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**Deloitte.**

## Model Error Risk

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## Overview of Model Error Risk

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### The headlines you never want to see

**U.S. to Take Over AIG  
in \$85 Billion Bailout**

*Wall Street Journal – Sept  
2008*

**West Coast Main  
Line franchise  
process a 'fiasco'  
says Branson**

*BBC – Oct 2012*

**JPMorgan loss stokes risk model fears**  
*\$2bn trading hit gives boost to critics of Value-at-Risk*

*Financial Times – March 2013*

**Bank of America Finds a Mistake: \$4  
Billion Less Capital**

*Telegraph – April 2014*

**SEC Charges AXA Rosenberg  
Entities for Concealing Error in  
Quantitative Investment Model**  
*Firms Agree to Pay More Than \$240  
Million to Settle SEC Charges*

*Securities and Exchange Commission –  
Feb 2011*



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## Where does the risk lie?

According to the **US FED - SR11/07** (and adopted by the IFoA Model Risk Working Party) risk occurs ...

...primarily for two reasons: (1) a model may have **fundamental errors** and produce **inaccurate outputs** when viewed against its **design objective** and **intended business uses**; (2) a model may be **used incorrectly** or inappropriately or there may be a **misunderstanding** about its **limitations and assumptions**

**EU Regulation (DIRECTIVE 2013/36/EU)** defines Model Risk to mean...

...the potential loss an institution may incur, as a **consequence of decisions** that could be principally **based on the output** of internal models, due to **errors in the development, implementation or use** of such models



## What do we mean by the term 'model'?

An End to End Process recognising all the constituent parts from Data through to Business Use



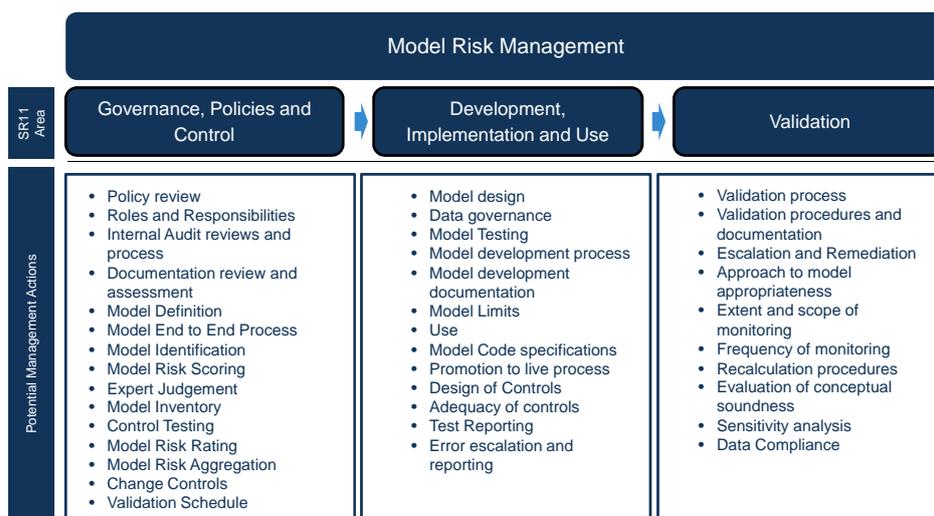


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## Putting a framework in place

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### The US banking regulator provides a useful framework for considering model error risk



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## The big ticket items to consider....

**Model Inventory:**

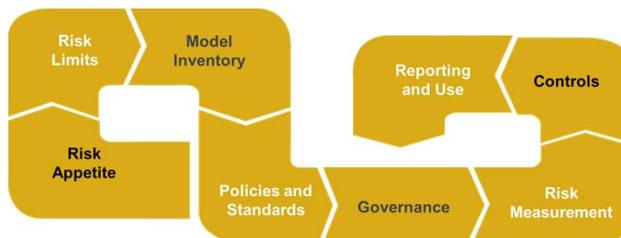
- Do you know how many models you have in the organisation?
- Which of them are critical?
- For the critical ones, where do the risks lie?

**Controls:**

- How well are they working?
- Do they align to where risk lies?
- Are they consistently applied?

**Risk Limits:**

- Do you have them?
- Can you differentiate between models?
- How well do they support decision making and taking action?



**Risk Measurement and Scoring:**

- Do you have a process to evaluate where risk lies in the process?
- Can you measure the risk levels at each stage?
- Is each key model process mapped and all moving parts well understood?

**Risk Appetite Statement:**

- Have you discussed model risk with your Board?
- Do they understand the risks associated with your models?
- What is their tolerance for errors, given the prohibitive cost of eliminating risks of errors?

