

PRA's 4 Key Principles of Model Risk Management

A Practitioner's Guide to Low Cost Compliance





Introduction

In the coming months, new regulation is likely to affect all major UK banks and insurers.

The regulatory scrutiny being applied to Model Risk Management (MRM) is intensifying and spreading globally. In the US, the Fed set out MRM principles in 2011. The European Central Bank (ECB) recently kicked off a Targeted Review of Internal Models (TRIM) for banks in countries with Euro.

UK banks and insurers have been waiting for similar regulatory guidance from the Bank of England/Prudential Regulatory Authority (PRA). This arrived on 27 March 2017 when PRA issued a guidance letter as part of its 2017 stress testing instructions.

The PRA's letter may only cover stress testing models and has no regulatory weight. However it is the PRA's first public MRM guidance and is likely to form the basis of future, much broader MRM regulation in the UK in coming months.

New regulation is likely to place direct responsibility for group wide MRM onto a senior director, affecting all major UK banks and insurers. The objective of this whitepaper is to provide this named director and his or her senior management team with practical guidance for setting up an MRM operating model that is both compliant and low cost.

Why act now?

Many banks thought that they could achieve compliance by upgrading MRM policies. Most have now recognised that they need a new policy, a central MRM team and systems to support them.

The experience of banks in countries already subject to MRM regulation has shown that compliance creates a significant burden and additional costs for an organisation. Creation of a new group MRM policy together with a central MRM team affects many staff including model developers, validators, owners, users and senior management. Done badly, MRM compliance can add millions in terms of direct and indirect costs.

However, several leading banks are now developing MRM operating models that deliver both:

- » Low cost, compliant MRM processes

AND

- » Improvements in the efficiency of the underlying model development process.

These banks have simultaneously upgraded MRM and model development processes, enabling delivery of MRM compliance at a low net cost.

By setting up the right approach early, organisations can avoid the rework, lack of transparency and subsequent compliance failures associated with a manual, short-term plan. Ensuring transparency and a future-proof MRM system will lead to ease of compliance and create an MRM approach that informs strategic and business decisions.

The cost of MRM compliance failure

In June 2016 the US Federal Reserve failed both Deutsche Bank's & Santander's stress testing submissions into CCAR (the Fed's regulatory stress testing process for the 33 largest US banks). The Fed gave the following reasons for the failures in its results document.

Deutsche Bank

"Deficiencies in the risk management and control infrastructure at Deutsche US, including risk measurement processes; stress testing processes; and data infrastructure."

Santander

"Deficiencies in the risk management framework, including important features of the risk measurement and monitoring function; stress testing processes; and internal controls, governance, and oversight functions."

Stress testing is effectively a large and complex modelling exercise. The results are primarily failures of the organisations' Model Risk Management processes. As a consequence, Deutsche Bank and Santander are currently blocked from paying dividends from their US businesses back to Group, effectively stopping payments of any US profits to shareholders. Both organisations suffered adverse press comment for the quality of their risk management processes.

See the full article in **Financial Times: Deutsche Bank and Santander fail Fed stress test again** <https://www.ft.com/content/9a018afe-3e37-11e6-9f2c-36b487ebd80a>



1. Regulatory Background

In the US, the Fed issued SR11/07 in 2011 setting out MRM principles. The resultant regulatory inspections have driven significant enhancements to MRM organisations structures, policies and processes in US.

Initially banks thought that they could achieve compliance by simply upgrading MRM policies and creating a central MRM team. However most have now moved to having a central MRM system support this team and demonstrate the necessary (documented) control of Model risk.

In Europe the European Central Bank (ECB) have recently kicked off a Targeted Review of Internal Models (TRIM) for banks in countries with Euro. This too is driving the need for formal MRM systems across mainland Europe.

The PRA issued a guidance letter on 27 March 2017 as part of its 2017 stress testing instructions. This letter may only be for stress testing models and has no regulatory weight. However it is the PRA's first public MRM guidance and its structure in the form of four key principles (together with 21 sub-principles) is likely to form the basis of future much broader MRM regulation in the UK in coming months.

