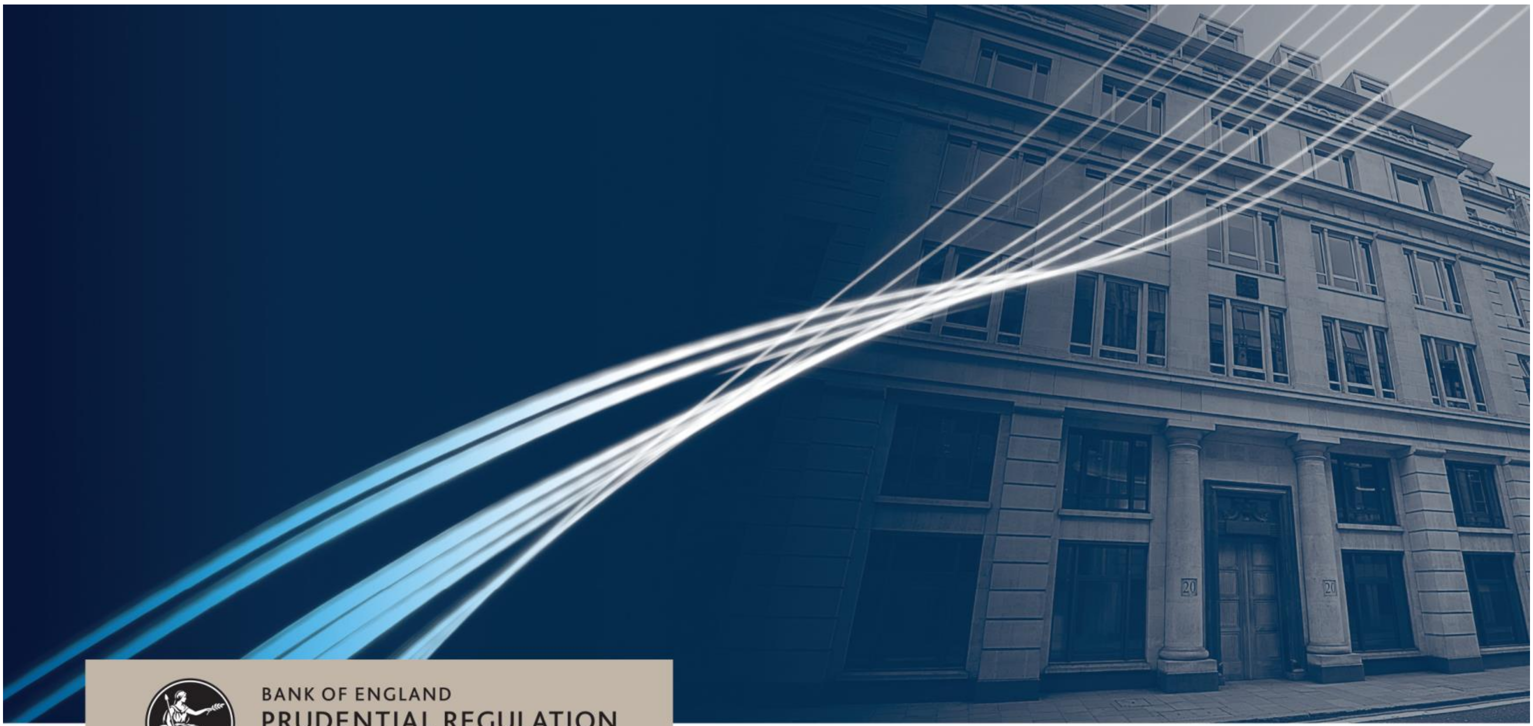

BANK OF ENGLAND
PRUDENTIAL REGULATION
AUTHORITY

Consultation Paper | CP26/17

Model risk management principles for stress testing

December 2017

Prudential Regulation Authority
20 Moorgate
London EC2R 6DA

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Responses are requested by Tuesday 6 March 2018.

Please address any comments or enquiries to:
Prudential Regulation Authority
20 Moorgate
London
EC2R 6DA

Email: CP26_17@bankofengland.co.uk.

Contents

1 Overview

1.1 This consultation paper (CP) sets out the Prudential Regulation Authority's (PRA's) proposals to support effective practices in model risk management for stress testing. A set of principles has been developed in the context of the annual concurrent stress testing process, which tests the resilience of the banking system and some of the largest firms within it. The PRA proposes to embed these principles further for firms participating in the annual concurrent stress tests, while also extending them, in a proportionate manner, to the wider banking sector.