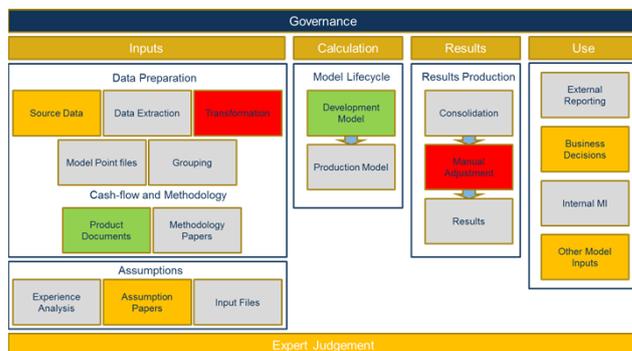
**Policies & Standards:**

- Do you have them?
- How good are they?
- How well understood and followed are they?

Through this approach identify the areas requiring in-depth validation and baselining



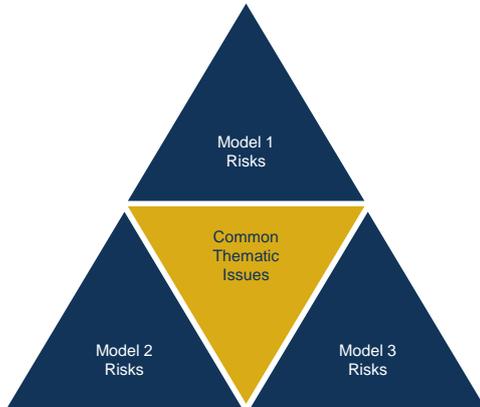
## Risk Measurement - Model Error Assessment



- Each component of the process should be assessed against a defined list of risks
- Ranking of 'riskiness' enables clarity around higher risk areas
- Risk rating should be linked to the wider Operational Risk Framework
- Consistency of approach enables comparison across models
- Clarity of the assessment process supports wider communication



## Individual Model v Portfolio



- The analysis of individual models produces local model risks and issues
- The identification of common thematic risks across the model portfolio may be a more productive way of addressing wider modelling concerns



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## Controls Framework



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## Developing L&G's framework

Focus on model uncertainty

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### Aims of Model Risk and Control Framework

- Formalise the **group's appetite for model risk**, and a new governance structure to oversee the risk (MRCC)
- Institute a new culture of increased **understanding** about the group's models and the **level of uncertainty** in their output through the operation of a new Model Quality Assurance Cycle
- **Manage the level of model risk taken**, including through best practice standards for the maintenance and use of models over their lifetime (Model Life Cycle, Model Quality Assurance Cycle and Model Realisation)



All stakeholders of models will have a clearer understanding that the output from models is only a single point estimate from a range of acceptable point estimates.

Model Quality Assurance Cycle requires the model owner to document and discuss with the model customer what are the model's significant expert judgements and limitations.

A clearer focus on validation and controls will in the medium term lead to a reduction in the instance of errors.

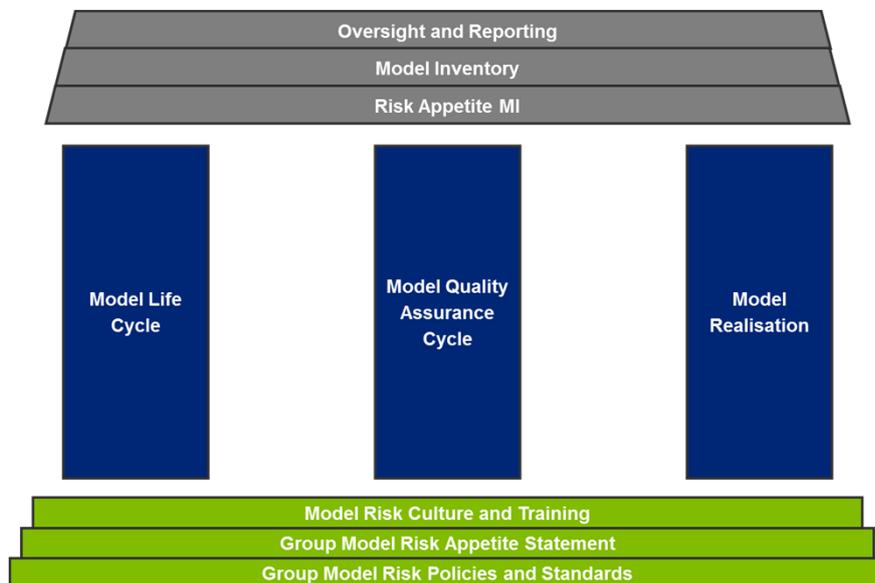


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### Model Risk Control Framework – Roman Villa View

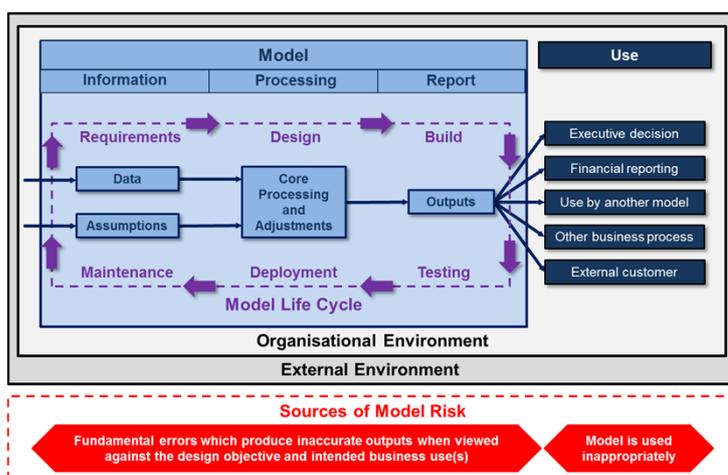


The MRCF pulls all the risk management activities for model risk into a single cohesive framework, aligned with the rest of the group’s risk management policies.

