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# Model Risk: Driving change in insurance

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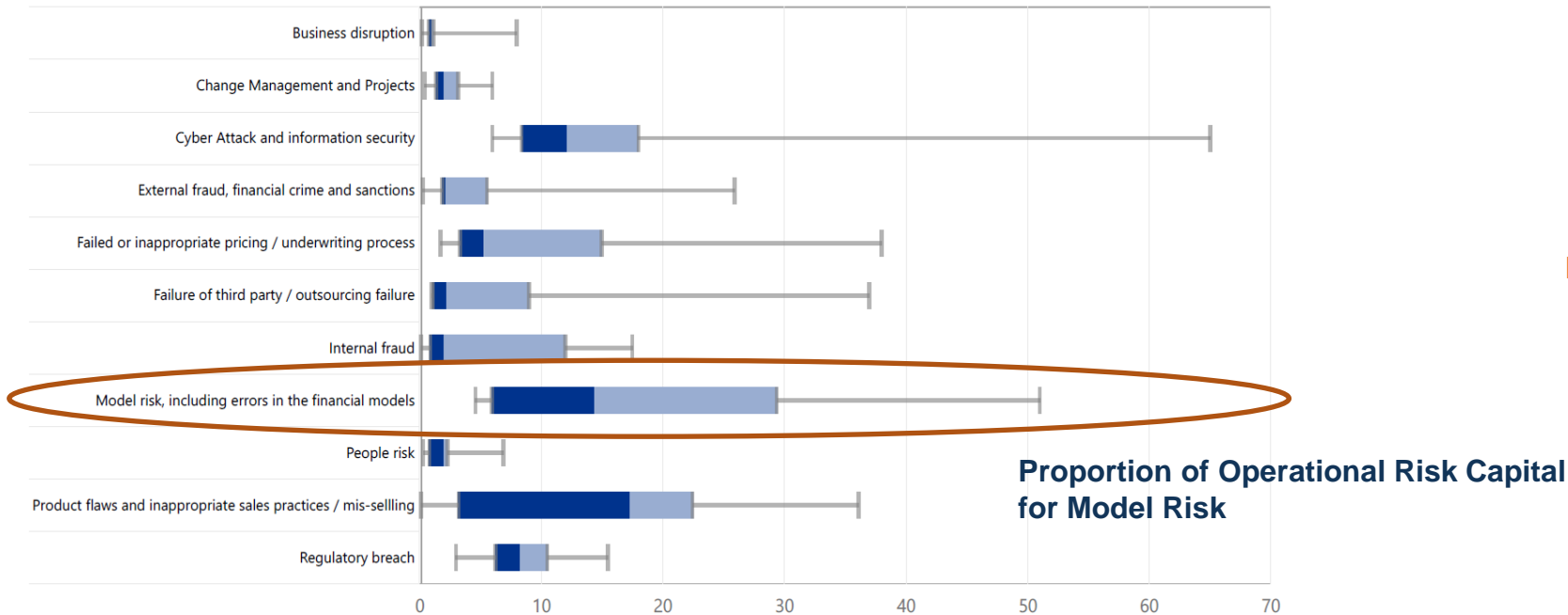
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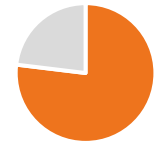
# Why should I care about model risk management?

- Model errors can have very material adverse outcomes and significant wider impacts:
  - Restatements
  - Capital add-ons
  - Incorrect decisions
  - Remediation activity
  - Section 166
  - Loss of confidence in management

9.1 What proportion of the your total operational risk capital do each of the following scenarios contribute (%)?



Do you have a Model Risk Policy?



Does it extend beyond Actuarial and Finance models?



YES NO

Source: KPMG Technical Practices Survey 2022



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# The drivers for change

Models are more complex and interconnected:  
increases impact of errors

Models applied to new issues, e.g. climate  
disclosures and therefore new users

Emerging practice and regulations from banking  
relevant to insurance

Boards and NEDs with banking background  
driving standards into insurance

New techniques now and going forwards, e.g.  
Big data analytics, artificial intelligence.

