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Session 10PD: Model Governance and Management – Advantages of a Formal Model
Governance Framework

Moderator:

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Model Inventory and Model Confidence

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8/28/2017

Why Build an Inventory?

- Prevent silos of modeling work
- Foster consistency in quality, efficiency, transparency of models
- Enforce production environment
 - Inventory acts as list of models to be tested for any production changes
- Improve communication across actuarial teams
- Steer the conversation during audits
 - Entrée to company-wide model change management policy
- Focus model improvement work more effectively

What is a Model Inventory?

- Comprehensive list of models identifying...
 - Owner
 - Purpose/Intended uses
 - Limitations
 - Audit trails
 - Several attributes of model risk
 - Confidence
- Constructed based on conversations with Owners

Identifying, Scoring Model Risk

- Dimensions of Model Risk should be observable, objective
- Define a consistent scale and clear meanings for each score
- Examples of risk dimensions:
 - Software employed
 - Audience
 - Reliability of calculations
 - Capability of attribution analysis
 - Efficiency
- Try to mitigate bias in risk scoring from Owners
 - Tendency to understate riskiness / overstate confidence in model
 - Steward can collect facts about models, score them on own first
 - If possible, group conversation with all Owners can iron out wrinkles

Operational Risk: Sample Rubric

Score	User Error, based on Software	Audience	Reliability of Calculations	Capability of Attribution Analysis	Efficiency
1 (low risk)	“Closed” system	Internal Only	Highly reliable that model ran correctly	Rollforward process exists, easily built from production run	Little user intervention, timely results
2	“Open” system, but code is locked		Reliable after analysis	Rollforward process exists, can be pulled from production run	Some user intervention, generally timely
3	“Open” system, in production		Somewhat reliable after analysis	Rollforward process exists, but requires some additional work	User intervention, acceptable processing time
4	“Open” system, not in production		Somewhat unreliable; using proxy	Rollforward process exists, but requires significant work	Lots of user intervention, long but predictable processing time
5 (high risk)	Access / Excel	External	Unreliable; comfort from trending	Rollforward process does not exist or is unreliable	Lots of user intervention, unpredictable processing time

Operational Risk: Mind the Gaps

- Score models on as consistent and objective a scale as possible
 - 1 (low risk) to 5 (high risk) applied below
- Analyze gap between overall operational risk against overall confidence
 - Use as a guide for model reviews/improvements

Model	User Error, based on Software	Audience	Reliability of Calcs	Capability of Attrib.	Efficiency	Overall Risk	Overall Confidence
Illustration Actuary	3	4	4	3	1	3.0	4
Pricing Model	5	3	3	2	4	3.4	4
Stat Vx	1	5	1	5	2	2.8	3
Cash Flow Testing	3	5	3	4	4	3.8	2
ULSG GAAP Vx	5	5	5	4	4	4.6	2

One Step Back, Two Steps Forward

- Before embarking on widespread model changes, define...
 - Clear modeling roles across company
 - Types of model reviews, testing
 - Materiality thresholds
 - Coding best practices
- Clarity around “state of the models” may help with new modeling projects
- Must define “direction” of a given model change exercise
 - Pull-up → Coded by Developers in functional areas
 - Push-down → Coded by Model Controls team
 - Require appropriate testing/approvals based on direction

