Demystifying validation tools

Risk Dynamics Approach to Model Testing

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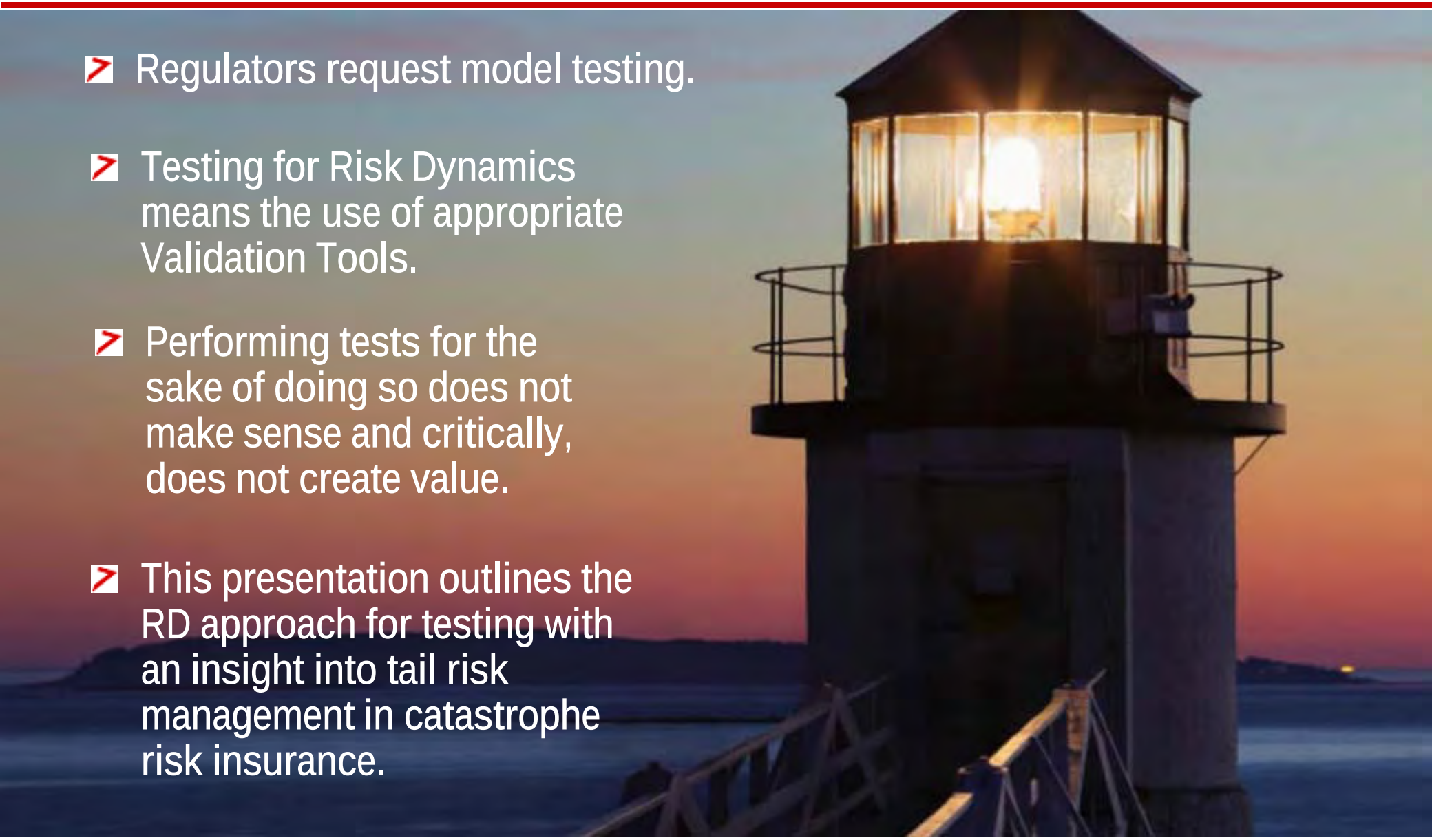
Outline

