Session 2B: Model Validaiton

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Validation and Model Risk Management

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History and Evolution

Ad-Hoc Pre-2008	Modeling and testing of models have long been part of insurers' operations. Peer reviews were common practice for some types of models. However, practices were widely dispersed within and amongst companies. Governance and independence was less developed.
Reactive 2009-2013	Beginnings of a more organized approach: • US federal regulatory emphasis (SR 11-7); ORSA Guidance Manual • European Solvency II and internal models. Insurers start to define "models" and develop inventory
Proactive 2014 - Now	Insurance company senior management and boards have continued driving further developments.
	Model Risk Management Forum created in June 2015 • Comprised of 14 leading North American insurers • Actively developing improved practices • November 2016 model risk scoring survey
Productive TBD	More emphasis on model stream and connectivity Viewing model risk management as a mechanism to ensure that models are performing at their best and generating measurable business value.

What is driving the acceleration in MRM activities?

1. Insurers' model validations are finding, and correcting, calculation errors

2. Process and control inadequacies and inefficiencies are being uncovered and resolved

3. Boards and senior management want better MRM:

- **79%** of surveyed directors agree that more work needs to be done to validate their insurer's models and keep them informed on the validation process
- **86%** of directors say more needs to be done to disclose models' strengths and limitations
- **93%** of CROs say more effort is needed to communicate how models are linked and used in important decisions

4. Regulators and rating agencies expect MRM programs to be in place:

"The Summary Report should demonstrate the insurer's process for model validation, including factors considered and model calibration."

ORSA Guidance Manual, ***NAIC***

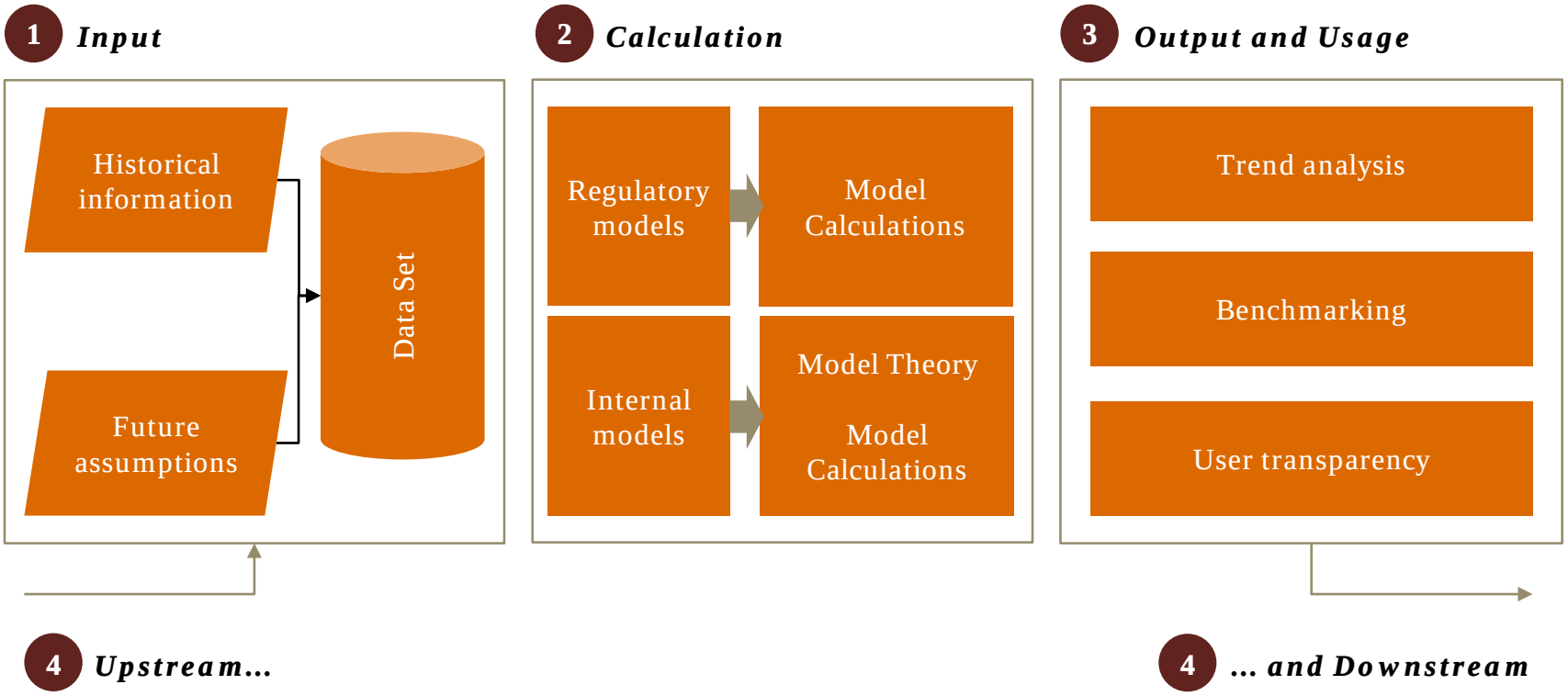
"The "testing and validation" category addresses the quality of an insurer's approach to testing and validating all aspects of its ECM, including the insurer's methodologies, interpretation of data and ECM outputs into its ERM program"

