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Model Error Risk - Unravelling the model environment web

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- In the news and on the agenda ...
- What is Model Risk?
- Putting a framework in place
- Helping to quantify the risk
- Final thoughts
- Q&A





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In the news and on the agenda ...

19 October 2017

Not all press is good press!

**Chief Economist
..admits errors in
Brexit Forecasting**

The Guardian – Jan 2017

**RBS admits
error in stress
test data**

BBC – Nov 2014

**Online Leading Platform
admits it miscalculated
investors' annual returns**

Financial Times – May 2017

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

Financial Times – March 2013

**Risk Management Breakdown at
AXA Rosenberg**

Firms Agree to Pay More Than \$240 Million to Settle SEC Charges in 2011 (for concealing coding error); articles published hypothesising too much trust placed on model managers

Stanford Closer– May 2013

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

Telegraph – April 2014



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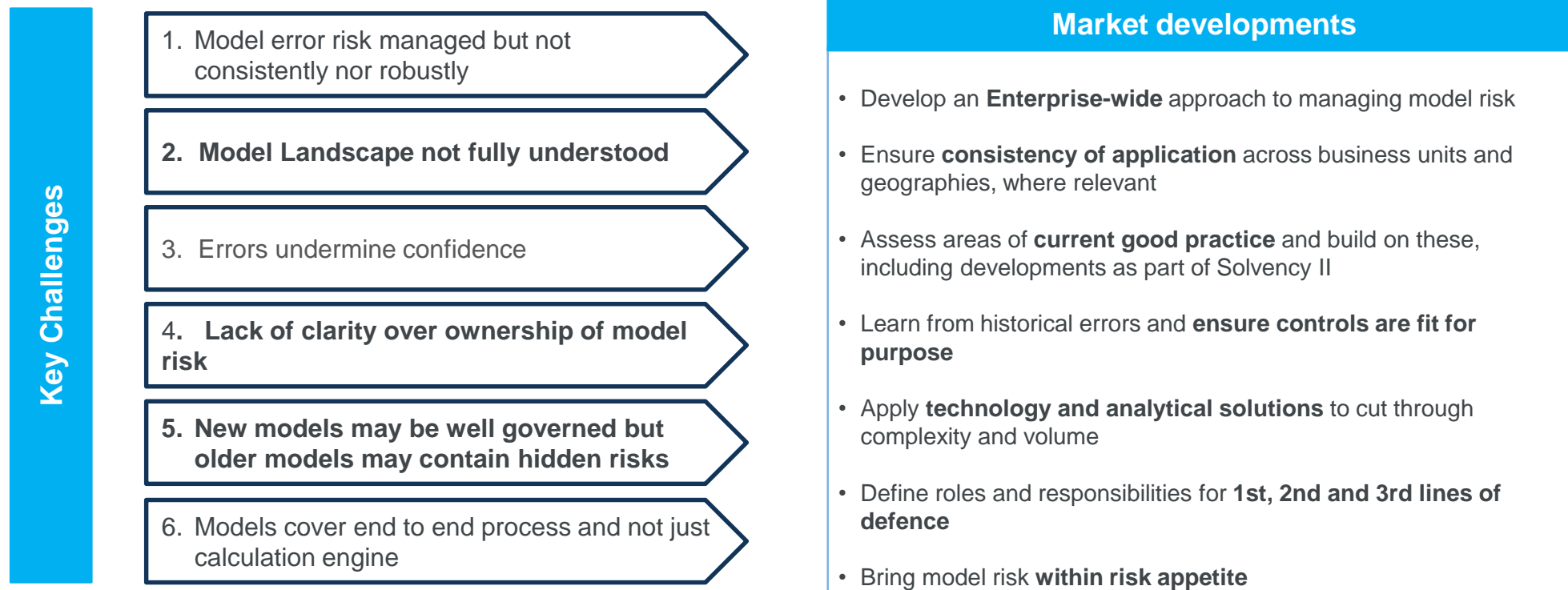
Importance to GI Insurers

Why and what to consider in a model risk assessment?



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Model risk is being pushed higher up the agenda of Senior Management



Assessing model error risk needs to consider all areas of an organisation which have a role in developing, governing and using model results. As such any framework needs to reflect this enterprise wide scope in its approach and any assessment process should not underestimate the eventual reach and impact.