1.2 The principles are intended to support firms in developing and implementing policies and/or procedures to identify, manage and control the risks inherent in the use of stress test models. The principles are set out in a proposed new supervisory statement (SS) 'Model risk management principles for stress testing' (Appendix).

1.3 The CP is relevant to PRA-authorised banks, building societies and PRA-designated investment firms ('firms'). The CP is not relevant to Credit unions and there is currently no proposal to extend the principles to insurance and reinsurance firms.[1]

1.4 The PRA proposes that firms participating in the Bank of England's (the Bank) annual concurrent stress test should adopt the principles in full, and firms not participating in the Bank's annual concurrent stress test should seek to apply the principles on a proportionate basis, taking into account their size, complexity, risk profile and the relevance to them of using stress test models.

Background

1.5 In its 2016 concurrent stress test results publication,[2] the Bank communicated the intention to develop guidance for firms to support raising standards in stress test model development and management.

1.6 In March 2017, the Bank communicated a set of principles on stress test model management to the firms participating in the annual concurrent stress test.[3] These principles reflected the Bank's thinking in relation to effective model management and were intended to support banks in assessing their own stress test model management practices.

1.7 A review of stress testing practices is currently taking place at the international level. The European Banking Authority (EBA) is reviewing the 2010 Committee of European Banking Supervisors (CEBS) Guidelines on Stress Testing (GL32). The PRA considers that the proposals in this CP reflect the aims of the EBA review by clearly setting out its expectations in relation to model risk management practices for stress testing. The proposals in this CP are also intended to align with existing guidelines on model risk management practices[4] from authorities outside Europe.

1 Insurance and reinsurance firms are currently not in scope as requirements on model management for firms subject to Solvency II are set out in Commission Delegated Regulation (EU) 2015/35 Title I, Chapter VI and PRA expectations are set out in SS17/16 'Solvency II: internal models – assessment, model change and the role of non-executive directors', November 2016: www.bankofengland.co.uk/pra/Pages/publications/ss/2016/ss1716.aspx.

2 Available at: www.bankofengland.co.uk/financialstability/Pages/fpc/stresstest.aspx.

3 Available at: www.bankofengland.co.uk/pra/Pages/supervision/activities/stresstesting.aspx.

4 For example (SR11-7) Supervisory Guidance on Model Risk Management, Board of Governors of the Federal Reserve System, Office of the Comptroller of the Currency, April 2014; (E-23) Guidelines for Enterprise-Wide Model Risk Management for Deposit-Taking Institutions, Office of the Superintendent of Financial Institutions Canada (OSFI), September 2017.

1.8 The principles in this CP have been developed and applied in the context of the annual concurrent stress tests. Drawing on this experience, the PRA considers they represent effective model risk management practices for other firms that make use of stress test models. The PRA therefore proposes they should be adopted by all firms in a proportionate manner.

Implementation

1.9 The proposed implementation date for the proposal in this CP is 1 June 2018.

1.10 The PRA proposes that all firms applying the proposed principles undertake a self-assessment of their stress test model risk management practices against the principles as part of the Internal Capital Adequacy Assessment Process (ICAAP) and report the findings in the ICAAP documents from 1 January 2019 onwards, depending on the frequency of the Supervisory Review and Evaluation Process (SREP).

1.11 The PRA also proposes that, for firms participating in the Bank's annual concurrent stress test, an assessment of stress test model risk management practices form part of the qualitative review component from Q3 2018 onwards.

Responses and next steps

1.12 This consultation closes on Tuesday 6 March 2018.

1.13 The PRA invites feedback on the proposals set out in this consultation. The PRA is particularly interested in respondent's views on the usefulness and applicability of the proposed principles for firms *not* participating in the Bank's annual concurrent stress test.

1.14 Please address any comments or enquiries to CP26_17@bankofengland.co.uk.

2 Proposals

2.1 The primary objective of stress testing is to help regulators and firms assess capital positions under adverse economic conditions. This exercise allows regulators to help inform the setting of capital requirements for both microprudential and macroprudential purposes. Banks are also increasingly using results of stress tests to inform strategic and business decisions.

2.2 Stress test models are designed to test firms' resilience in the face of severe but plausible hypothetical 'tail' scenarios based on real world or historical experiences. As they are used to assess the impact of unexpected or extraordinary risks and are often based on limited historical data, there is a level of uncertainty inherent in their use. Improperly accounting for the uncertainty, or failing to account for it, may lead to the inappropriate use of stress test models or model errors.

