



ENTERPRISE RISK
MANAGEMENT SYMPOSIUM

Leading Model Risk Management Practices

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Desired Outcomes

1. Explore leading model risk management practices;
2. Discuss process for conducting effective validation of “significant” models;
3. Share practical insights for managing and deriving value from a model risk management program.

Overview

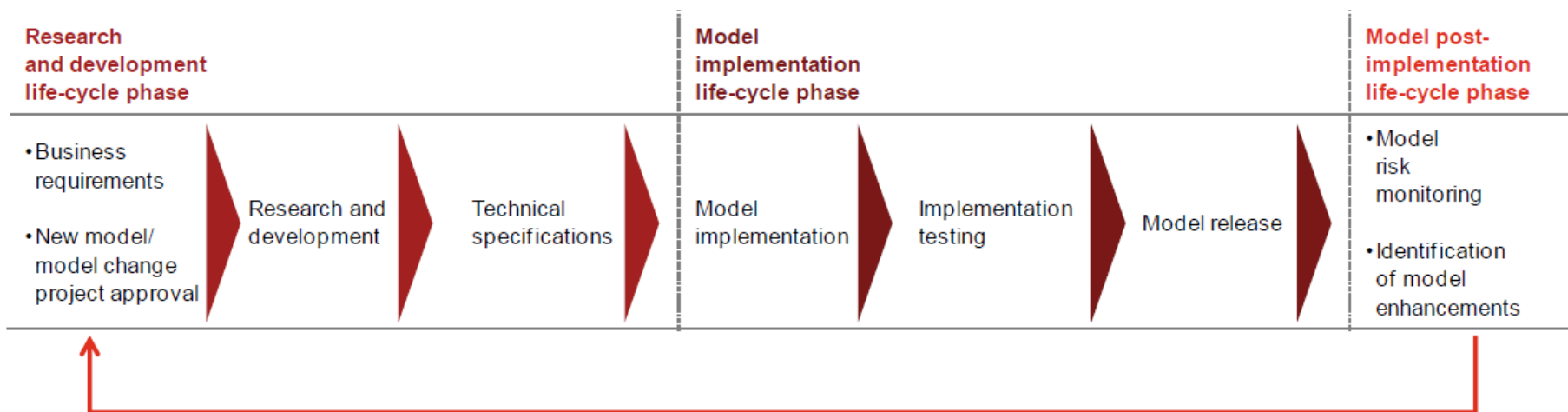
- Increased regulatory focus on models since the financial crisis of 2008;
- Dodd-Frank Act of 2010;
- OCC Bulletin 2011-12 / Federal Reserve Bulletin SR 11-7, “Supervisory Guidance on Model Risk Management,” (April 4, 2011) is the authoritative guidance on model risk management in the banking industry;
<http://www.occ.gov/news-issuances/bulletins/2011/bulletin-2011-12a.pdf>

What is a model?

- SR 11-7: A “quantitative method, system or approach that applies statistical, economic, financial or mathematical theories, techniques and assumptions to process input data into quantitative estimates” and “simplified representations of real-world relationships among observed characteristics, values and events”
- Model components:
 - **Information input** - delivers assumptions and data to the processing component
 - **Processing component** - transforms inputs into estimates
 - **Reporting component** - translates the estimates into useful business information

Lifecycle of a model

- The lifecycle of a model includes:
 1. research and development;
 2. Implementation; and
 3. post-implementation “use”



Model risk

- Primary sources:
 - A model may have **fundamental errors**, producing inaccurate outputs relative to the model's design objective and intended business uses.
 - A model may be **used incorrectly** or inappropriately.
- Model risk increases with greater model complexity, higher uncertainty about inputs and assumptions, broader use, and larger potential financial impact upon errors or misuse.
- Consider risk from the perspective individual models and in the aggregate.

What is MRM?

