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System Peer Review: A Missing Link in the Evolution of Actuarial Modeling

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As the industry continues to progress from a formula-based to a principle-based approach to capital and reserves, companies and their actuaries face mounting challenges to keep pace. Dynamic systems that support stochastic modeling will become requisite tools, and making any modifications to these systems will require a robust set of internal controls. This article considers the importance of the system peer review within the auspices of the larger system change control process and provides clients with suggestions for creating more robust controls.

Figure 1
The State of Modeling Controls

Modeling Governance Theme	Score	Current State Synopsis
Governance Standards	3	While many companies employ a variety of model governance policies, few companies have a holistic, formal and documented model governance structure.
General Modeling Process	3	Many companies have multiple models and modeling platforms and few companies incorporate a model steward role in the modeling processes.
System Access and Change Control	**4**	**Model changes are not generally governed by a formal change process.**
Model Assumption Management	3	Assumptions are regularly reviewed and updated, but with few controls in place to ensure assumptions are approved and input appropriately.
Model Input Management	2	Many companies use automated feeds from admin systems for model inputs of liabilities. Other model inputs are often less automated.
Model Output Management	2	Model output used for financial reporting purposes is generally well controlled, while model output for analysis and other purposes is generally less controlled.

Peer review of coding changes falls under the governance theme of System Access and Change Control. This category rated the worst of all governance themes. (Source: "Actuarial Modeling Controls: A Survey of Actuarial Modeling Controls in the Context of Model-Based Valuation Framework." SOA, December 2012)

OVERVIEW

Over the past decade, the desire for open-code modeling systems and home-grown actuarial modeling software has guided the evolution of third-party systems and software application tools. Many of these systems provide a clean slate for flexible model development and creativity, allowing the models to be tailored to specific company needs. But such in-house development efforts also raise the possibility of system error. While this remains an ongoing risk, it should be understood that proper system controls are needed to help reduce this risk. A recent Society of Actuaries (SOA) survey indicates that adequate system change controls appear to be a missing link in actuarial modeling evolution.

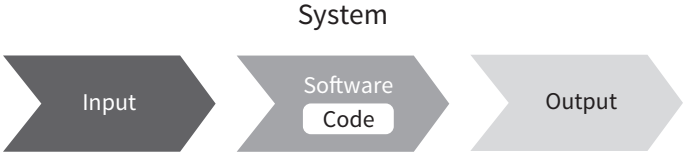
IS THE INDUSTRY READY FOR THE NEXT EVOLUTIONARY STEP IN ACTUARIAL MODELING?

Back in December 2012, the Society of Actuaries (SOA) published "Actuarial Modeling Controls: A Survey of Actuarial Modeling Controls in the Context of a Model-Based Valuation Framework." The intent of this research survey was to compare the current state of industry modeling controls against those expected to be in place for model-based valuation (MBV) approaches. Deloitte Consulting analyzed the survey results and appraised existing control gaps that need to be addressed. (Note that this survey has been recently updated and is expected to be published in late 2016).

The report rated six governance themes on a scale from 1 to 5 (1 being the best, 5 the worst). And, not surprisingly, the category receiving the worst score of 4 was System Access and Change Control (Figure 1). This reflects the need for improved system change control processes when system code is modified.

This low grade should not come as a complete surprise. Consider that actuaries historically have focused more on checking modeling input and validating modeling output. In fact, these two areas are the focus of most model peer reviews. In contrast, system peer reviews should include a direct evaluation of the code (Figure 2). This situation may reveal a mindset that coding errors will manifest themselves in the output where they can be easily identified. While output evaluation is certainly expected,

Figure 2
Model and System Peer Reviews



Actuaries typically focus on inputs and outputs during a model peer review. A system peer review directly examines the appropriateness and effectiveness of the underlying code, supporting system parameters and documentation.

many coding errors may remain undetected and buried without an adequate evaluation of the coding changes.

In the world of software development, it is well recognized that code analysis helps to root out logic and calculation errors that may otherwise go undetected when evaluating only system inputs and outputs. If industry best practices are the goal, in-house code changes may require a more thorough treatment in the system control process. Software vendors already institute these best practices. Carriers that either modify open-code systems or create in-house applications should implement their own formal system change controls.

INHERITANCE OF SYSTEM CONTROL TRAITS

Code management and corresponding system change controls require a high level of due diligence that is currently a trait of the software vendors. When software vendors modify the code in their maintained systems, they follow a robust change control process. Without such control processes, their software would quickly get out of hand and result in potentially disastrous error levels. No vendor has perfect code, but third-party software providers know the value of a formal control process.

The robust system control traits of the software vendor should be passed down to those who continue to modify their system code. Carriers will benefit from similar control processes when they modify their modeling software. Proper consideration and care should be reflected in the company's system change controls to assure that their modeling applications remain accurate and viable. One important feature of any system control process is the system peer review.

PEER REVIEW OBJECTIVES

As system complexity increases, so does the risk of system errors. Consider also that system errors, by their very nature, can be "systemic" in their effect as they may impact each model that is built on the affected platform. It may not be possible to identify and remedy all weaknesses before a system change goes into production, but peer reviews help identify errors that otherwise may go undetected.

A system peer review should attempt to identify:

- **Technical errors.** Does the coding have any mistakes (logic loops, wrong formulas, etc.)?
- **Consistency.** Does the code reflect the desired options and feature specifications?
- **Technical documentation.** Are requirements for user documentation and tutorials satisfied?
- **Assumptions.** Does the system accommodate the full range of required modeling assumptions?
- **List of features.** Is it up-to-date?

Note that an important step in a system peer review is the assurance that the system is properly documented. Also, the peer review process itself should be well-documented. As the system continues to be modified and evolves over time, system change requests should be managed and documented to reflect the purpose and specifics of each modification. Whether the changes are due to error corrections or added features/functionality, documentation should accompany each modification. Maintaining a well-documented version history aids in the reconciliation of modeling results among different system versions.

THE REVIEW TEAM

Not all actuaries are expert programmers, and the inverse is also true. Thus, it is highly desirable for the peer reviewer to be an amalgam of the two—an actuarial developer. This person may be hard to find, especially when considering the required knowledge of the products and features that the system supports.

The ideal system peer review team should include both programmers and actuaries. Additionally, it is called *peer* review for a reason. Teams should include seasoned experts at the same level as those initiating and implementing the system change. To ensure the most candid and unbiased assessments, reviewers should be selected from outside of the designers' reporting hierarchy. In some cases it may be recommendable to engage an outside consultant to participate in the review.

IMPLICATIONS FOR THE NEAR FUTURE

Formal system peer reviews may currently be treated as a luxury, but that status may not last long. The introduction of VM-20 raises the bar for system change controls. A formal peer review process—not only of models, but also of underlying systems—should become standard practice. Companies employing a robust formal system peer review process will have a competitive advantage over many companies that have yet to identify this missing link in modeling evolution. ■

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