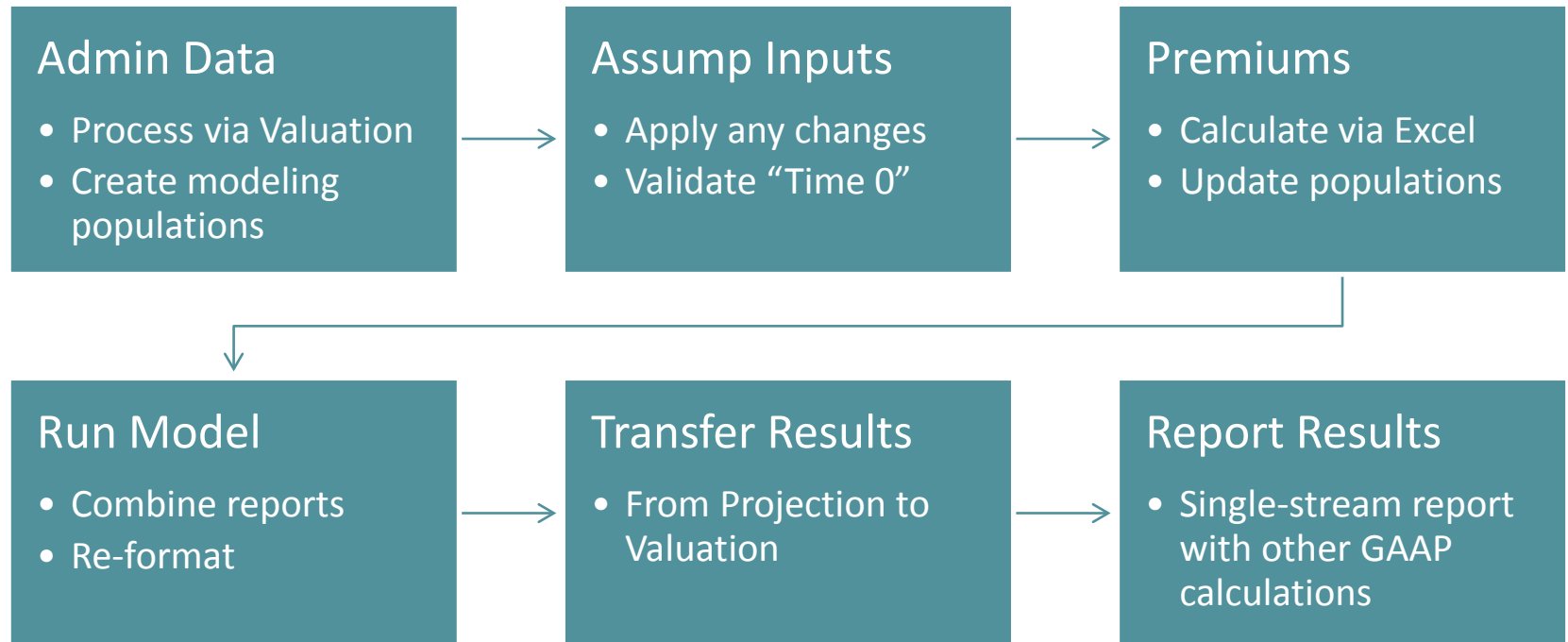
Model Review Procedures

- Foster common understanding of effective modeling
 - Reduce key person risk
 - Make inventory, testing more understandable
- Standards for accuracy, efficiency in model construction
- Review requires modeling expertise
 - Rigor should build over time
- Code is reviewed to encourage legibility, not just correctness
 - If done well, code can act as own documentation

ULSG GAAP Vx Model Example: Background

- Several disparate ULSG models
- Multistep input, validation, result processing
- Sequential passage from Admin System to Valuation Model to Projection Model to Valuation Model
- Time-consuming Excel macros required for inputs
- Controls Team tasked with aligning model with company best practices
 - Based on high “gap” of Model Risk vs. Confidence
 - Independent from functional area responsible for model run