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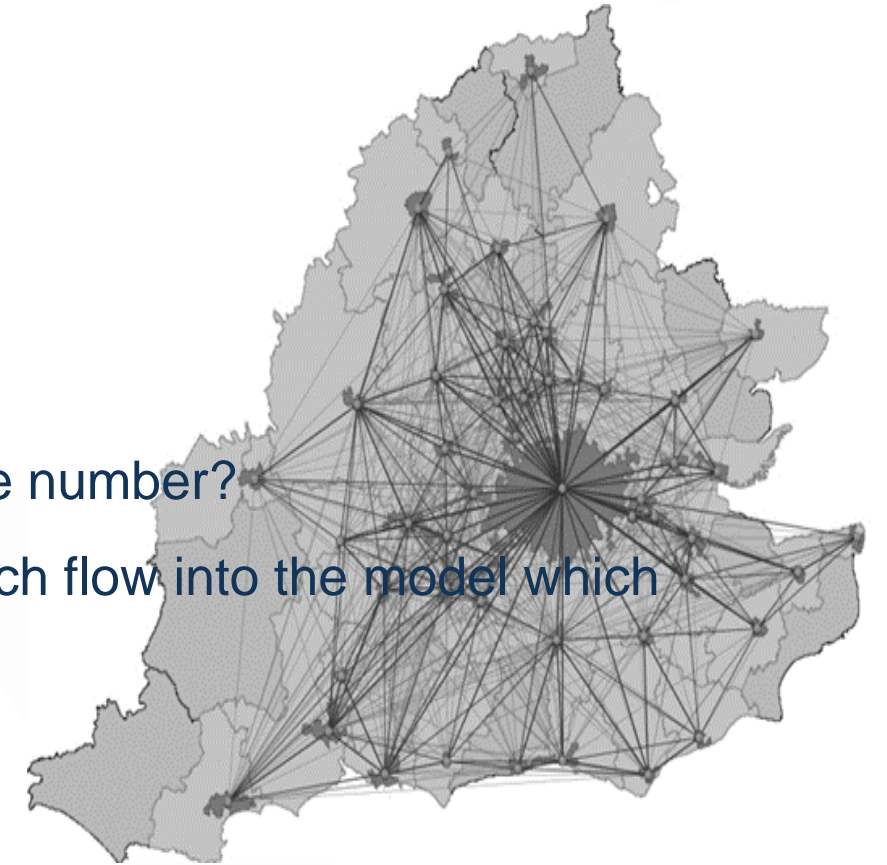
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What is Model Risk?

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Question Time

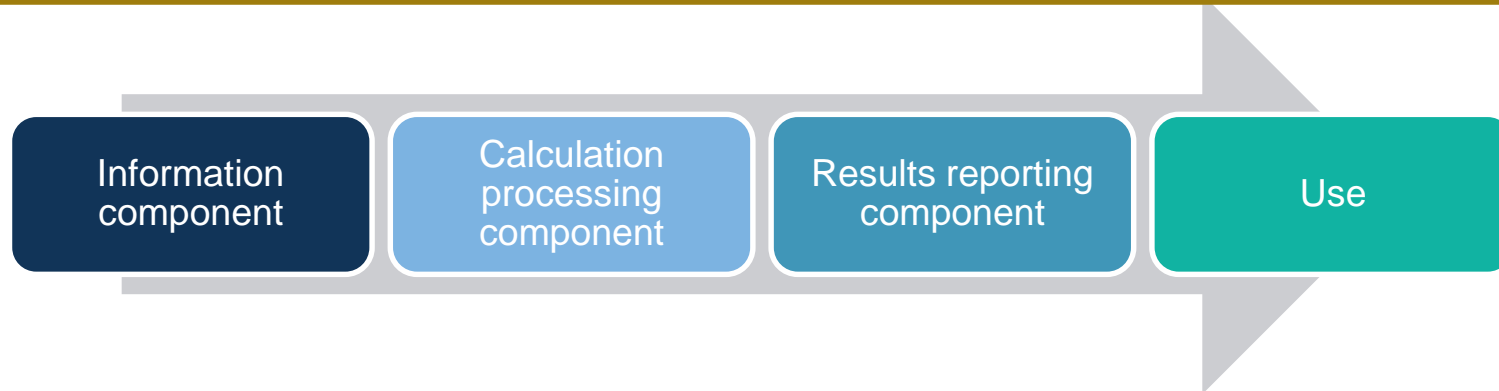
- Which number concerns you the most?
- Which model produces that number?
- How many models flow into the model which produces the number?
- How many individuals and teams work on the models which flow into the model which produces the number?
- **What does that process look like?**
- **What is a model??**



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What do we mean by the term 'model'?

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



What is Model Risk and where does it lie?