» Principle 1. Model Definition

Define a model and record such models in inventory

» Principle 2. Risk Governance

Establish model risk governance framework, policies, procedures and controls

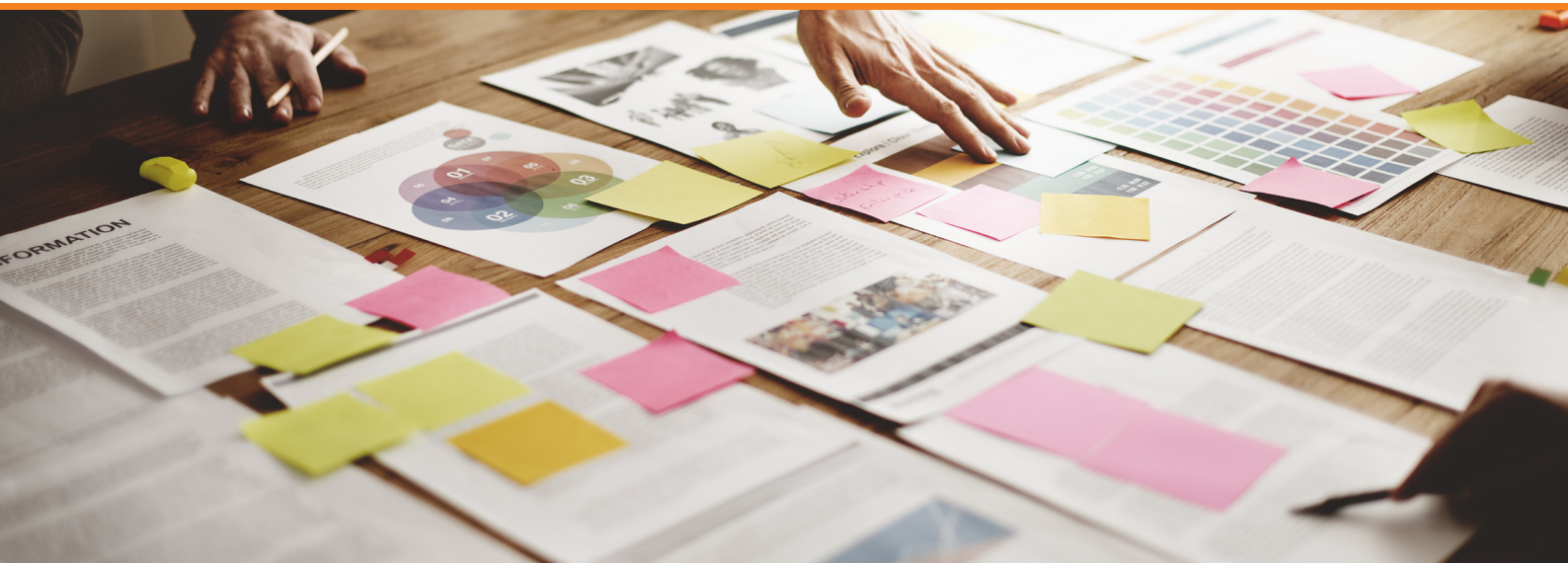
» Principle 3. Lifecycle Management

Create robust model development, implementation and usage processes

» Principle 4. Effective Challenge

Undertake appropriate model validation and independent review

For more details on the 21 sub-principles, see the full letter online. <http://www.bankofengland.co.uk/pradocuments/about/letter270317.pdf>