- A formalized process for managing and mitigating model risk
- Key principle: effective challenge!
- Three lines of defense framework

Governance

Risk Appetite for Model Risk

Model Risk Management Framework

Policies and Procedures

First Line of Defense

Model Developers, Owners, and Users

Model Development & Testing

Model Changes

Model Usage Changes

Model Performance

Second Line of Defense

Independent MRM Team, Validation Staff, Senior Management, and Board of Directors

Model Inventory Management

Independent Model Validation

Annual Model Review Process

Model Risk Monitoring

Model Risk Escalation & Periodic Reporting

Third Line of Defense

Internal Audit

Review Model Risk Management Policies

Compliance with Policies

Review of Model Validation

Model validation

Validation Area	Purpose	Model Validation Guidance	
		Fed (OCC 2011-12)	SII IMAP
Model Use	Confirm model is used properly in a manner consistent with model objectives; confirm that model limitations are understood	“Model use” responsibility of model owner, to be reviewed by oversight team	Use Test
Inputs	Test data, parameters and assumptions used by the model	“Evaluation of conceptual soundness” includes data quality	Statistical Quality Standard
Methods and calculations	Test the soundness of model methods and calculations	“Evaluation of conceptual soundness” includes methods and calculations	Statistical Quality Standard
Outputs	Test that outputs are reasonable and appropriate	“Outcomes analysis” includes hindsight analysis, back testing, review quality of past judgments	P&L Attribution
Governance, controls, and documentation	Confirm governance processes are operating effectively, including model performance monitoring; periodic independent validation	Ongoing monitoring (test ongoing effectiveness, focus on components most sensitive to changes in conditions)	Validation Standards, Documentation Standards

Validation considerations

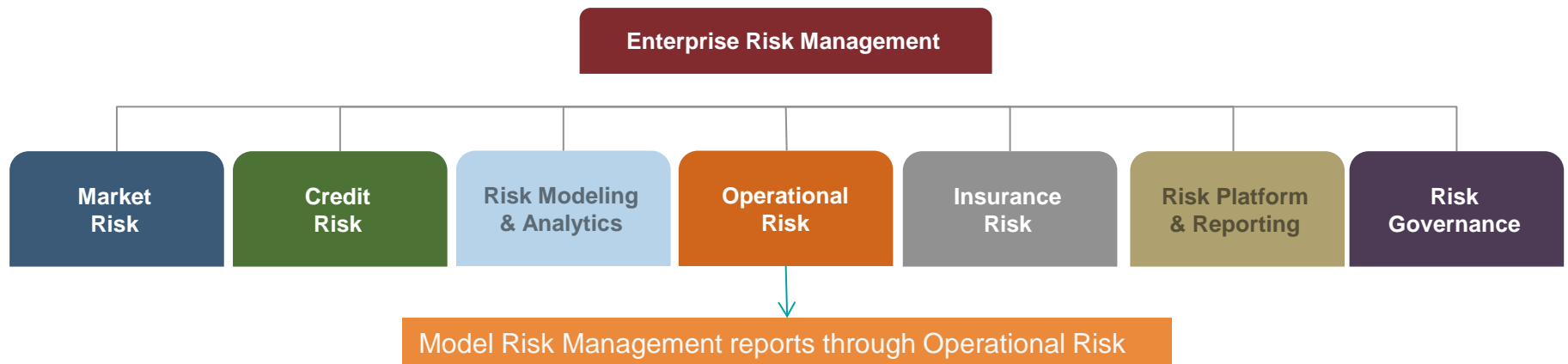
Requirement	Consideration
Well-understood purpose	Ensure that there is a clear statement of purpose for the model and that there is a model “owner”
Relevant business drivers	Confirm that the model appropriately represents the business drivers, risk factors and relationships that are relevant and material, and that the model is fit for purpose
Sound methodology	Confirm that the model applies an appropriate and practical methodology and mathematical basis that represents good practice and that limitations are understood
Suitable assumptions	Confirm that assumptions are grounded in past experience, consider future outlook and likely trends
Appropriate inputs	Confirm model inputs are accurate, appropriate, and complete
Appropriate outputs	Confirm that outputs provide the type of results needed to meet the stated purpose
Adequate documentation	Confirm accuracy and completeness

Designing a validation test plan

1. Determine coverage of tests
 - Consider scope of validation
2. Perform risk assessment by model component, considering underlying volatility and impact on overall results
3. Select series of tests depend on results of component risk assessment:
 - Independent calculation or re-performance
 - Analytical comparison to industry practice or benchmark
 - Inquiry with review of documented evidence
 - Other
4. Establish criteria for reaching overall conclusion based upon test results

MRM at The Hartford

- A centralized model risk team was formed in 2011 as part of Enterprise Risk Management
- The team functions as a 2nd line of defense
- Main Functions: Governance & Independent Validations



Question: Does your company have a centralized model risk team? Does it reside in Op Risk?