“The potential for adverse consequences from decisions based on incorrect or misused model outputs and reports”

EU Regulation (DIRECTIVE 2013/36/EU)

Model risk occurs primarily for two reasons:

1. The model may have fundamental errors and may produce inaccurate outputs when viewed against the design objective and intended business uses
2. The model may be used incorrectly or inappropriately or there may be a misunderstanding about its limitations and assumptions

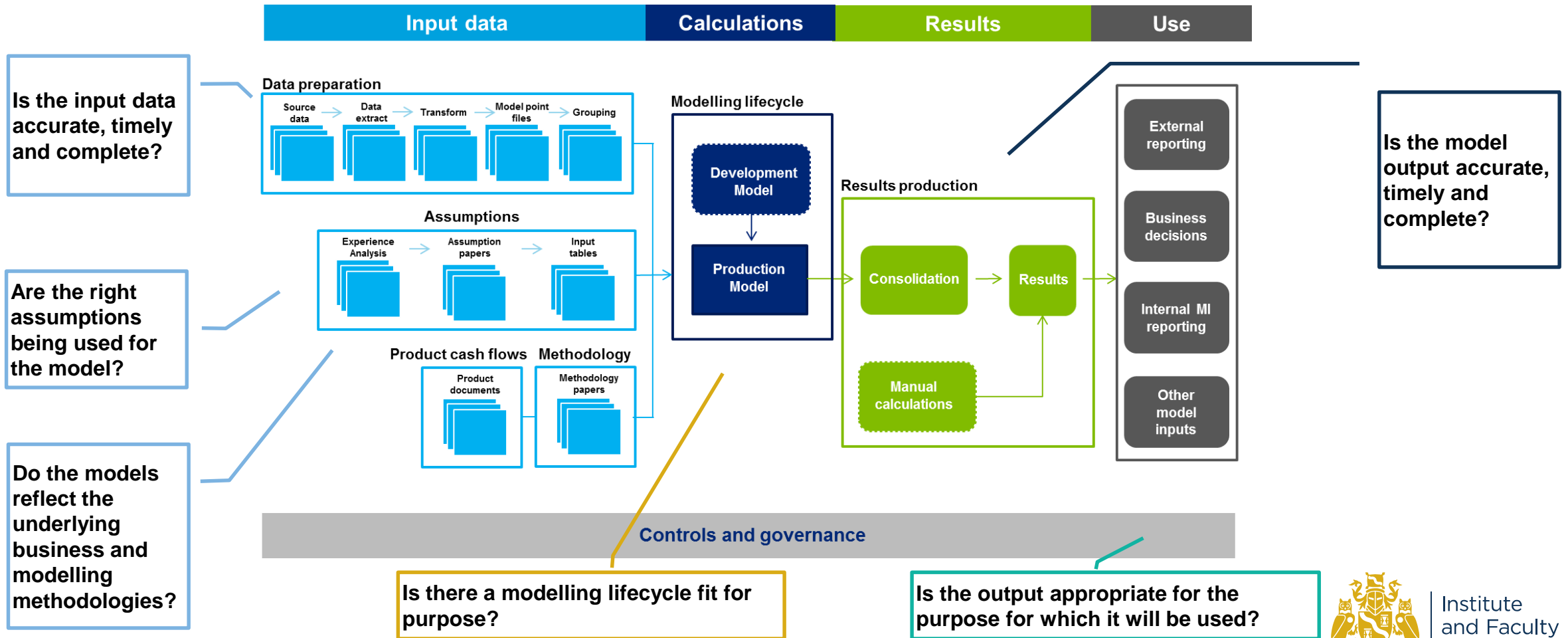
US SR11-07, IFoA Model Risk Working Party



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How does model risk arise?

To understand inherent risks that exist within your model lifecycle, the end to end process should be assessed, monitored and tested.





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Dealing with the problem: Putting a framework in place

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Where to begin....

3

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?

6

Controls:

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

2

Risk Limits:

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

5

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?

1

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?