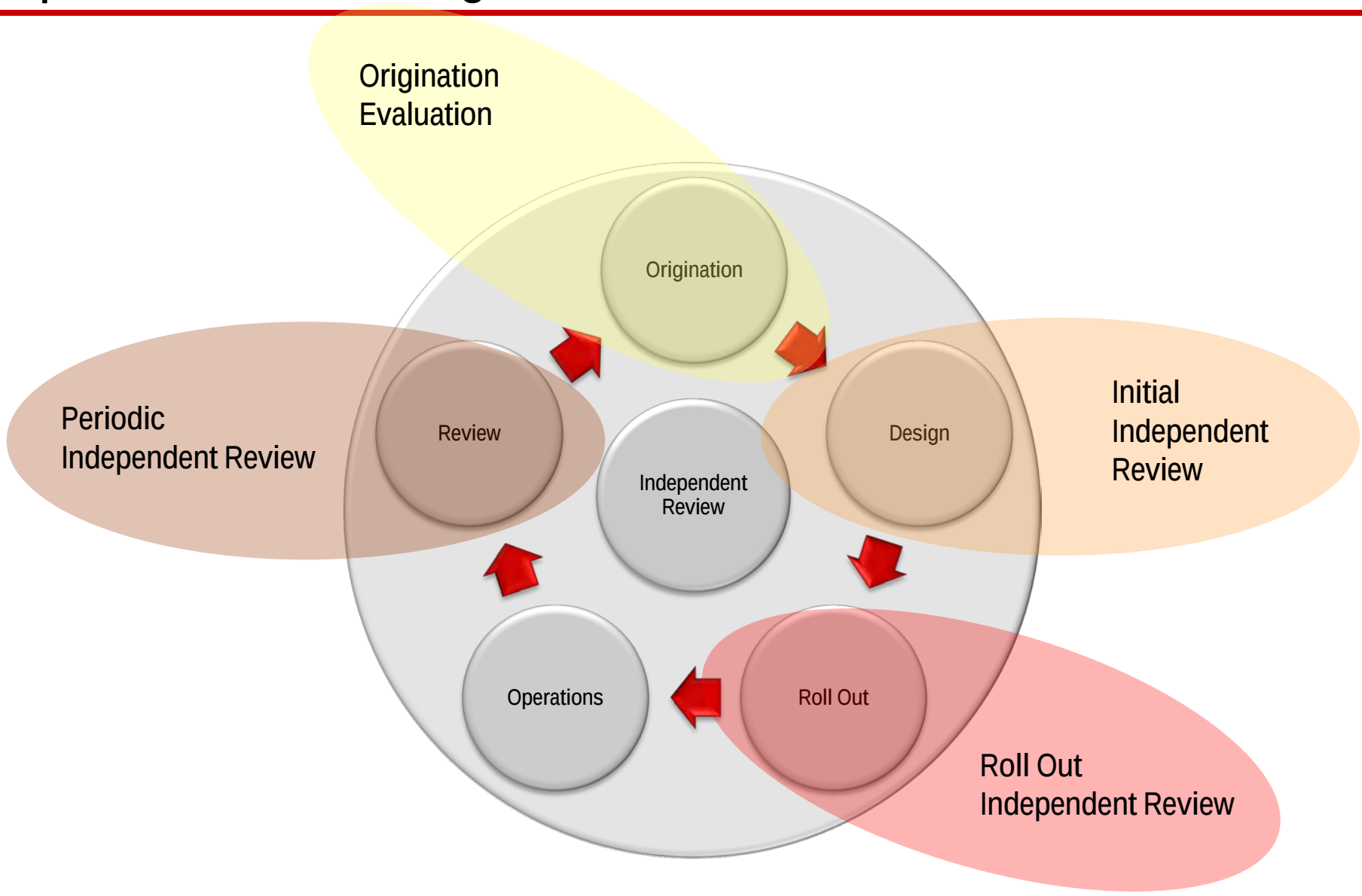


- Regulators request model testing.
- Testing for Risk Dynamics means the use of appropriate Validation Tools.
- Performing tests for the sake of doing so does not make sense and critically, does not create value.
- This presentation outlines the RD approach for testing with an insight into tail risk management in catastrophe risk insurance.

Context challenge

- Testing often looks like a burden
- It provides information on
  - whether a model is sound and performing,
  - whether some model choices (assumptions, calibration, EJ) have a material impact, and
  - therefore it is useful not only with a view to fulfil regulatory requirements.
- While the burden evolves with time
  - Initial model approval: complete and extensive testing tends to be heavy.
  - Periodic model reviews: tend to focus on both, identified key model elements and elements of model change (e.g. changes in the environment, on the performance).

Independent Review Framework
Independent Review Stages



Conceptual challenge

- Risk Dynamics uses a multi-layered validation and testing approach:
- Outer levels are generic, highly conceptual, timeless and constant
- Inner levels are very granular, objective driven and respond to evolving change

Testing
A performance challenge

- Different steps are required to perform testing

Testing Strategy	▪ A definition of test objectives setting out at high-level what is expected to be tested for each model. ▪ This ensure completeness of the analysis. ▪ It is specific to each model since it depends on the model characteristics, requirements and shortcomings.
Test Specification	▪ Definition of statistical/expert test(s) to be applied for each test objective. ▪ Such test specification might be different throughout the model's lifecycle due to time and/or data availability
Test Application	▪ Application of the tests on the correct scope with the appropriate tool ▪ Tests can be applied by different parties depending on the timing on the model lifecycle ▪ The validation assesses the correctness of the application during the different validation stages
Test Analysis	▪ Analysis of the test outcome and conclusion drawing ▪ It has to take into account the test objectives and the acceptance criteria ▪ Conclusions have to be drawn not only at individual test level but also at test objective level ▪ And in the end, it is the combination of tests that leads to a final conclusion on the model

- Testing is not about computing results, but it is about analysing them, while keeping the initial objective in mind.

