

PRACTICAL MODEL RISK MANAGEMENT

FOR THE CREDIT SCORECARD MODELLER

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Pre-conference Workshop

CRC XIX

Edinburgh, August 2025

ABOUT YOU

The Model Developer

You're developing a model to be approved for use in credit risk management and you're nervous (and a bit cynical) about how it will go with the validators. A lot hangs on this and if this model doesn't go through smoothly it won't look good, right to the top.

You know your model is good enough and follows best practice, but there seems so much more to do than just get it right. What value does validation add? what are the magic words to make validation pass your model?



ABOUT YOU

The Model Validator

You're a model validator and you have a model to review.

It's an interesting development and you're keen to check that the model is safe for the bank to use. But the model's history is long and controversial, the bank's validation actions and checklists seem set up for an unpleasant adversarial conversation, and the document templates feel stale and irrelevant.

You want to add value but you're not sure how, and any investigations beyond box-ticking will cause delays and challenge from all sides.



ABOUT YOU

The Researcher

You're a student or researcher and you see banks adopt only slowly the latest model methods and the sharpest technique.

There seems to be a blockage between the junior developers who are keen to try out your latest ideas and the business which wants improved predictions. They agree the goal, why can't they adopt the method?

You want to help banks with advanced modelling and to give your industry collaboration the best results, but you doubt whether anything new you produce will be put into practice.



ABOUT YOU

The Consultant

You're a consultant helping a bank produce models for a high profile project.

You're in the middle between the developers, the validators, audit, the executive and everyone is worried that something will go wrong. The ground is already muddy with politics, positioning and unrealistic expectations.

You want the right way to speak to all stakeholders to help them push on the model together. Then you want them to accept a proportionate view of the risks and their actions needed to manage them.



MODEL RISK – HOW IT CAN HELP YOU

Model Risk thinking clears the air.

Models exist to help make decisions – good models help make good decisions.

“Model Risk is the potential for adverse consequences from decisions based on incorrect or misused model outputs and reports.”

SR11-7

“Model risk should be managed like other types of risk.”

SR11-7 (again!)

Apply the universal risk management template - identify, assess, act and monitor – to model risk.



MODELS HELP MAKE DECISIONS

What decision does the model help?

What is a poor decision? i.e. one with “adverse consequences”.

How can the model cause / make more likely a poor decision?

In what ways does the model not make a material difference to the decision?



APPLICATION SCORECARD DECISION

Example: Score or grading for a customer loan application.

Here the model (score, probability etc) might be just one element in the decision, combined with cutoffs or other logic, or with manual overrides.

What decision does the model help?

Accept or reject application, or refer for manual review

What is a poor decision?

Reject good; Accept bad; Unnecessary manual review;

Illegal, uncompliant or unethical basis for decision (or not provably legal, etc)

Slow, inconsistent service, or otherwise causes customer dissatisfaction



APPLICATION SCORECARD DECISION

How can the model cause / make more likely a poor decision?

Directly through the decision logic.

- Reject good – the model's false negative rate and variations, possibly weighted by costs.
- Accept bad – the model's false positive rate etc.
- Excessive refer decisions – related to Gini or other discrimination criteria.
- Legality and ethics – factor selection, explainability, fairness, customer treatment.

In what ways does the model not make a material difference to the decision?

- Increased model accuracy has diminishing returns – we tolerate quite rough output.
- Away from the cutoff boundaries, model accuracy is less important.
- In certain conditions the decision is already a policy override or strongly indicated, and the model has little influence.



APPLICATION SCORECARD DECISION

How can the model cause / make more likely a poor decision?

Indirectly, model weaknesses can undermine a good decision

- The model's concept or structure makes it difficult to calibrate the cutoff or has a complicated relation with the decision – e.g. a model based on a proxy event.
- The model does not show the expected relationship between cases – interpretability – and the users lose trust in the model.
- Compromises are needed to implement the model in the decision system – eg continuous factors in an integer-valued calculator – degrading model performance.
- The model's structure makes decisions difficult to explain to customers – explainability.
- The model's complexity makes it difficult to prove fairness and other regulatory conditions.
- The model is sensitive to data errors, missing values, edge cases.