It sets out clear accountabilities for all three lines of defence.



### Definition of 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”

Federal Reserves definition



## Risk Appetite

We have very limited tolerance for model risk where inaccuracies would result in:

- Poor decision making,
- Material financial misstatement,
- Disruption or delay to disclosure of results,
- Widespread customer detriment,
- Reputational damage to the group.

However, we accept that we cannot completely eliminate the risk and are prepared to tolerate a degree of model error, provided it remains within pre-set operating ranges.

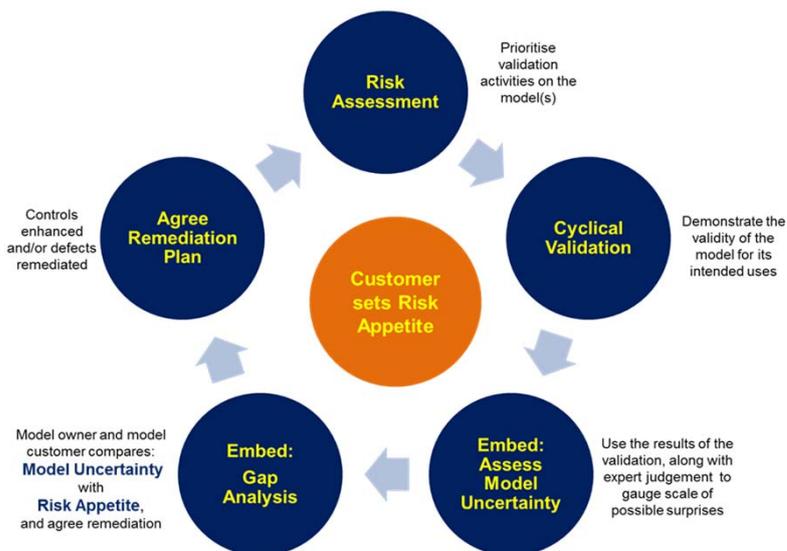


The Risk Appetite applies to **significant models**, which are defined to be those that could lead to one or more of the following:

- Poor decision making by the executive committee of a business unit, entity, or group; or that is used in providing MI at a group or business unit risk committee;
- Material financial misstatement;
- Disruption or delay to disclosure of entity results, or other milestone deemed critical by the Board of any entity, including group;
- Widespread customer detriment; or
- Damage to the reputation of the group or a legal entity within the group, at a level likely to be reported to the Group Audit Committee.



## Model Quality Assurance Cycle



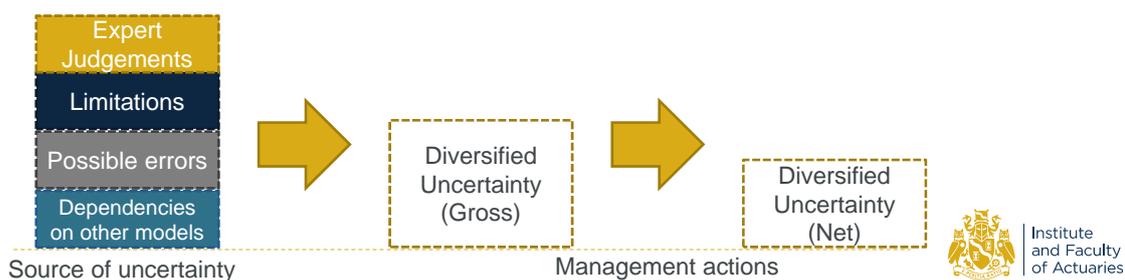
The Model Quality Assurance Cycle is a key component of the new framework



## Model uncertainty

Model uncertainty measures the potential for the model output to (retrospectively) change, due to both errors and enhancements in the model, other than those that arise because of future development of the business.

- Model uncertainty is distinct from business uncertainty
- Model owners should consider and communicate all possible (significant) causes of uncertainty
- Model owners and model customers may prepare for model risk by considering what management actions they may take in response



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## Summary

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## Model Error Risk – Some takeaways

**01** Model Error Risk is a growing area of Operational Risk for Firms and Regulators

**02** All Three Lines of Defence should be central to Model Error Risk and its impact on a company

**03** The End to End process is complex with a vast number of potentially moving parts

**04** Integration with the wider Risk Framework, Appetite and Limits is essential

**05** Opportunity to learn from the Banking global management standard SR11-07

**06** Cultural awareness is embedded through starting this journey and engaging the wider business in change



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**Questions**

**Comments**

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