A New Level Of Enterprise Risk Management Analysis: Methodology For Assessing Insurers' Economic Capital Models, ***S&P Global Ratings***

Model Risk Management
Basic Components

Model Risk Management Function	• Charged with managing model risk • Typically part of risk management function • Interaction with other functions (actuarial, internal audit)
Model Risk Policy	• Roles and responsibilities • Model development and model change management • Model validation
Model Inventory	• Defining "model" • Record of models and key model information • Tracking validation status
Risk Scoring	• Typically defined via failure likelihood and loss severity • Prioritize models based on risk • Focus activities on higher risk models
Validation	• Periodic validation of model inputs, calculations, and outputs • Key element for most insurers' management of model risk • Maximize efficiency as well as effectiveness

End-to-end validation



End-to-end validation

- Input
- Calculations
- Output and Usage
- Upstream and Downstream

The model validation team should assess the data for its completeness, accuracy and reliability:

- If the data is historical information (known past events), the objective of the input validation is to confirm that the input is a true representation
- Confirm the source of the data and establish compatibility of model input with source data
- For data that presents information about the future (assumptions), the objective is to ensure that the input either (a) conforms to prescribed standards or (b) comes from a validated upstream model
- Where input represents prescribed standards or agreed values, ensure that users of the model are aware of this condition

End-to-end validation

- Input
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The calculations can be validated by a comparison of "model to actual" or a comparison of "model to model."

- Back testing (model to actual) can confer a high level of confidence, but is often not possible due to insufficient data
- In a model to model comparison, both conceptual soundness and calculation accuracy should be validated
- If the model is regulatory, design documentation should be compared to up-to-date regulation
- If the model objective is other than regulatory, an independent subject matter expert may need to be engaged to assess conceptual soundness
- Depending on model riskiness, recalculate using an independent model and compare to within agreed error tolerance