2. Analysis of changes required

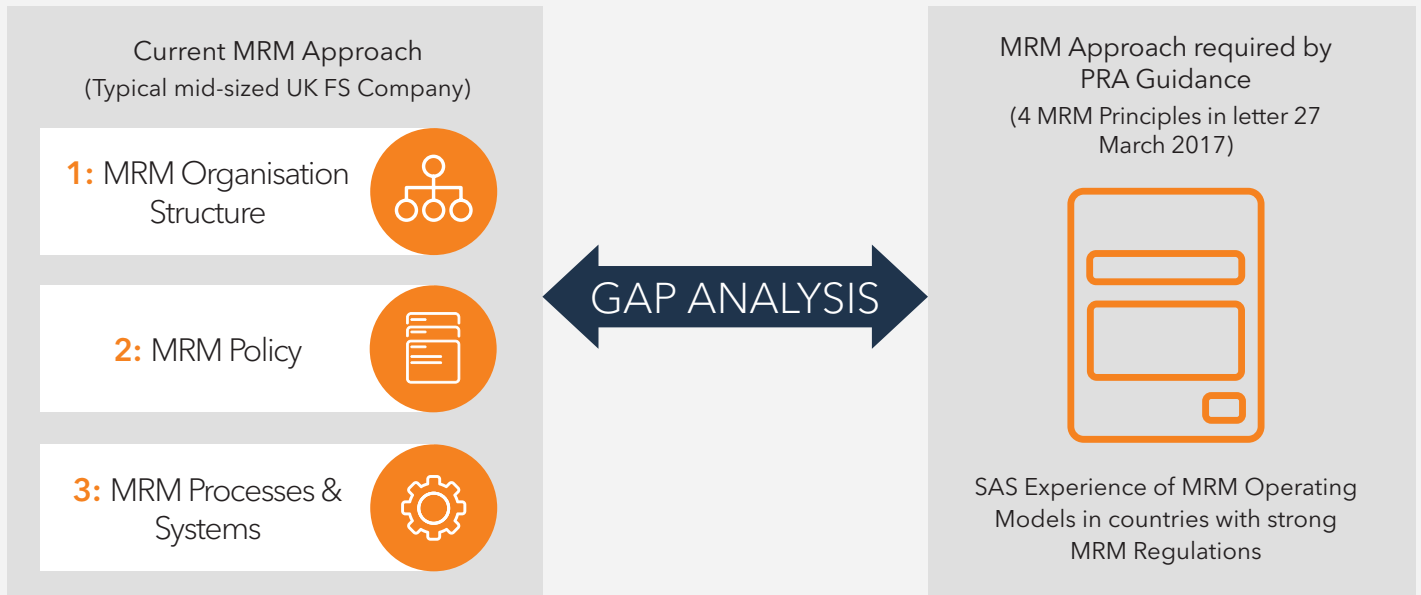
This whitepaper considers the impact of the regulations by performing an operating model gap analysis between the typical MRM operating model in UK banks and insurers today and the operating model needed to comply with the PRA's MRM Principles.

Our analysis uses a simple MRM operating model with three components:

- » **Organisation Structure**
- » **Policy**
- » **Processes and Systems**

It also draws on SAS' experience supporting MRM projects at 22 banks around the world. This has provided us with useful insights into MRM operating models prior to the impact of MRM regulations, what works well and the best practice approaches needed to comply with the new regulations.

MRM Gap Analysis - Overview of Approach



Current Situation

For the purposes of the gap analysis we created the following reference MRM operating model typical of a medium sized bank prior to MRM regulation.

1: Organisation

- » **MRM CONTROL FUNCTIONS:** No central independent MRM team or dedicated Group MRM committee.
- » **VALIDATION TEAMS:** Validators not formally trained and often closely connected to model development community.
- » **BUSINESS INVOLVEMENT:** Focus on requirements and output. Limited understanding of model risks/uncertainties.

2: Policy

- » **MRM POLICY:** Prepared at division/product level and of variable quality and scope.

3: Process & Systems

- » **INVENTORY:** Incomplete record of 'models', often spread across multiple inventories.
- » **VALIDATION:** Model checking processes designed and executed by local validation teams.
- » **MRM DATA:** Limited, of poor quality and often duplicated.
- » **DOCUMENTATION:** Model and validation documentation of variable quality and distributed over hard-drives and SharePoint sites.
- » **USAGE CONTROLS:** Limited/no controls over usage of model without validation.
- » **REPORTING:** Manual, spreadsheet based, model risk reporting. Limited scope.
- » **STAKEHOLDERS:** Limited recording of who involved in requirements, design/build or validation of models.

Gap to Compliance

Our gap analysis highlighted a number of changes that are often required to become MRM compliant. These changes are summarised under the three operating model themes: Organisation Structure; Policy; Systems and Processes.