## .....but progress is mixed

- Increasing realisation of the need for common standards rather than model-by-model approaches
- Increased use of regular baselining exercise when model components are updated or reviewed
- EUC standards cover some models and require defined controls
- A few insurers have gripped Model Risk and introduced new standards:
  - Investing time and effort into formal model identification exercise and establishing of a model inventory.
  - Standardising model control environments, model owner definition and governance roles
  - Internal Model standards and Validation are now embedded – defining a more encompassing role for validation based on model use and moving towards rolling validation of other models.
- But there are insurers who have not made as much progress



# What drives good Model Risk Management?

## What is a model?

This is the key question – all other components flow from it.

## How is each model used?

The controls (monitoring, validation etc) are shaped by the use of the model



Outcome will be a model inventory with more models and greater variety.

From 20–30 models to hundreds of models ?

**This is a significant change to the model risk management landscape for any insurer**

## What do we want to achieve?

- Scope and level of assurance:
  - Purely model integrity and method
  - E2E including outputs and inputs
- Ongoing appropriateness and restrictions on models that do not have appropriate controls

## How do we implement?

- The model risk policy sets the standards
- Model owners drive implementation but using a consistent approach
- Model Governance Committee oversees the overall risk mitigation

## What is the right operating model to upscale oversight?

- More models and more variety – need right level of resourcing and skill sets
- Validation approach with greater flexibility and scoped around the use of the model

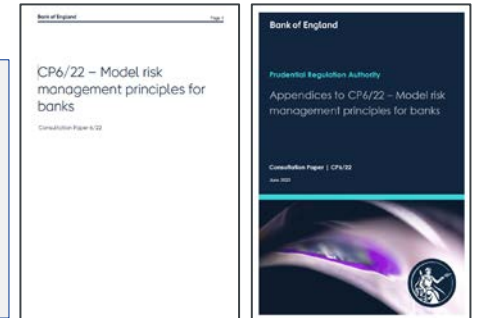
**Users of model output want to know that the control environment is making the model fit for purpose**



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# PRA CP6/22 - Highlights

- The PRA issued Consultation Paper CP 6/22 on 21 June 2022 on model risk principles for banks
- Appears to be more evolutionary than revolutionary, building on well-established foundational principles of existing regulatory guidance (e.g. SR 11-7)
- Emphasis on MRM framework embeddedness, Senior Manager accountability, and enhanced model governance of more sophisticated modelling techniques (e.g. AI and ML)
- Provides impetus for some much needed investment, and heightens the profile of MRM at board level - especially given the ever increasing complexity and reliance on models



|                        |   |  |
|------------------------|---|--|
| PRA CP 6/22 HIGHLIGHTS | <b>SCOPE OF CP</b>                        | <ul style="list-style-type: none"> <li>• <b>Key principles and proposals for the implementation of an effective MRM governance and framework</b> across the model lifecycle <b>in a proportionate manner</b>. This CP is relevant to all firms in the wider banking sector and their external auditors</li> </ul>  |
|                        | <b>MOTIVATION BEHIND CP</b>               | <ul style="list-style-type: none"> <li>• <b>Address specific shortcomings currently observed in UK banks</b></li> </ul>  |
|                        | <b>MODEL ESTATE</b>                       | <ul style="list-style-type: none"> <li>• Broadens scope to <b>include all models used for key business decisions and financial reporting</b> (including models used for accounting purposes)</li> </ul>  |
|                        | <b>COMPLEXITY OF MODELLING TECHNIQUES</b> | <ul style="list-style-type: none"> <li>• Explicitly <b>calls out new modelling techniques</b> e.g. artificial intelligence &amp; machine learning, <b>and the increasing complexity of models</b></li> </ul>   |
|                        | <b>ACCOUNTABILITY</b>                     | <ul style="list-style-type: none"> <li>• Proposes the <b>identification of a Senior Management Function (accountable individual) who will ultimately be responsible for the MRM framework</b></li> </ul>   |
|                        | <b>EMBEDDEDNESS &amp; ATTESTATION</b>     | <ul style="list-style-type: none"> <li>• Focuses on <b>embedding the principles of the MRM framework</b>, and the operating effectiveness thereof.</li> </ul>  |
|                        | <b>PRINCIPLES</b>                         | <ul style="list-style-type: none"> <li>• The CP sets out <b>five core principles of MRM</b>, complemented with a <b>number of more detailed sub-principles</b> <ol style="list-style-type: none"> <li>1. Model identification and model risk classification</li> <li>2. Model governance</li> <li>3. Model development, implementation, and use</li> <li>4. Independent model validation</li> <li>5. Model risk mitigants</li> </ol> </li> </ul> |