4

Policies & Standards:

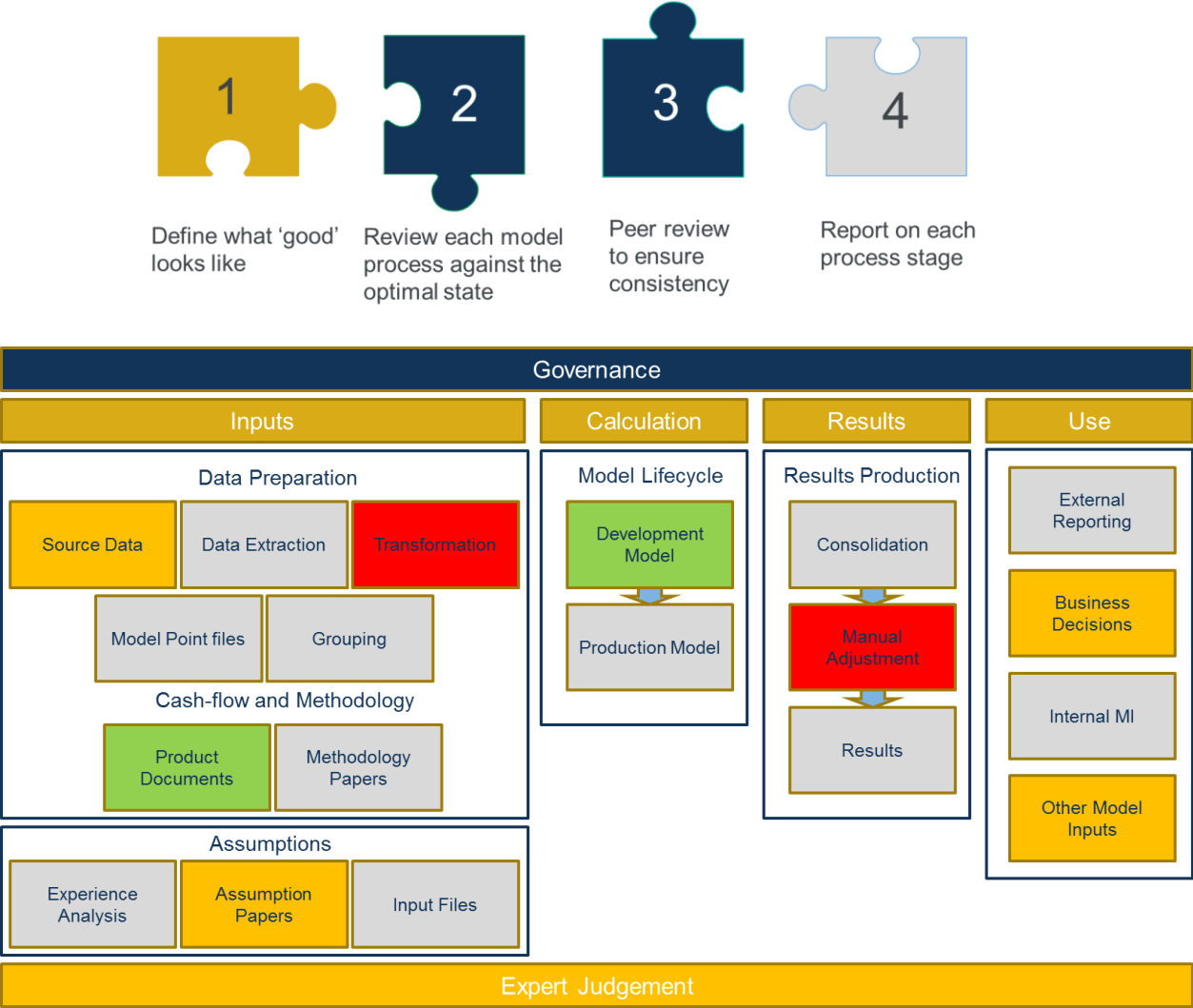
- Do you have them?
- How good are they?
- How well understood and followed are they?