1: MRM Organisation Structure Changes

New teams need to be formed (or developed) to design, build and operate the required (compliant) MRM approach. Four specific business functions need to be specifically identified as follows:

MRM COMMITTEE

SENIOR MRM COMMITTEE (Principle: 2.1)

Board/Senior management level committee that:

- » Establishes the MRM framework and documentation;
- » Designates roles & responsibilities for MRM framework;
- » Ensures MRM framework is executed and maintained;
- » Challenges key model outputs directly (incl: model limitations/uncertainties & its impact on model results).

INTERNAL & EXTERNAL AUDIT (3RD LINE)

INTERNAL AUDIT: (Principle: 2.4)

- » Team to independently verify MRM practices are comprehensive, rigorous and effective.

MODEL RISK MANAGEMENT GROUP (2ND LINE)

MRM TEAM (Principle: 1.2)

- » Central MRM team responsible for group model inventory and all model risk information about the models.

MODEL OWNERS, DEVELOPERS & VALIDATORS (1ST LINE)

VALIDATION TEAM: (Principle: 4.3)

- » Reporting line for validators to central MRM team so that model issues/deficiencies get considered & quickly addressed.



2: MRM Policy Changes

Our gap analysis identified the following areas of MRM policy that are likely to need major revisions.



MODEL DEFINITION

Principle 1.1: Create single groupwide “model definition framework” that sets out clear identification criteria for all models needing validation (either for regulatory or business needs) and the degree of validation needed for particular model.



ROLES & RESPONSIBILITIES

Principle 2.1: Issue formal delegation of authority for MRM setting out roles and responsibilities for the key MRM stakeholders (i.e. model owners, users, developers, validators and the control and compliance functions). (P3.7) Involve frontline business in model design (including assumptions), testing and output review.



MODEL VALIDATION

Principle 3.1: Define the required model validation tasks and documentation needed to support this validation. These may vary by each class of model and with model materiality and uncertainty.



GOVERNANCE & CONTROL

Principle 2.2: Create set of model governance/control procedures across the model lifecycle with clear identification of responsibilities.



DATA QUALITY

Principle 3.2: Define acceptable data quality and relevance checks to be performed together with the impact assessment required where adjustments/proxies have been used as data has been determined as not representative.

MODEL SYSTEMS

Principle 3.6: Issue group standards on testing of all IT environments used to run models.



MODEL PERFORMANCE

Principle 3.8: Define acceptable approaches for the assessment of model performance and application of conservative adjustments to address uncertainties.



MODEL USAGE

Principle 3.4: Set documentation requirements covering: how model operates, and its usage, key assumptions and limitations. This should cover both internally created and vendor models.



BUSINESS USERS

Principle 3.7: Set out the role of frontline business in model design, testing and challenge throughout the model's lifecycle.



MODEL TESTING

Principle 3.3: Set groupwide model testing policy setting out approved test approaches.



3: MRM Process Changes

Finally, we analysed the MRM process upgrades needed to be compliant with the PRA's Model Risk principles. Our analysis suggests that all but the smallest banks and insurers (with < 200 models) will need a major upgrade to their MRM processes for compliance.

For the analysis we looked at the PRA's MRM process requirements mapped to the eight-stage MRM lifecycle shown in the following diagram.



1: SET-UP NEW MRM PROCEDURES

1: SET-UP NEW MRM PROCEDURES

Inventory (P1.2)

Create single groupwide inventory system that can:

- » Contain all necessary model level governance data points
- » Identify connected models
- » Set-out level of validation needed for each model

Inventory Documentation (P3.4)

Enable holding of model documentation covering:

- » How model operates & sufficient key assumptions/ limitations to enable replication of results
- » Involvement of frontline business in model design, testing and output reviews

Review Scheduling (P3.9)

Establish and maintain a process of periodic model reviews with frequency set by nature and materiality of model risk.

Staff Skills (P4.3)

Establish a training and certification process for the validation team with certification records.

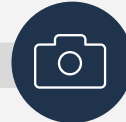
2: ASSESS MODEL GOVERNANCE NEED

Model Candidate Assessment (P3.1)

Establish pre-validation process to agree the appropriate level of documentation needed for a new model (or one going through significant changes in usage, risk profile or structural approach).



2: ASSESS MODEL GOVERNANCE NEED



3. CAPTURE MODEL DETAILS

3. CAPTURE MODEL DETAILS

Inventory (P1.2, 3.4, 3.7)

Capture Inventory data points and documents per set-up (see Inventory P1.2).