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# PRA CP 6/22 – Banking industry challenges

## Principle 1 - Model Identification & Model Risk Classification

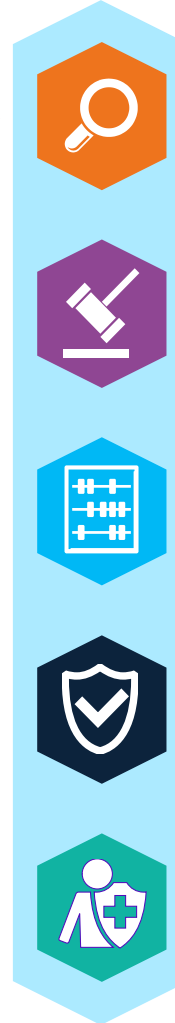
- **Expanded definition** of a model, new model types and sophisticated modelling techniques
- **Extended information** capturing requirements in model inventories
- Model tiering to represent both **materiality** and **complexity** dimensions

## Principle 3 - Model Development, Implementation & Use

- **Model purpose** and **design** and rigorous **data testing** across range of dimensions (incl. bias)
- **Development testing** to identify **operating boundaries** and model **sensitivity to economic and market conditions**
- **Model deficiencies** and **adjustments**, improving **documentation standards** and testing suitability of **information systems**

## Principle 5 - Model Risk Mitigants

- **Post-Model Adjustments (PMAs)** clearly linked to **model limitations** and documented extensively
- **Clear standards** and a **systematic approach** to **model restrictions** and **exceptions** with focus on **remediating deficiencies**
- **Model restrictions** and **exceptions** for (material) models using **escalation protocols** where appropriate



## Principle 2 - Governance

- **Board involvement** in setting MRM framework, cascading **model risk appetite** and promoting **MRM culture**
- **Accountable SMF** for MRM effectiveness aided by clear and sustainable **governance** design and appropriate **monitoring** and **assurance** tools
- **Clear roles** and **responsibilities** joined by **comprehensive** and **prescriptive policies** to ensure **consistency** of validation activity
- Expectations around **third-party vendor models**

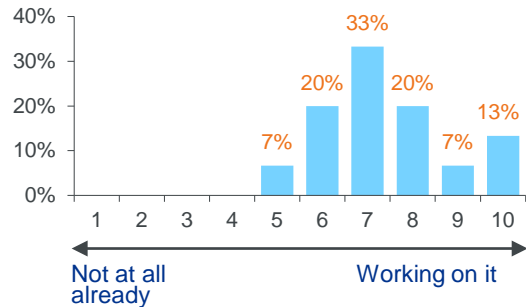
## Principle 4 - Independent Model Validation

- **Independence** of validation function and access to **input data** and **coding platforms** to perform **comprehensive reviews**
- **Independent model performance monitoring**
- **Triggers** for and **depth** of **review activity** commensurate with model materiality and complexity