Testing Strategy
A structural challenge

Domains		Key objectives of testing	Example – Regulatory View
	Level 1	Key objectives	Objectives of specific testing in an applied review
Environment	Strategy	Understand the portfolio	Asse
	Specifications	Understand the risk profile	Exan
Outcomes characteristics	Performance	Assess 'how good' the model is in different circumstances	Exan defin Meas ✓
	Soundness	Assess whether the model is sound	Asse blind serie
Model	Methodology	Assess the appropriateness and impact of methodology	Evalu assu range ✓
	Development	Assess the appropriateness and impact of development choices	Chec Asse choic inacc ✓

Minimal objective:

Has the model been sufficiently tested to be accepted by the supervisor.

This does not cover all areas of a conceptual or applied model testing strategy.

Testing Strategy
A structural challenge

Domains		Key objectives of testing	
	Level 1	At the Design stage	At the Operation and Review stage
Environment	Strategy	<u>Understand the portfolio</u> • Materiality, recent and foreseen evolution of the portfolio per product, business	<u>Follow up of the portfolio</u> • Evolution (recent and foreseen) of the portfolio per product, business
	Specifications	<u>Understand the risk profile</u> • Risk profile characteristics – importance and evolution of risk factors	<u>Follow up of the risk profile</u> • Evolution of the risk profile • Evolution of the risk measure
Outcomes characteristics	Performance	<u>Assess 'how good' the model is in different circumstances</u> • Performance testing on past data • Performance under specific scenarios / hypothetical portfolios • Comparison/Reconciliation with other/external information (e.g. P&L attribution)	<u>Verify the evolution of model 'quality'</u> • Performance testing on recent data • Performance under (new) scenarios
	Soundness	<u>Assess whether the model is sound</u> • Clarification of the outcome characteristics • Sensitivity to key risk factors • Benchmarking with other/external information (e.g. expert intuition)	<u>Verify the soundness of the model</u> • Benchmarking with other/external information (e.g. expert intuition)
Model	Methodology	<u>Assess the appropriateness and impact of methodology</u> • Verification pertinence of the underlying assumptions • Quantify/qualify the impact of the methodological choices (e.g. via sensitivity analysis) • Decomposition of model outcome variations due to changes in modeling or input datasets (e.g. analysis of change)	<u>Verify the appropriateness of methodology</u> • Verification pertinence of key underlying assumptions • Decomposition of model outcome variations due to changes in modeling or input datasets (e.g. analysis of change)
	Development	<u>Assess the appropriateness and impact of development choices</u> • Assess the data quality and quantify/qualify its impact on the model • Verify the pertinence and quantify/qualify the impact of the choices related to data treatment, modelling and estimation/calibration	<u>Verify the appropriateness of development choices</u> • Assess the data quality and quantify/qualify its impact on the model • Verify the pertinence and quantify/qualify the impact of key choices

Example
Insurance Modelling of Natural Catastrophe Risks

Domains		Key objectives of testing	Conceptual Example
	Level 1	Key objectives	Tail-Risk Management in Insurance of Catastrophe Risks
Environment	Strategy	Understand the portfolio	• Exposure to regional perils • Exposed lines of business and coverages • Architecture, Objectives and Model Design
	Specifications	Understand the risk profile	• Identification of known and unknown risks • Determine to which degree the risk profile is experience driven; how much can be derived from data and at which level of granularity; where physical CAT risk models come in to replicate tail risks that have not or rarely been observed; how actuarial techniques are used to represnt otherwise non-modelled risks.
Outcomes characteristics	Performance	Assess 'how good' the model is in different circumstances	• Assessment of model performance against specification, claims and benchmark events; crash test assessment and analysis of individual loss driver components, including, for example the regional characterstics, frequency, severity.
	Soundness	Assess whether the model is sound	• Demonstrate appropriateness of the model for the representation of cat risk losses across the risk distribution and according to strategy and specification.
Model	Methodology	Assess the appropriateness and impact of methodology	• Analyse the approach for each building block of the model, including the exposure data selection and parameterisation, the vulnerability parameterisation and related outcomes respective of their model specification and the degree to which the stochastic hazard event set is a sound representation of risk.
	Development	Assess the appropriateness and impact of development choices	• A check of data quality, appropriateness, representativeness and treatments to assess the robustness of the modelled loss distribution and the underlying uncertainty, estimation choices, whether conservatism is commensurate to uncertainty and inaccuracy.

Many thanks,

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For further information we refer to the Risk Dynamics White Paper on Insurance Model Validation Challenges, providing a summary of Risk Dynamics' 2012 Model Validation Roundtable.

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