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



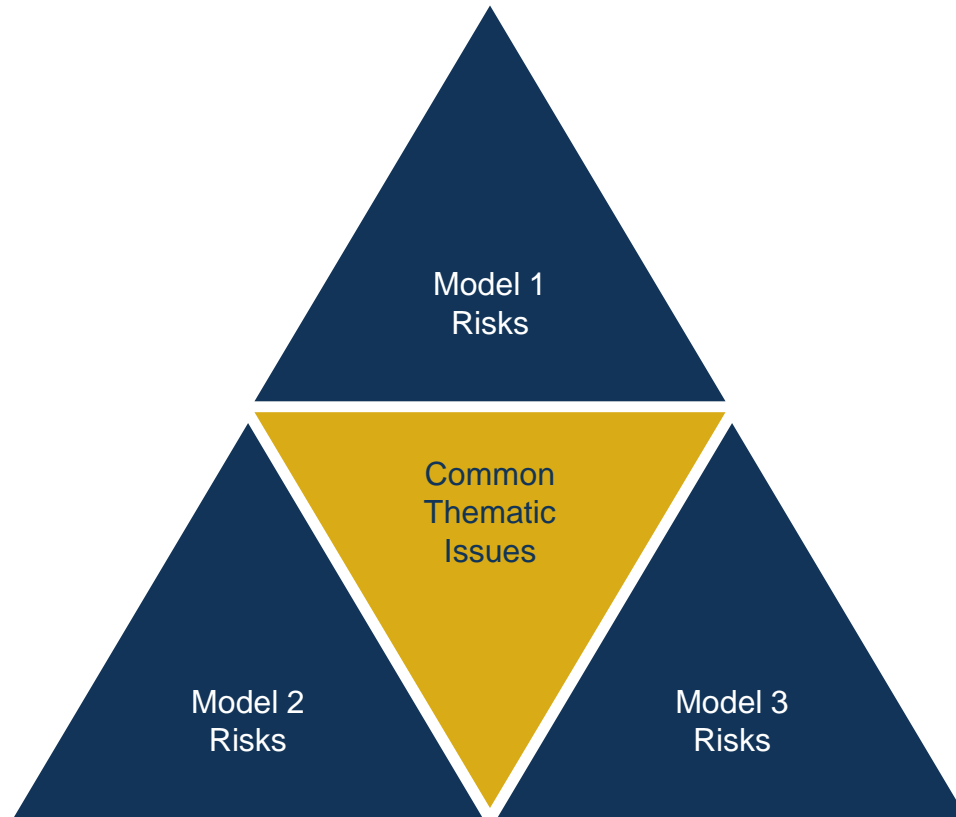
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Risk Measurement: Model Error Assessment