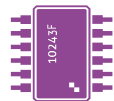
# Experience from the Banking sector

## Firms' awareness of the CP



**67%**

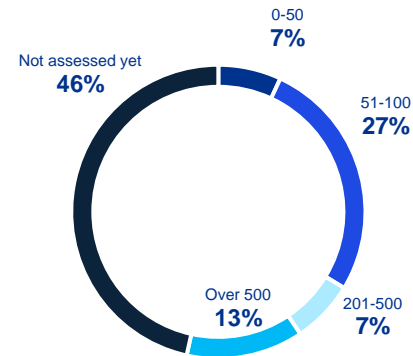
AI/ML techniques



## The biggest organisational challenge in implementing CP 6/22

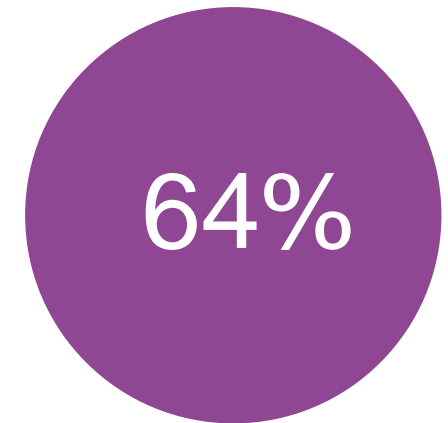
|  |            |
|--|------------|
| Extent of effort/resource to comply            | <b>33%</b> |
| Applying CP6/22 to non-models                  | <b>33%</b> |
| Engaging boards with material models           | <b>13%</b> |
| All models being subject to independent review | <b>7%</b>  |
| Expansion of risk appetite metrics             | <b>7%</b>  |
| Other  | <b>7%</b>  |

## Number of non-models expected to be captured as part of implementing CP 6/22



The survey responses reflect the varying sizes of firms and their respective model landscapes.

## Resourcing requirements and challenges



Almost two thirds believe FTE headcount will increase by at least 20%



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# Insurance case study: Model Identification Process

What is a model?

“the term model refers to a quantitative method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques, and assumptions to process input data into quantitative estimates.”

*Letter from the US Federal Reserve – “SR 11-7: Guidance on Model Risk Management” – April 2011*



A model is a quantitative method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques, and assumptions to process input data into output. The definition of a model includes input data that are quantitative and / or qualitative in nature or expert judgement-based, and output that are quantitative or qualitative.

*Appendices to CP6/22 – Model risk management principles for banks – PRA June 2022*

Currently more than half of insurers use this as the basis of the definition.

But still plenty of room for debate



| Tax Calculation                      | Climate Financed Emissions            | Risk Margin   |
|--------------------------------------|---------------------------------------|---|
| Reliance on outputs of feeder models | Factual data but high volume          | Reliance on outputs of feeder models                    |
| Simple mathematical process          | Simple mathematical process           | Simple mathematical process                             |
| Based on mechanical rules            | Judgement where there is lack of data | Judgement for projection factors and product allocation |

May apply an overarching criteria about consequences of an error and use in decision making. If in doubt include model in scope.

**We have seen insurers set up model inventories with hundreds of models**  
**Mindsets need to change about what a model is**



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# Implementation challenges

Once we have identified the models and decided our Model Risk Standards, we face implementation challenges

| Problem  | Solution  | Challenges encountered in implementing solution  |
|--|---|--|
| Many models will not meet the new standards      | One-off exercise to bring models to standard                  | <ul style="list-style-type: none"> <li>• Documentation: needs right mindset and common requirements. Important not to underestimate scale of task – likely to need phasing and resource boost.</li> <li>• Establishing model performance and monitoring approach needs understanding of inputs, calculations, outputs and use – reliance on key individuals</li> </ul>   |
| Too many models to apply all standards uniformly | Risk based approach   | <ul style="list-style-type: none"> <li>• Tiering is used to prioritise controls. But financial materiality is not enough – e.g. material individual customer impact is not material at a company level. Use a combination of materiality by use, complexity, strategic importance, regulatory impact, customer impact etc.</li> <li>• Tiering impacts levels of governance, frequency of controls, validation depth and frequency, monitoring activity and triggers</li> </ul> |
| Currently roles are not defined for many models  | Define roles and responsibilities (model level and oversight) | <ul style="list-style-type: none"> <li>• Model owner typically defined as ultimate user of outputs: i.e. Exec Level</li> <li>• Additional role with defined responsibilities for someone who is closer to the functionality and operation of the model</li> <li>• Rely on these locally based individuals to implement the standards</li> <li>• Multi-use models have roles defined depending on use</li> </ul>  |



