

# MODEL RISK MANAGEMENT

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# Model Risk Management

- What is Model Risk?
- What is Model Risk Management?
- Best Practices
- How Do Actuaries Fit In?

# What is Model Risk?

Risk of financial loss, poor decision making, reputational hit, etc. due to:

- Incorrect model (fundamental error)
- Improperly spec'd model
- Incorrect or inappropriate usage
- Bad data?

# What is Model Risk Management?

Applying ERM principles and techniques to the risk of loss due to model risk.

*Applies to all models – not just models used in ERM but also capital models, reserving models, underwriting models, pricing models...*


# Where Can We Find Best Practices?

Banking world is one source:

- Federal Reserve Letter SR-11-7
- Office of the Comptroller of the Currency Bulletin 2011-12
- Following 2008 financial crisis, Dodd-Frank Act of 2010

# Best Practices

Three lines of defense still apply:

-  Business unit & model developers
-  Risk management team, management, board of directors
-  Audit


# Best Practices

## Sound development process:

- Clear statement of purpose
- Sound design, theory, and logic
- Robust methodologies and processing components
- Rigorous assessment of data quality
- Appropriate documentation

# Best Practices

## Accounting of Uncertainty

- Applying well-supported judgmental adjustments  *Conservatism? Excessive conservatism will lead others to discount results.*
- Placing appropriate level of emphasis on output
- Include a range of outputs to prevent spurious precision
- Ensuring a model is used only when supported by other models or approaches



# Best Practices

## Validation

- All model components (inputs, processing, outputs, reports...)
- Independence
- Culture of organization should support objective thinking, questioning, and challenging of decisions

# Best Practices

## Validation

- Ongoing basis
- Evaluation of conceptual soundness
- Judgment used is well informed, carefully considered, consistent with published research
- Outcomes analysis & back-testing

# Best Practices

## Effective Challenge

- Critical analysis by objective, informed parties who can identify model limitations and assumptions, and produce appropriate changes
- Depends on combination of incentives, competence, and influence

# Best Practices

## Effective Challenge

- Challenge from model users and business managers is good to have but may be weak if they only speak up if affected, or especially only if they are affected in a negative way

# Best Practices

## Governance

- Policies, procedures, allocation of resources, and mechanisms for testing that policies and procedures are carried out
- Detailed documentation and validation enforced
- Roles and assignments should be identified, along with clear reporting lines
- Maintain an inventory of models
- Role of board

# Best Practices

## Governance: Internal Audit

### VERIFY...

- Policies and procedures are followed
- Validation is thorough and according to schedule

### ENSURE...

- Inventory is detailed and complete
- Effective challenge is practiced

# Best Practices

## Documentation

- Enough to ensure that parties unfamiliar with the model can understand how it operates, its limitations, key assumptions
- Keep up-to-date
- Document selection of model, if selected among various third party options

*Will pay dividends when someone comes asking*



# Best Practices

Consider risk from individual models and in the aggregate...

- Interaction and dependencies
- Common assumptions



# Best Practices

- Rigorous change control
- Monitor market conditions and other variables
  - ✓ *Modify or cease using model if environment progresses outside any constraints on model function*
- Proper benchmarking
- Apply same standards and procedures to third-party vendor models
  - ✓ *Document adjustments*

# How Do Actuaries Fit In?

Actuary might be...

- Developing models
- Using external models
- Acting as CRO
- Performing validation work
- Performing audit work
- Acting as a regulator

# How Do Actuaries Fit In?

## ASOPs & Other Guidance

23	Data Quality
38	Using Models Outside the actuary's Area of Expertise <i>(Economic Scenario Generators, Catastrophe Models)</i>
41	Actuarial Communications
46	Risk Evaluation in Enterprise Risk Management
47	Risk Treatment in Enterprise Risk Management

- ✓ Most precepts of the Code of Professional Conduct can be applied
- ✓ Not just best practices, but we are bound to only do work we are qualified to do, show professional courtesy, etc.

# How Do Actuaries Fit In?

## Context of Model

- Understand how model will be used and what decisions will be made based upon the results
- Guard against misuse:

E  
X  
A  
M  
P  
L  
E  
S

*If the model isn't very robust in the tails, disclose that especially if the audience is primarily concerned with those scenarios*

*If a pricing model puts rough boundaries around expected profitability, that shouldn't be used for reinsurance purchasing decisions*



# How Do Actuaries Fit In?

## Context of Model (cont.)

- Ensure proper attention is paid to the most relevant components
- How far out in the future can be reasonably modeled?
- Guide data used, benchmarks, reasonability checks

# How Do Actuaries Fit In?

## Context of Model (cont.)

- Keep in mind impact on industry from extreme events
- Provide clarity as to what numbers really represent
  - ✓ *"The 1 in 250 per XYZ Earthquake model v23.2..."*
- Disclose shortcomings

# How Do Actuaries Fit In?

## Which risks will be included?

- Be clear about what isn't considered, or what is considered but with above average uncertainty (difficult to quantify risks....)

## External models: catastrophe, ESGs, etc.

- Multiple models options – understand the differences and be able to communicate them
- Understand any data or model adjustments

## Reproducibility



# How Do Actuaries Fit In?

- How far do qualifications extend? Are you an expert on modeling investments?
- Don't lose sight of reality and common sense.
  - ✓ *Models are important, but simply helping the organization gain perspective on the variety and relative magnitude of risks is, too. Some of the biggest risks can't be modeled well.*
- ERM is an opportunity to expand management's perception of actuaries.



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*Thank  
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