- 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

Risk Measurement: Drawing out the thematic issues



- 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

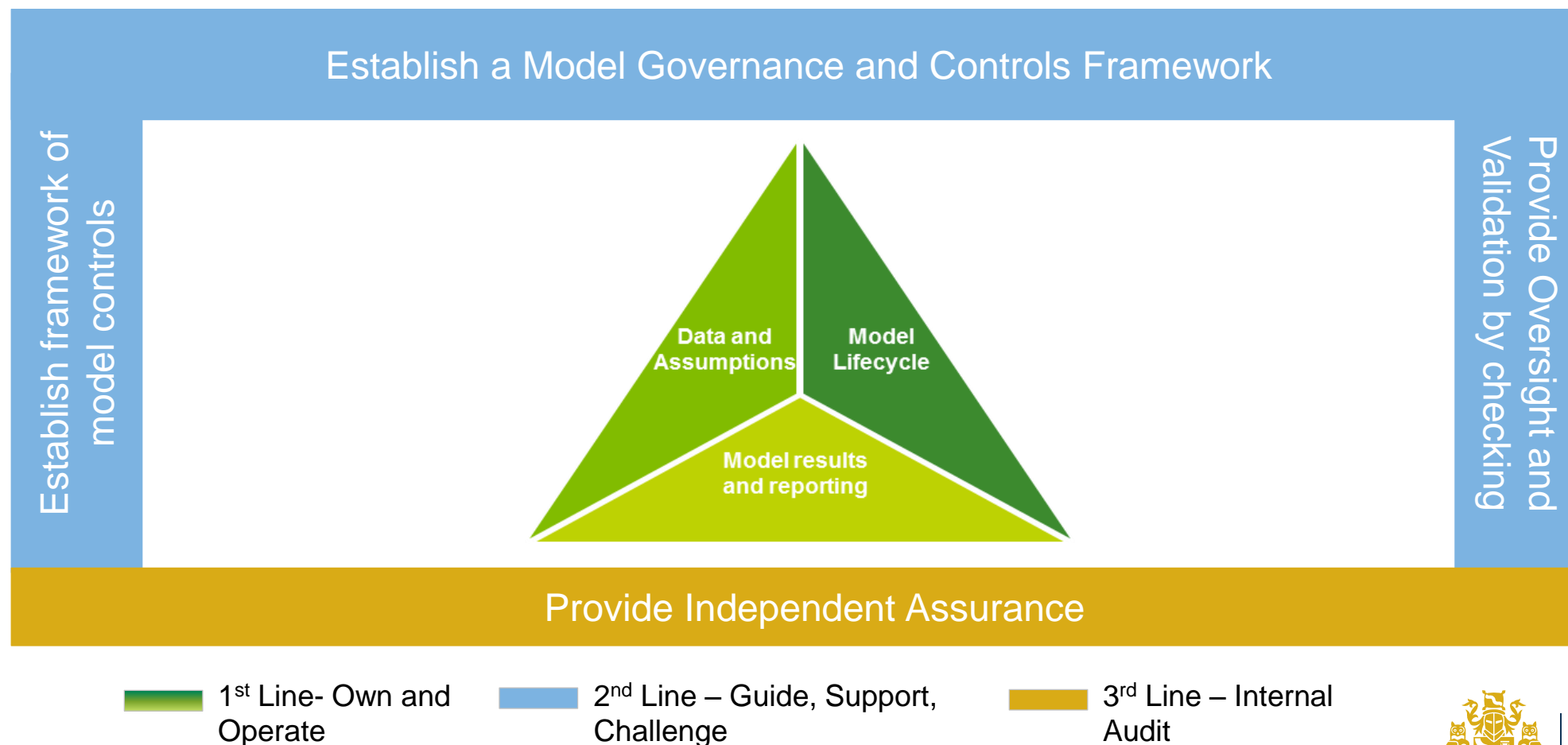


Controls Framework



Roles and Responsibilities

Model error risk is a key risk to the operations of a company which can have unexpected impact on reported results and balance sheet position. In this context, it is crucial for management to be clear on the controls framework that is in place and to take a view on its adequacy. Each of the three lines of defence has a role to play.



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Dealing with the problem: Helping to quantify the risk

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Where to begin....

Model Inventory:

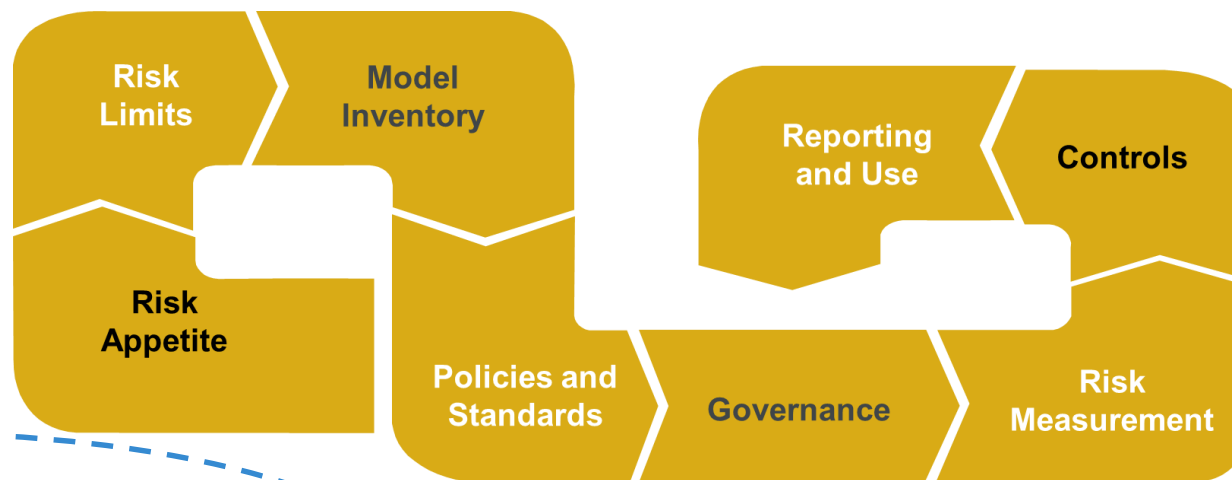
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Risk Appetite

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.



Challenge: How to set acceptable 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;
- **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.



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Risk Appetite : Possible Framework - Top Down

- Board:
 - Sets and approves Risk Appetite
- CRO:
 - May consider different tolerances depending on the model and its business use
 - Define risk limits and metrics to be monitored based on past experience, peer comparisons
 - Sets the prioritisation of models to be validated in accordance to usage level and materiality perhaps via reference to a number of questions designed to define 'riskiness'
- Model Owner:
 - Updates inventory on number of models being used
 - Provide training to team



Risk Appetite: Possible Framework – Bottom Up

Technology enablers for automated assessment

The two modules with the software which underpin the basis of the risk assessment are described in more detail below:

1. Discovery

- Automated discovery of the entire spreadsheet estate.
- The discovery phase identifies data flows and links between models to provide a of dependencies.
- This linkage captures links from other software into the spreadsheet model.
- Mechanically builds up a picture to illustrate the complexity of the underlying model environment
- Model inventory populated