External Models (P2.5)

Maintain documentary record of:

- » Who within organisation responsible for external validation task
- » Due diligence performed on any external validation resource used
- » Quality control performed on externally validated models

Model Systems (P3.6)

Document all tests of IT systems used by models.

4. VALIDATION

Scope (P4.1)

Establish process of independent reviews of all model inputs, calculations, and reporting outputs.

Data Tests (P3.2)

Create documentary record of:

- » Data quality and data relevance checks performed
- » Usage of adjustments and proxies and their potential impact on model outputs
- » Obtain sign-off from users on the limitations on the model due to data availability and/or quality

Model Tests (P3.3)

Document how model test process evaluated a model including: limitations, robustness & stability (across time and economic conditions).

Overlay Review (P3.5)

Establish a documented independent review and challenge process of all model overlays used to modify parameters, inputs or outputs.

Re-validation (P4.5)

Establish formal process for initiating re-validation exercises that reflects model use, complexity & materiality.



4. VALIDATION



5. MONITORING

5. MONITORING

Control reporting (P2.1)

Implement control reports for central MRM team to monitor:

- » Current model lifecycle status e.g. issues, actions, sign-offs, change requests
- » Model risk i.e. limitation/uncertainty of model output and financial impact

Provide fast, efficient access to detailed model risk records for effective challenge.

Controls over Unapproved Usage (P2.3)

Establish reporting process that regularly monitors all production models with alerts on approval status and any with temporary exception.

Performance Assessments (P3.8)

Perform and document model performance assessments which need to include business/economic commentary on conservative assumptions addressing uncertainty.

Establish control procedures so that models in production either:

- » Have been fully validated and signed off
- » Operate under temporary conditional exception which is strictly monitored against conditions



6. MANAGE MODEL CHANGE



7. AUDIT SUPPORT

7. AUDIT SUPPORT

Audit Packs (P2.4)

Develop formal audit reports together with audit trail to underlying details and supporting documentation.

Internal audit (P4.2)

Establish process of periodic independent (3rd line) checks of the quality of the independent validation of models. Establish control reporting on the actions raised during independent validation exercises and the clear down of these actions by model owners.



8: RETIRE MODEL

We anticipate that many (newly formed) central MRM teams will initially try to build the PRA MRM processes using a mixture of paper checklists, spreadsheets, email and SharePoint sites. Our experience globally has been that this mainly manual approach to compliance either:

- » Fails to deliver required MRM control (e.g. out of date model inventories, missing MRM records, little or no model risk status reporting, poor quality unsupported regulatory reporting)

AND/OR

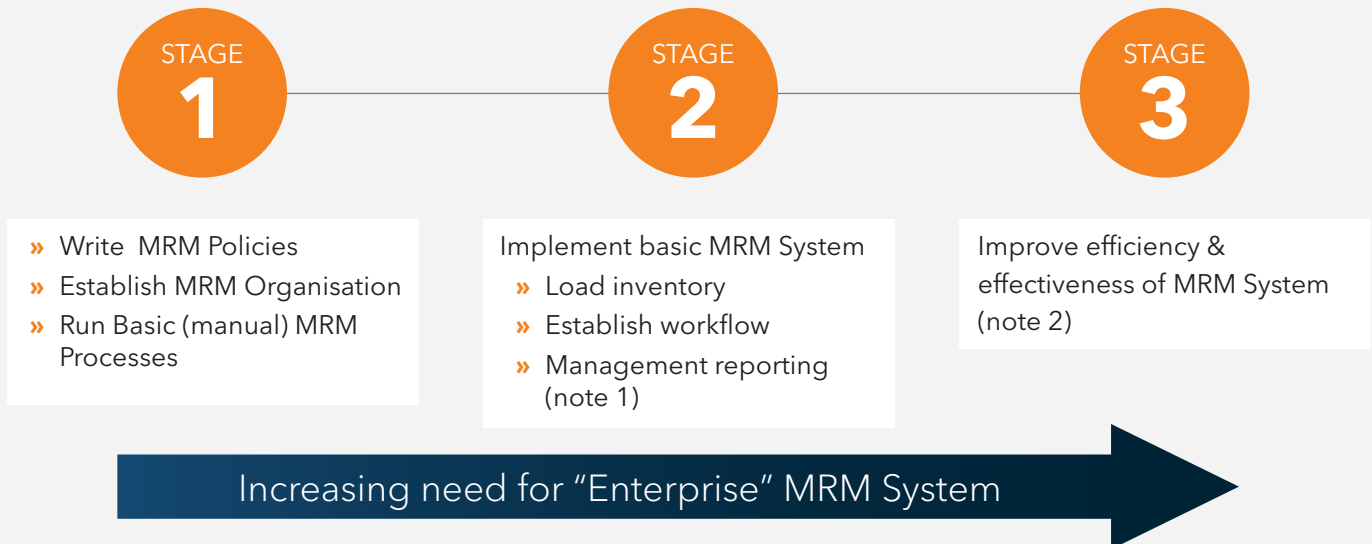
- » Faces budget challenge as it rapidly becomes excessively expensive to run due to its inherent inefficiency and the resulting increase in staff workload