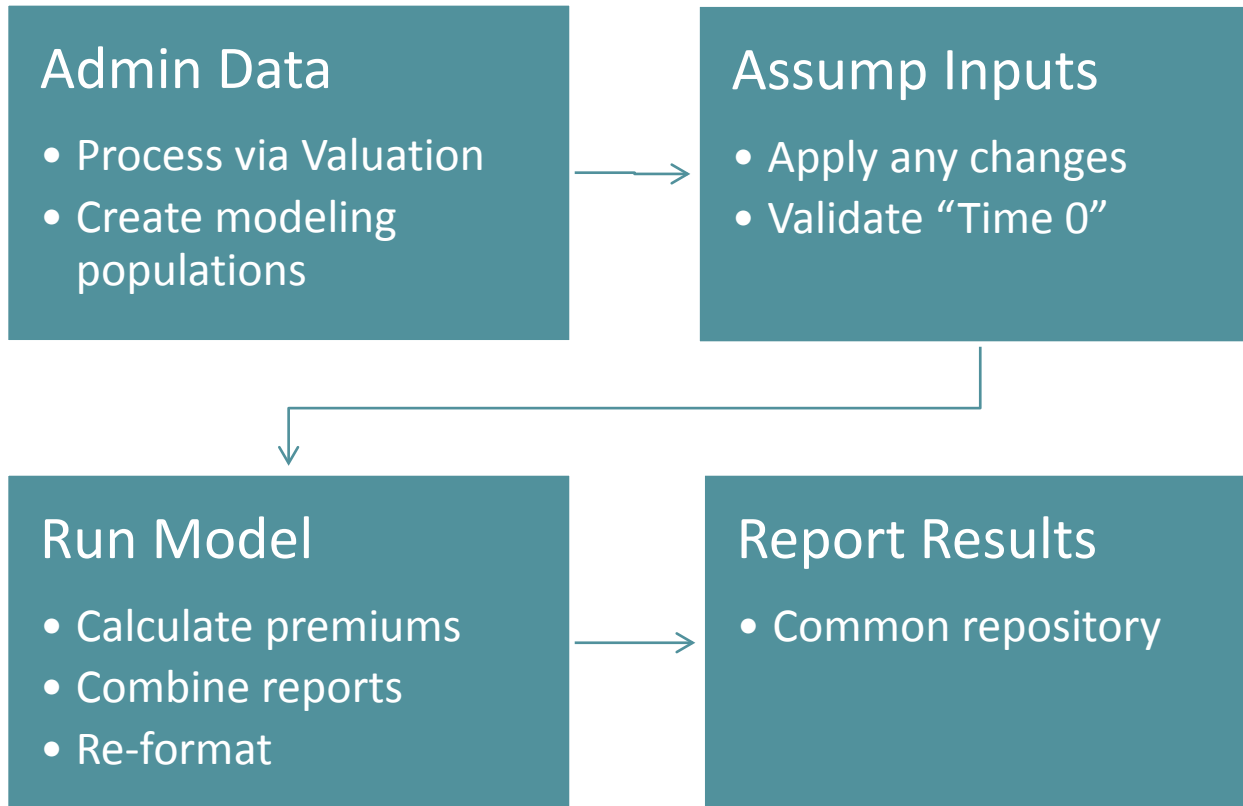
ULSG GAAP Vx Model Example: Original Method



ULSG GAAP Vx Model Example: Changes

- Merged with improved inforce projection logic
 - Seriatim populations
 - Common database, population format across all products
- Eliminated unnecessary transfers of data/calculations
- Researched and coded premium assumption calculation directly in projection model
 - Removed slow, hard-to-control Excel macros
 - Reduced end-to-end process runtime from 2 days to 2 hours

ULSG GAAP Vx Model Example: New Method



ULSG GAAP Vx Model Example: Conclusion

- Model entered User Acceptance Testing
 - Sign-off from Valuation Model Owner on changes
 - Verify meeting specs/expectations
- Performed Regression Analysis on models in common environment
 - Confirm no unintended impacts
- Model ratings updated in Model Inventory
 - Reduced Model Risk across almost all dimensions; boosted confidence
 - Consulted with Valuation Model Owner
 - Updated associated process documentation, impact memos, etc.

Leveraging the Model Inventory

- Model Inventory is a comprehensive tool
 - Compiles full details on risks, uses, limits, etc.
 - Drives conversation on improvements
 - Encourages company-wide standards for modeling
- Must decide how to allocate work identified by Inventory
 - By Owners → several branches of work, but familiar with needs; require clear guidance on modeling standards
 - By Controls team → central, consistent, independent; more gradual
- Proceed beyond “putting out fires,” develop cutting-edge techniques
 - Best practices, improvements applied more consistently
 - Fold in with overall company operational risk metrics



Thank you

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8/28/2017

Cell Testing : a System-Based Approach

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8/28/2017

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Why a system-based approach for cell testing

- Cell testing requires focus on the interconnections between the test tool and the model as well as elements of cell testing process:
 - The model could be a moving target
 - Separation of duty in development and testing
 - Black-box model vs. glass-box model
 - New model development vs. model conversion

Elements of Cell Testing Process

- Input testing
- Output testing
- Calculation testing

Input testing

- Validate whether the input/assumptions are implemented correctly in the models
- Reliance on vendors or other departments
- Correct usage of assumptions
- Correct assignment of assumptions
- Scenario review
- Check and balances with other sources