2. Risk Assessment

- Automated identification of high-risk EUC models and spreadsheets.
- ‘High-risk’ identification is based on standardised rules
- Examples of high-risk values may be hard-coded numbers, hidden (and very hidden) data, data identified as personal/sensitive, complex formulae.
- We can help to tailor these conditions to meet your materiality framework



**Model Inventory &
Risk Prioritisation**



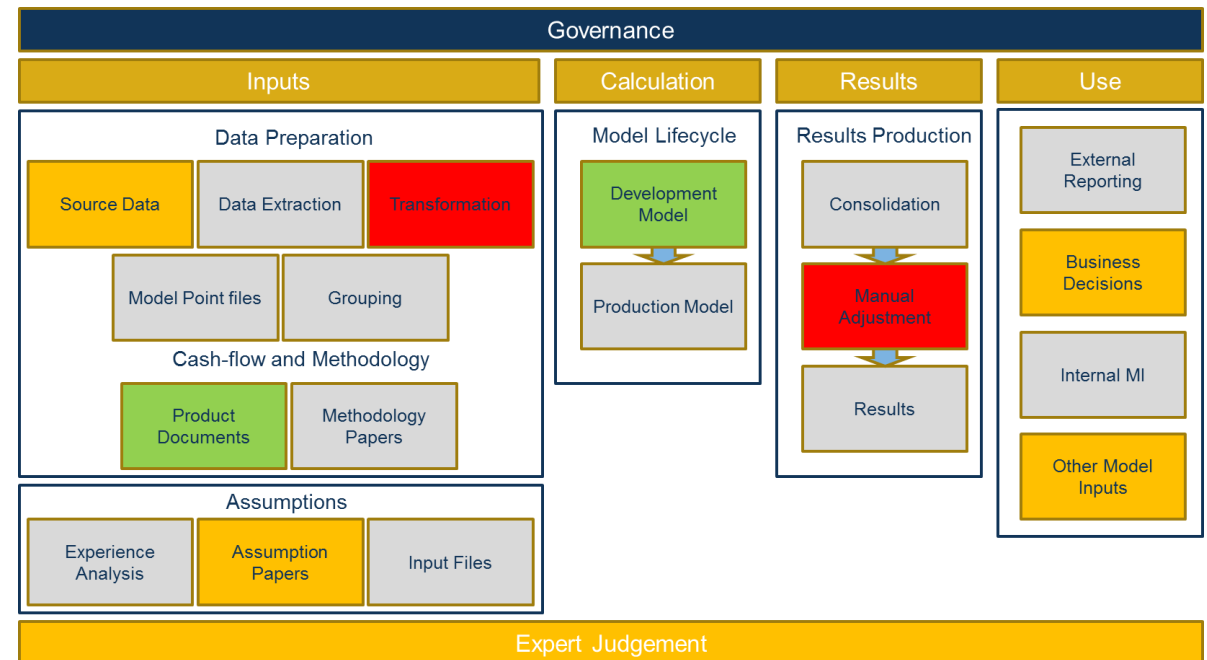
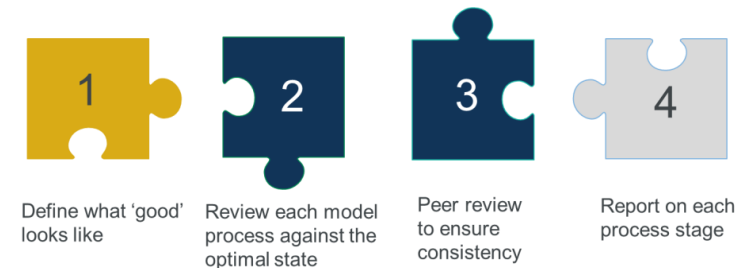
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Risk Appetite : Assessing individual risks with model

Revisiting the Model Error Risk Assessment

The key dimensions in the end to end modelling environment

- Qualitative criteria for each element of the model under examination
- Can be translated to a score with associated weight to produce a quantitative score metric
- This can be aggregated for each model to compare risk levels between models