APPLICATION SCORECARD DECISION

How can the model cause / make more likely a poor decision?

Changing impacts over time

- Changing / dropping data feeds
- Changing data meaning
- Changing customer management process, regulation, referral guidance etc.
- Data drift in general – market shifts, product changes, advertising, bank merger
- Any of the previous static risks growing or shrinking over time



BASEL PD DECISION

Basel Probability of Default (PD) model on a Mortgage Portfolio.

What decision does the model help?

What is a poor decision?

How can the model cause / make more likely a poor decision?

In what ways does the model not make a material difference to the decision?



OTHER KINDS OF DECISIONS

Climate risk model – for decisions to lend in particular geographic areas or to certain industry sectors, and for making regulatory ESG submissions

Fraud models – for screening customers, for allocating manual checking efficiently and to prioritise escalations with external authorities

Sovereign Credit Rating model – an expert system reflecting the views of senior analysts in the bank, as well as externally sourced data – for decisions about lending and expansion in certain countries, involving FX risks, trade, international partnerships, etc

What decision does the model help?

What is a poor decision?

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OTHER KINDS OF DECISIONS

Chatbot support for a loan application – LLM making autonomous decisions to offer services, advice, onward connections, product offers

VIP customers list - managed on an excel sheet by a specialist team – outputting customer selections and summary statistics that help decisions about offering exclusive products and services

What decision does the model help?

What is a poor decision?

How can the model cause / make more likely a poor decision?

In what ways does the model not make a material difference to the decision?



MODEL RISK AND CREDIT RISK

Model Risk should be managed like other types of risk SR11-7

Much good practice follows directly from the SR11-7 link between model risk and other types of risk. How about Model Risk linked to Credit Risk?

Let's imagine how Credit Risk would appear if we managed it like Model Risk today.



Customer / applicant / obligor

Customer database

Credit application decision

Customer behaviour scoring

Individual Credit report

Credit Default / Impairment

Model

Model Inventory

Initial model validation

Regular model review / tiering review

Model monitoring

Model failure / governance exception



MODEL RISK AND CREDIT RISK

Credit Portfolio	Model Portfolio (?)
Credit Risk Appetite	Model Risk Appetite (?)
Credit sector specifics	Special model types / governance pathways
Ongoing customer relationship	Model management / Lifecycle
Credit monitoring	Model risk monitoring
Credit recoveries and write off	Model repair, replacement, decommissioning
Credit provisions and capital	Model Risk Basel Pillar 2A for capital
Provisions? Can IFRS9 / CECL accommodate model risk?	



MODEL RISK AND OTHER TYPES OF RISK

Universal principles of general risk management can be adopted by model risk

For instance the classic four Stage approach to managing risk:

1. Identify / Detect
2. Assess / Quantify
3. Manage / Act
4. Monitor / Review



IDENTIFY / DETECT

Much of our work here is already done when looking at Decisions

What is the decision that the model helps?

What is a poor decision?

How can the model cause / make more likely a poor decision?

In what ways does the model not make a material difference to the decision?

Be curious, be honest.

Look for points where the model is most likely to fail to help the decision: where it

- makes assumptions about the data, method or decision context,
- has sensitive dependencies on data and sensitive impact on the decision,
- makes technical and structural choices that narrow its applicability.

Think how the model could come under pressure in the future - models under stress.



ASSESS / QUANTIFY

Assessing qualitative and quantitative impacts of each mode of model failure

Keep up the connection with decisions

What is the impact of a poor decision?

How much adverse consequence or how many poor decisions can we tolerate?

Model impacts can flow from changes in

- the model output, or
- the model specification – how would the model have been built differently?

Qualitative assessments – rough analysis is better than nothing and can be refined later.

Sensitivity analysis – if a particular risk was realised, or a model choice or assumption was flexed, what would be the impact?

Scenarios – if conditions changed what would be the impact?



MANAGE / ACT

Managing the risk through agreed actions

Triage, prioritise and manage each identified risk in proportion to its assessed impact.