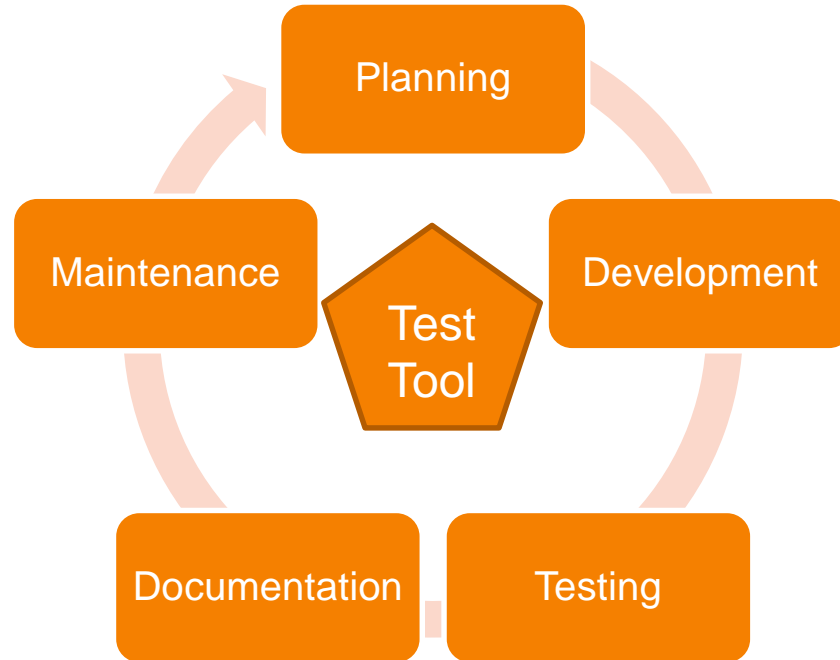
Output testing

- Reasonability test on the output
- Sensitivity test with key assumptions
- Attribution analysis on changes
- Trend analysis
- Check and balances with other sources

Calculation testing

- First-principle calculation for the test tool
- Reliance evidence on the “black-box” calculation
- Create a proof-of-concept model to test complex calculation
- Run different scenarios in the test tool
- The test threshold needs to be discussed and agreed upon among stakeholders
- Run time consideration for testing

Design a robust cell testing system



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2017 Valuation Actuary Symposium Session 41

Model Governance and Management - Advantages of a Formal Model Governance Framework

**Uri Sobel
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August 28, 2017

Agenda

1

- The goals of model governance

2

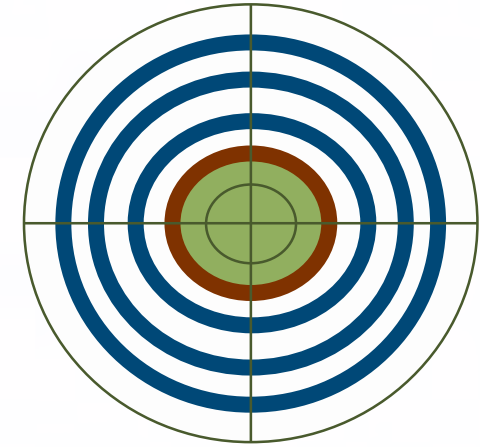
- Roles within model governance

3

- Governance structure

Goals

- Model Efficiency
 - Reduced Runtime
 - Maintenance, Upgrades, Updates
 - Alignment of human capital with model tasks
 - Sensitivity testing: starting base case
- Consistency of Results across Organization – easier / fewer reconciliations
- Validity, Accuracy, Applicability – Confidence in Results and Process
- Audit Trail



Roles

- By clearly defining roles, align human capital with model tasks
- More complex models require more delineated roles to ensure validity, accuracy, applicability
- Having only certain personnel permitted to do certain sub-tasks of the whole modeling process also promotes consistency of results across the organization
- Essential Roles:
 - User
 - Developer
 - Owner
 - Steward

Roles (Continued)

User

Can run production models (or copy of production models)

Has access to change model inputs

Typically, a young actuary early in their career; mustn't even be an actuary

Developer

Has access to change formula or programming code

Does not generate “real” runs (all runs are for testing purposes)

Typically, a more experienced actuary

- Do Users and Developers sometimes collaborate?