End-to-end validation

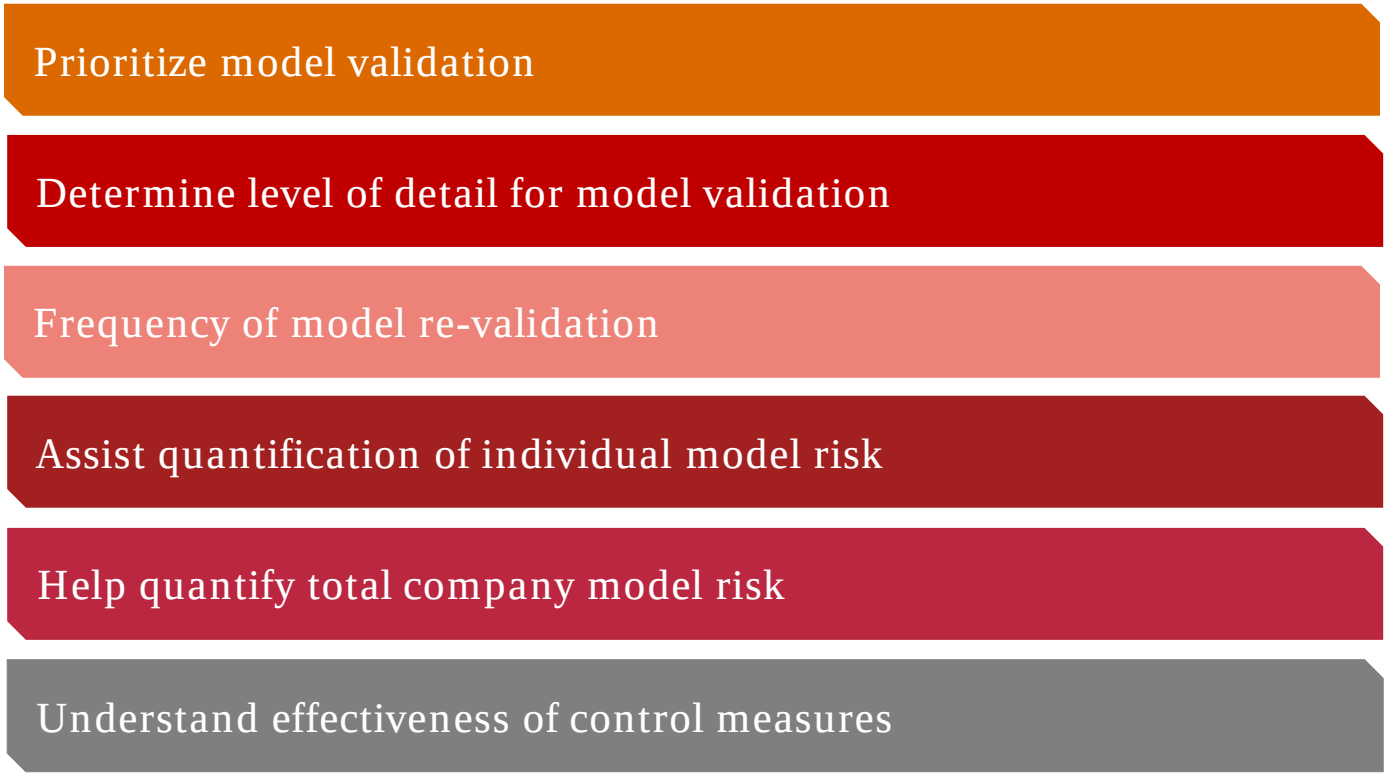
Input	Model output can be directly vetted by a comparison to other model outputs.
Calculations	• Output can be compared to outputs from previous runs of the same model (trend analysis) • Output can be compared to output from unrelated third party models with similar objectives (benchmarking)
Output and Usage	• Benchmarking has the benefit of providing independent perspective • If model results are directly used, ensure that decision making users are aware of any conditions
Upstream and Downstream	• If model results are indirectly used, ensure downstream owners are aware of model limitations and conditions

End-to-end validation

Input	A comprehensive model inventory and an inventory management framework are essential to effective model risk management.
Calculations	The documentation of the validation should identify any upstream models used and their validation status.
Output and Usage	Downstream models should be identified and informed of the model validation results.
Upstream and Downstream	Mapping the entire model stream can be an effective way of understanding the key decision making processes. Opportunities exist to improve the efficiency and effectiveness of the models/decision making process. Mapping the streams and help to identify and prioritize these.

Risk Scoring – Why?

The top 6 reasons that companies create model risk scores:



Results from MRM Forum Model Risk Scoring survey

Risk Scoring - Characteristics

Most companies use a two-dimensional risk-scoring system based on likelihood & severity of model failure

Common characteristics used to assess **failure likelihood**:

1) Complexity of Model
2) Complexity of Process
3) Complexity/Quality of Input Data
4) Complexity of Model Theory
5) Complexity of Calculation Engine
6) Model Platform or Software Used
7) Dependency on Other Models
8) Transparency of Model
9) Expertise & Number of Users
10) Use of Output (Short or Long-Term)

Common characteristics used to assess **loss severity**:

1) Financial Impact – B/S or I/S
2) Financial Impact – not B/S or I/S
3) Reputational Impact
4) Strategic Decision Making Impact
5) Regulatory Impact
6) Recoverability/Cash Flow Impact
7) Downstream Usage
8) Autonomous Execution
9) Customer/Operational Impact

Using external resources

A 2015 study by the North American CRO Council reported that more than **80%** of respondents make use of external resources for their validation activities. For some respondents, as much as **50%** of their validation work is conducted by consultants. Insurers are looking for the following benefits from external resources:

Ready, available and independent	External providers frequently have many consultants who have experience doing insurance model validation work. They typically have a large pool of experienced resources available that can complete validations in a timely and efficient manner.
Specialist Expertise	Complex models often require specialist knowledge or expertise to understand and assess. While insurers may have staff with the required knowledge, these staff are often not sufficiently independent of the model or may have limited experience of alternative models, methodologies and processes.
Benchmarking data	External providers can often draw from an extensive database of industry practice to develop benchmarks to compare against an insurer's model assumptions and parameters. This comes from both other client work and specialized subject matter specific surveys.
Purpose-built tools	Often external providers build and maintain an inventory of purpose built calculation checker tools to support its validation and audit work. This provides a ready platform to conduct validations effectively as well as explaining any various in results in a comprehensive manner.