Options include:

- Live with it – some impacts are small and tolerable, if registered and monitored.
- Inform the model users, who may find the risk within appetite or who may wish to change the model's use in decisioning or to build an overlay or work around.
- Restrict the model use or change user guidance to mitigate the risk.
- Impose new monitoring with action requirements should thresholds be hit.
- Adjust or recalibrate the model or its implementation, to avert specific failings or make general improvement.
- Rebuild the model with fresh data or insights from the risk assessment, to minimise identified risks and for future proofing.



MONITOR / REVIEW

Keeping track of the model risks

Each risk and action should be monitored in proportion to its impact.

The metrics should be tuned specifically to the model risk involved.

The thresholds should be tuned to the sensitivities discovered as part of the assessment stage.

The actions triggered by these thresholds could affect any part of the model's life cycle:

- calibration and maintenance (like ordinary model monitoring);
- review frequency, tier level and governance path;
- rebuild schedule;
- use and restrictions for use;
- notification to Board and Regulator.



VALIDATION CASE STUDIES

Applying the stages of model risk management

Application scorecard example

Recall that the decision is about customer selection, which has model performance aspects and questions of compliance / legality etc

Case study A – data - data is missing in a key factor and I've filled in the missing values using a standard methodology, what's the risk?

Case study B – model methodology – I've implemented a neural network that performs better than the old logistic regression, what's the risk?

Case study C – model use - I'm using the output of an application scorecard as an input to my behavioural scorecard, what's the risk?



YOUR WAY AHEAD

The Model Developer

- Recognise your models are there simply to support decisions – from this you understand how your model is important to the bank.
- Recognise that your model is the end point of your choices, assumptions and simplifications. Best practice no doubt, but external challenge is a threat only if your choices are unthinking or have no professional foundation.
- Be honest with yourself – every model has a weak side or conditions under which it fails. Discover your model's weaknesses and failure modes before someone else finds them or, worse, they surprise you in production.
- Use these discoveries to structure your submission and documentation. Present how your models could fail, how likely and the possible impact on the decision. This workshop's template is a good way to meet the validators halfway.



YOUR WAY AHEAD

The Model Validator

- You are responsible for the tone of the validation and must earn the respect of all stakeholders. Ensure a safe and respectful space for the validation conversation.
- You're challenging the modellers' best professional efforts and they will respond to a clear aim and structure to your validation.
- Structure the validation around the decisions the model helps, leading on to its failure modes and weaknesses. This workshop's template can help your enquiry and become part of your validation document.
- Connecting everything with decisions means there is no doubt about the value of your work and the importance of the risk being managed.
- Sometimes your most valuable contribution is to do the analysis that allows the bank to say "this particular risk doesn't matter".



YOUR WAY AHEAD

The Researcher

- Recognise that the bank's objective is not simply technical, or even a single numerical objective. The bank has constraints, practices, organisational structures etc that have as much influence over a model as does the data.
- Connect your modelling outcomes and conclusions as directly as possible with the bank's decisions and think always of the way your model or analysis supports them. If you don't know what those decisions are in enough detail to turn them into quantitative objectives or constraints, then you've not completed your preparations.
- One of the bank's constraints is model validation and model risk management. As a routine part of your research, see how much of this workshop's template you can complete – it could be highly revealing and add depth to your academic paper.



YOUR WAY AHEAD

The Consultant

- Connect your observations and advice as directly as possible to the decisions to be helped by the models. Exploit the fact that all stakeholders have a common goal to improve those decisions.
- Your goal is to listen and build bridges, and this workshop's template can help achieve this. Your task is helped greatly by manoeuvring each stakeholder into a positive engagement with such a template:
 - the modellers agree safely that their models have weaknesses and failures – they list and communicate them in the template.
 - the validators can complement the modellers' hard work, but insist all models have risks to be managed – the template logs and communicates them.
 - the users engage with the model by defining what makes a good or bad decision and reading from the template and the monitoring how far they should trust the model to help.



MODEL RISK – HOW IT CAN HELP YOU

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SR11-7

A universal template: identify, assess, act and monitor

Models fail. Don't beat yourself up about it: manage and communicate the risk.

The whole model lifecycle should be directed by the decisions the model helps.

All stakeholders should know and communicate the model weaknesses, risks and impacts.