Roles (Continued)

Owner

Oversees Users and Developers;

Responsible for Model Maintenance and Results Reporting

Ensures Appropriateness of Model for Application / Use

Steward

Gatekeeper of Production Environment ; Grants Appropriate Model Access

Maintains Model Inventory

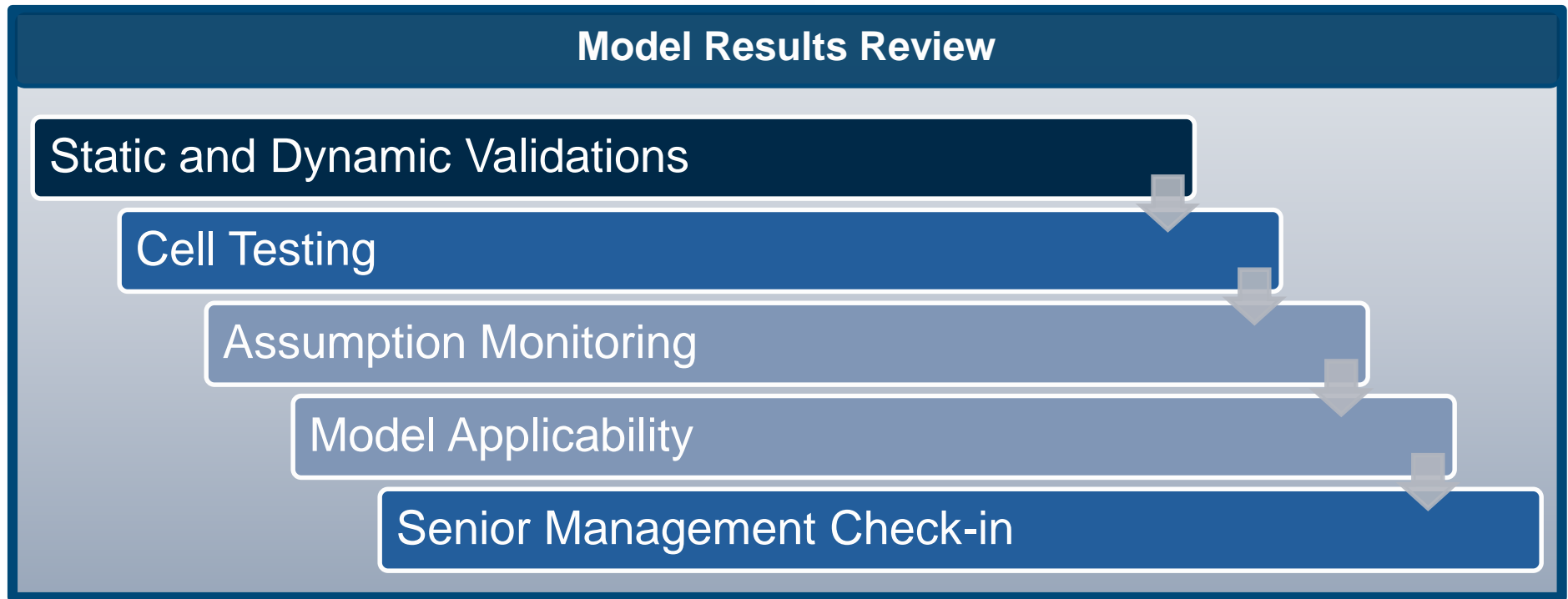
Independent ; Monitors Effectiveness of Governance

- Who did we leave off our list?

Structure

- Articulated, documented statements of authority
- Library of changes of modeling decisions (different than log of model changes)
- Governance around implementation of model changes
 - Planning, Implementing
 - Checking the implementation – Someone with necessary expertise, and ideally, an independent fresh set of eyes
 - Reviewing the impact of the change
 - Close the loop with the decision makers
 - Documentation of change: within the model, and separately
- Bring into production model?
 - Model Steward, with its own level of checking and reviewing
- Model Lineage
- Exceptions – Well Documented Rationale and Authority

Structure (Continued)



EXPERTISE is a key!

Structure (Continued)

- Culture, Soft Skills, The “Fuzzy” Stuff
- How to avoid defensiveness, power struggles, games of “gotcha”
- Preach early and often
- Look for openness to collaboration as part of hiring process
- Normalization – showcase issues averted or resolved at group meetings
 - How found? What was wrong? Why solution was better?
 - Encourages a sense of “we all make mistakes.” We’re all in it together
- Occasionally changing roles
 - Implementers become checkers / reviewers, and checkers / reviewers become implementers
 - Subject to expertise



Thank you

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