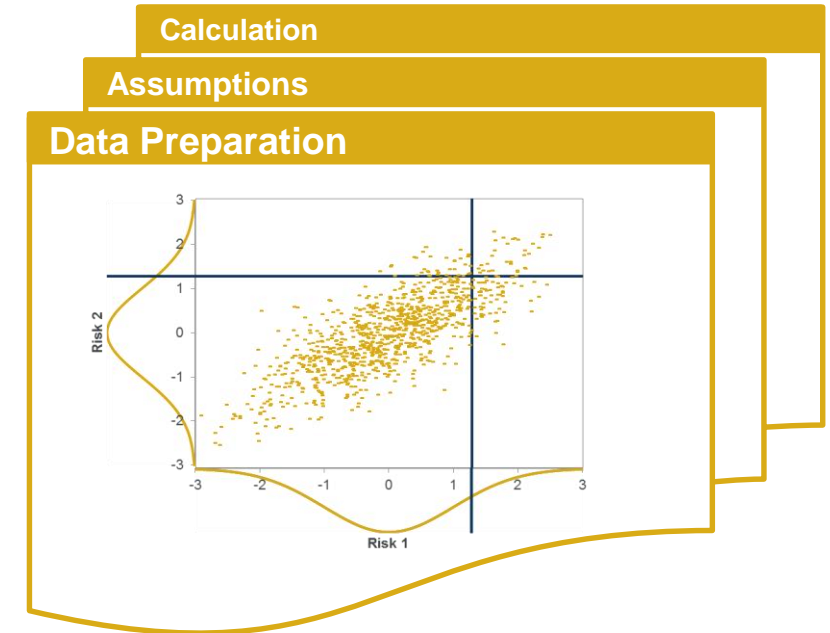


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Risk Appetite : Assessing individual risks with model

Overlaying a stochastic lens on this approach

- Adding correlations to improve the robustness of risk score
- Listing potential error risk events, from the model error risk assessment conducted ...with knowledge of their probabilities from risk scoring
- Severities can be added and correlations so that aggregated impacts can be calculated, while also allowing for diversification impacts
- ...this helps to provide a range of risk score percentages for each model which help more easily define the risk limits and appetites



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Case study

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Developing a model error risk framework

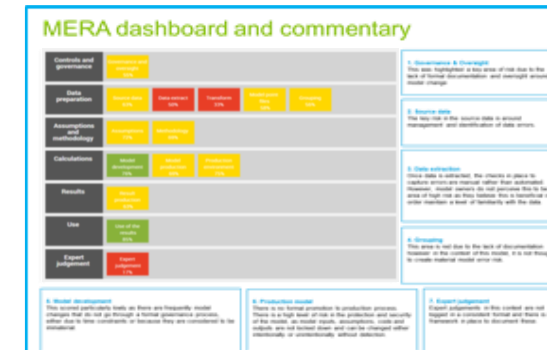
There are five phases in developing the model risk framework. These cover all the major components of assessing the model environment and producing a business action plan to enhance the model risk framework and reduce residual model risk.



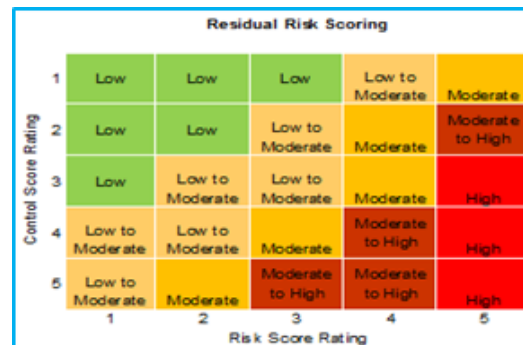
Phase 1 :
Model Risk Appetite



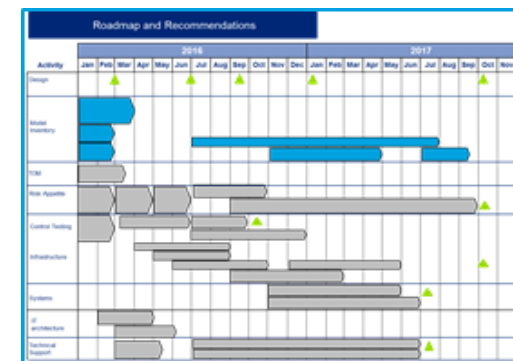
Phase 2 :
Model Standards



Phase 3 :
Model Error Risk Assessment



Phase 4 :
Controls Identification and Mapping



Phase 5 :
Business Action Plan



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Final Thoughts

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Model Error Risk – Some takeaways

01

Model Error Risk continues to be a growing area of Operational Risk for Firms and Regulators

02

Insurers should not rely on Solvency II to cover off model governance requirements

03

Models need to be considered in the context of an End to End process with a number of inputs, outputs & potentially moving parts

04

Integration with wider Risk Framework, Appetite & Limits is essential and all three Lines of Defence should be involved

05

Opportunity to learn from the Banking global management standard SR11-07 and what has been achieved with Solvency II

06

Don't be lulled into a false sense of security... pre-empt the regulator interest and assess your model risk!



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Questions

Comments

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