Model results are ready
Overall Features

- **Process logging**
  - Might need multiple logs for various process flows
  - Should include date/time, process step, run time, user id, and any manual notes
  - Generate notifications/change appearance based on thresholds

<table>
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<tr>
<th>Step</th>
<th>Notes</th>
<th>Records</th>
<th>Face</th>
<th>Premium</th>
<th>RunTime</th>
<th>User</th>
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<td>BLipperman</td>
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</table>
Model Process

- Code Changes
- Assumption Updates
- Reporting Results
- Production Model Run
- Input Preparation

FIS
Model Process

- **Gather requirements**
  - Formal change request documentation
  - Meeting with users to set expectations and answer questions

- **Coding/Naming standards**
  - Well documented
  - Easy to understand where applicable
  - Cost/Benefit analysis on complex code

- **Documentation of changes**
  - Change log of any variables/process/objects that were changed
  - Detail reasons behind the change, include links to request forms

- **Baseline testing**
  - Developer runs regression tests against sample test suite to validate results
  - Tests runtime to ensure changes have no adversely affected timeline

- **User acceptance testing**
  - Requesting user validates results match request
  - Users should also validate results continue to work with post-calculation processing

- **Promotion to master**
  - Changes should be integrated into master model
  - Regression and runtime testing should be repeated with the master file
Model Process

• Scheduled assumption reviews
  – Periodic review of assumptions to determine fit
  – Can result in no update

• Assumption review committee
  – Meets regularly to review assumption changes
  – Any production updates require signoff

• Assumption repository
  – Location to house prior and current assumption sets
  – No editing allowed
  – Documentation around changes and use of assumptions

• Automated reporting
  – Standardized reports

• Promotion to master
  – Changes should be integrated into master model
  – Regression and runtime testing should be repeated with the master file
Model Process

• **Maintain checklists**
  – Typical availability window
  – Provider
  – Approver

• **Automate**
  – Where possible, automate steps that need no intervention
  – Where not possible, automate notifications to proper staff

• **Naming convention**
  – Flexible naming convention based on frequency of updates
  – Method of versioning for “final” inputs

• **Input documentation**
  – List of all inputs used for a specific model
  – Where possible, links to relevant files
Model Process

• **IT Monitored run**
  – IT implements changes to the production process
  – Alerts before potential issues pop up (space, conflicts, etc)
  – Specific individuals responsible for IT portion

• **System designed around potential re-run**
  – Can re-enter the process if errors are found
  – Can re-run from any point to create a branch set of results

• **Naming convention**
  – Flexible naming convention based on frequency of updates
  – Method of versioning for “final” inputs

• **Model run document**
  – Lists the model used, purpose,
  – Links to the input document
Model Process

• **Final Approval process**
  – Actuaries sign off on final results before publishing to relevant stakeholders
  – Method of versioning for “final” inputs

• **Generated reporting templates**
  – When run is finished, statistics are emailed to approvers
  – Once approved, templates are emails to stakeholders or dashboards are updated
  – Templates/dashboards are tagged with run id

• **System designed around potential reruns**
  – Can re-enter the process at any point and move from that point forward
  – Update any relevant parties that prior results are no longer valid
  – Have a plan for replacing results and for adding a second set of results

• **Results document**
  – List of all post model changes to the results
  – List and describe purpose of each data mart
Everybody has a plan until they get punched in the mouth

Mike Tyson
Conclusions

- Understand the value benefit vs the upfront time required
- Get executive level buy-in
- Target the highest risks first and work your way down
- Seek outside assistance/knowledge
- Leverage IT resources where possible
- Be adaptable
2017 SOA Annual Meeting

176 - Emerging Trends in Model Risk Management for Small Companies

STEFANIE J PORTA, ASA, MAAA

October 18, 2017
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Emerging Trends and Tools

• Risks That are Analyzed Using Models
• Techniques to Improve Modelling
• Company Practices to Refine Models
• Emerging Tools to Analyze Assumptions
Risks That are Analyzed Using Models

- Mortality Risk
- Interest/Investment Risk
- Persistency (Lapses, Surrenders)
- Policyholder Behavior
- Expenses
- Pricing Risk
Techniques to Improve Modelling

- Sensitivity Testing
- Stochastic Modelling
- Credibility Analysis
- Dynamic Assumptions
- Assumption Sets
Company Practices to Refine Models

• Experience Studies
• Sensitivity Studies
• Probability Fitting
• Increased Number of Scenarios
Emerging Tools to Analyze Assumptions

• Modelling Platforms that can switch between GAAP models, Statutory cash flows, pricing models, Asset-Liability Projections, etc.
• Experience Studies, providing Actual to Expected Ratios
• Multi-Risk Scenario Generator
Multi-Risk Scenario Generator

• Will be available on the Society of Actuaries webpage
• Open code, well-documented, developed for PBR VM-20
• Fully stochastic scenarios, calculating CTE 70 reserve
• Adjustment based on the variance of the CTE estimator (the fewer scenarios, the higher the CTE estimator)
• Simplification comes in because the CTE 70 reserve becomes the VM-20 reserve, and other calculations (NPR, DTR) not required
Multi-Risk Scenario Generator

• Multi-Risk Scenario Generator can Identify and Measure the Risk
• Gives rationale for determining that a risk is material
• Description of approach and rationale used to validate model calculations within each model segment (DTR, SR)
• Evaluation for appropriateness and applicability, compare to historical experience, what risks not included, material limitations of model
• Correlation of risks in margins
Multi-Risk Scenario Generator

• Goal is to have the Multi-Risk Scenario Generator available for SOA member use before Year End 2017

Research Team:

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