Our advice to MRM teams facing such significant upgrades to their MRM processes is to avoid the time and cost of a failed manual roll-out and instead:

- » First, implement a pilot MRM system with limited scope to prove out the MRM approach
- » Then run a continuous programme of MRM system enhancements, which over time can incorporate all model types, full MRM lifecycle functionality and control reporting

Roll-out Approach

We see three stages to how banks across the world have responded to new MRM regulation.



Note 1: Management reporting includes: model risk metrics, MRM stakeholder information, MRM lifecycle monitoring, MRM event linkages and model risk alerts.

Note 2: Improvements in efficiency & effectiveness include:

- Develop enhanced electronic workflows
- Use MRM system to better monitor and manage model development resources
- Minimise effort supporting MRM reviews (e.g. from internal audit or regulators)

SAS roll-out experience on MRM

SAS has now engaged with 22 banks globally, supporting MRM projects and developing MRM ecosystems that support all model types across their lifecycles. These banks range from large tier 1 (> US\$1,000bn total assets) to mid-tier 2 (~ \$30bn total assets).

In our experience successful MRM system roll-outs have two distinct phases:

Phase 1- Initial rapid roll-out for (basic) MRM Compliance: The SAS solution can typically meet 80 per cent of an organisation’s primary MRM needs from the base solution. An experienced consulting team then works closely with the MRM team to configure the remaining core requirements. Basic compliance over core MRM processes is typically achieved in a 4-5 month period.

Phase 2 - Internal programme of MRM process efficiency: Part of the Phase 1 roll-out involves a knowledge transfer of SAS MRM configuration skills to the client’s MRM business system admin team (or equivalent). This allows the bank to run a Phase 2 efficiency programme in which they directly implement a series of solution enhancements (e.g. adding new metrics, changing validation checklists or amending assessment workflows).

Examples might include:

- » Addressing new issues raised during regulatory inspections
- » Improving timeliness and efficiency of model development
- » Reducing costs of MRM compliance tasks

To find out how SAS helps banking and insurance organisations with a low cost, efficient approach to MRM compliance then please visit: https://www.sas.com/en_us/software/model-risk-management.html or contact Simon Goldsmith on +44 (0) 1628 490 972



Further reading

Deutsche Bank and Santander fail Fed stress test again

<https://www.ft.com/content/9a018afe-3e37-11e6-9f2c-36b487ebd80a>

Bank of England PRA letter

<http://www.bankofengland.co.uk/pr/ Documents/about/letter270317.pdf>

MRM Product Solution Brief

https://www.sas.com/content/dam/SAS/en_us/doc/solutionbrief/mitigate-model-risk-reduce-model-related-costs-107250.pdf

SAS Whitepaper: Future of Model Risk Management in Financial Services (produced June 2016)

https://www.sas.com/content/dam/SAS/en_us/doc/whitepaper1/future-model-risk-management-for-financial-services-108343.pdf

SAS UK & I WITTINGTON HOUSE HENLEY ROAD MARLOW BUCKS SL7 2EB
+44 (0) 1628 490 972 www.sas.com

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies. Copyright © 2017, SAS Institute Inc. All rights reserved.