Overview of MRM Program

Comprehensive Framework

- Policies and procedures
- Best practices for implementation, use, controls, and monitoring
- Annual updates to board

Model Inventory & Assessment

- Centralized list of models
- Annual assessment of critical model attributes

Model Oversight Committees (MOC)

- Enterprise MOC
 - Sets company wide validation priorities
 - Approves policy
- Line of Business MOC
 - Establishes line of business plan
 - Resource & escalation forum

MRM policy

- The Hartford utilized “OCC Supervisory Guidance on Model Risk Management” as a basis for policy
- Customized for Hartford, shift focus from requirements to insurance industry best practices
- Provided baseline for framework & priorities

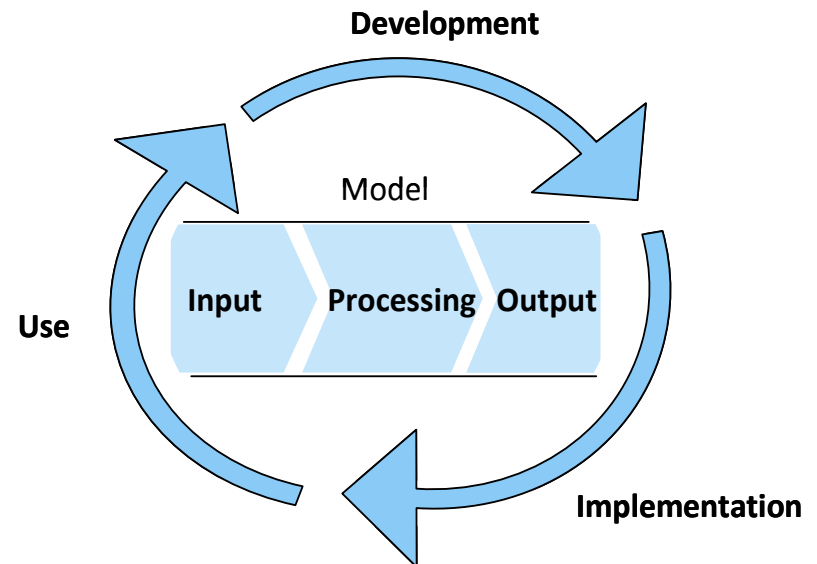
Key elements include:

- Defines a model
- Establishes roles and accountabilities
- Sets risk appetite and tolerances
- Outlines scope and applicability
- Contains governance oversight
- Describes escalation and exception process



Independent validation

- All models are categorized:
 - ‘Critical’
 - ‘Important’
 - ‘Other’
- Centralized team conducts independent validations of ‘Critical’ models
 - Line of business resources assist with other validations
- Validations cover the model lifecycle and are conducted at periodic intervals



Question: Are validations performed at your company at periodic intervals?

Lessons Learned: Implementing a MRM program

What worked well

- Established framework with oversight committees
- Comprehensive centralized inventory
 - Categorized/prioritized
 - Annual certification
- Periodic validations of most critical models
- Tracking of model issues
- Coordination with Internal Audit

Challenges

- Business Resources
- Timelines to complete validations
- How to expand validations across more models
- Level of findings
- Scoping and 'feeder' models
- Varying expertise with centralized team; ability to effectively challenge
- Executive buy-in and value add

Expectations for the future

- Increased regulatory focus despite lack of requirement for domestic insurers
 - S&P considers model risk framework in the overall ERM rating
- ORSA recommends inclusion of validation procedures for risk tools
- Next Steps for The Hartford:
 - Expanding the framework to a larger set of models
 - Continue to show value to executive leadership team
 - Publish standards and best practices for modeling

Question: Has your model risk framework influenced your ERM rating?

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