# Case study: Extending Solvency II IMV to other models

- Internal Model firms already have Internal Model Validation (IMV)....
- ....but not possible to apply this directly to the wider group of models. Keep parts and adapt others:

| What do I keep?   | What has less emphasis?  | Where do choices need to made?   |
|---|--|--|
| <ul style="list-style-type: none"> <li>• Independence</li> <li>• Formality of test design and conclusions</li> <li>• Formal approach to validating expert judgements</li> <li>• Weaknesses and limitation approach</li> </ul> | <ul style="list-style-type: none"> <li>• Calibration standard and statistical tests</li> <li>• Standard approach to P&amp;L attribution</li> <li>• Backtesting as not always relevant</li> <li>• Fewer quantitative tests for some models</li> </ul> | <ul style="list-style-type: none"> <li>• Model integrity only vs. E2E. IMV includes calibration, calculations and outputs.</li> <li>• Model boundaries and feeder models. Which feeder models are subject to separate validation.</li> </ul> <hr/> <ul style="list-style-type: none"> <li>• IM has a clear purpose: The SCR + model use policy</li> <li>• But some other models have multiple uses. Success criteria which underpin validation need this context.</li> <li>• Once a model has been validated for one use, overlap needs to be avoided in subsequent validation.</li> </ul> |

**The choices made determine the level of ongoing effort and operating model required to support it**



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# Case study: Actuarial Cashflow model

Too big for single validation – how does it get split?

Multiple uses – this context is needed for output lineage, validation tests and success criteria

One solution is to split as follows:

## In scope feeder models / processes

- Data extraction
- Assumptions management

**In core validation**

## Out of scope feeder models

- ESG
- Ratings Model
- Longevity Model etc

**Separate validation**

## Core components

Applicable across all uses of the model

For instance:

- Input of policy data and assumptions
- Application of decrements to produce cashflows
- Growth and Discounting calculations
- General model controls

**Validated together and then used by other validations**

## Bespoke components

Only relevant for certain uses

For instance:

- Actual data and assumptions used
- Additional calculations with specific purposes
- Weaknesses and Limitations
- Controls on additional calculations
- Output controls

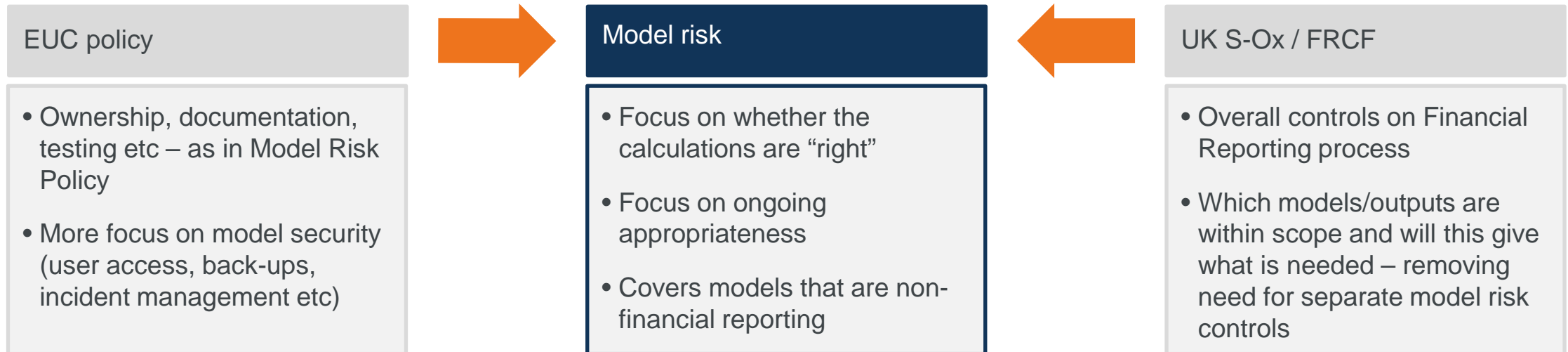
**Validation is by use and relies on core component validations to avoid overlap**



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# Links to wider risk management

How model risk management interacts with wider risk management such as IT controls and Operational Risk / Control processes



**How does Model Risk Management sit with the other parts of the control environment?**



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# Summary

- Many drivers for change
- Direction of travel towards more consistent controls across a much wider model estate
- PRA banking focus areas are consistent with developments in insurance
  
- Progress varied and different approaches seen in different insurers
- Scaling up controls is a big challenge and will rely on work by model owners / delegates
- Oversight arrangements established for Internal Model but need rolling out to other models
- Validation for other models will need to consider the use of the model – significant adaptation of the IMV approach is needed



# Questions

# Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.



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# Thank you

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