2.3 A model risk management framework for stress testing is important since it establishes processes and procedures for managing the risk. It also engages a firm's senior stakeholders and thereby supports the mitigation of the risk. The PRA considers that an effective model risk management framework should be supported by a comprehensive governance framework and an effective model life cycle management process. In particular:

(a) a comprehensive governance framework should include the identification of models, clear model ownership and purpose, an appropriate governance structure, clearly defined roles and responsibilities of senior stakeholders, model developers, model owners and control functions, supported by a well embedded policy framework; and

(b) model life cycle management should cover the development, validation, independent review, use of judgement, implementation and the use of models, supported by adequate documentation, IT systems and an appropriate level of reporting to senior management.

2.4 The PRA considers that an effective model risk management framework in the context of stress testing is supported by the following principles:

(a) Principle 1 – Banks have an established definition of a model and maintain a model inventory.

(b) Principle 2 – Banks have implemented an effective governance framework, policies, procedures and controls to manage their model risk.

(c) Principle 3 – Banks have implemented a robust model development and implementation process, and ensure appropriate use of models.

(d) Principle 4 – Banks undertake appropriate model validation and independent review activities to ensure sound model performance and greater understanding of model uncertainties.

2.5 The PRA proposes:

(a) that firms participating in the Bank's annual concurrent stress test should adopt the principles for all stress test models; and

(b) firms not participating in the Bank's annual concurrent stress test should take into account their size, nature, scale, complexity of business activities and use of stress test models when seeking to apply the principles. For these firms the PRA proposes at a minimum:

   (i) implementation of Principles 1 and 2 (ie establish a model definition, maintain a model inventory and implement an effective governance framework, policies and procedures); and

   (ii) application of Principles 3 and 4 (ie implement a robust model development process and undertake validation and independent review) to models they have identified as material.

2.6 The four principles above would form the basis of the PRA's expectations for model risk management practices for the use of stress test models. The principles are designed to support firms in developing and implementing policies and procedures through which to identify, manage and control the risks inherent in the use of stress test models and thereby meet the high standards of risk management and internal governance already required of them under Capital Requirements Directive IV (CRD IV)[1] and the PRA Rulebook.

1 Capital Requirements Directive (2013/36/EU) (CRD) and Capital Requirements Regulation (575/2013) (CRR) – jointly 'CRD IV'.

3 The PRA's statutory obligations

3.1 The PRA is required by the Financial Services and Markets Act 2000 as amended (FSMA) to consult when setting its general policies and practices.[1] In doing so, it is required to comply with several statutory and public law obligations. The PRA meets these obligations by providing the following (as appropriate) in its consultations:

- a cost benefit analysis;
- an explanation of the PRA's reasons for believing that the proposed policy or practice is compatible with the PRA's duty to act in a way that advances its general objective, insurance objective (if applicable), and secondary competition objective;[2]
- an explanation of the PRA's reasons for believing that the proposed policy or practice is compatible with its duty to have regard to the regulatory principles;[3] and
- a statement as to whether the impact of the proposed policy will be significantly different to mutuals than to other persons.

3.2 The Prudential Regulation Committee (PRC) should have regard to aspects of the Governments' economic policy as recommended by HM Treasury.[4]

3.3 The PRA, as a public authority, is also required by the Equality Act 2010 to have due regard to the need to eliminate discrimination and to promote equality of opportunity in carrying out its policies, services and functions.

Cost benefit analysis

3.4 The proposals contained in this CP set out the PRA's expectations in relation to effective model risk management practices for the use of stress test models. The proposals are centred on four key principles firms should adopt when using stress test models.

3.5 The PRA considers that the principles would bring greater clarity and transparency to the PRA's expectations regarding the governance frameworks and life cycle management of stress test models. This would be in line with the regulatory principles of openness and transparency.

3.6 The proposed principles are in line with emerging EU and international standards and are intended to clarify the PRA's expectation against international guidelines.

3.7 The PRA considers that the proposal to extend the principles in a proportionate manner to firms not participating in the Bank's annual concurrent stress test balances its desire to ensure that all firms benefit from the experience gained through that process while not burdening smaller firms with expectations designed for larger, more complex firms.

3.8 The PRA considers that the proposals in this CP would not result in material additional costs for firms since the principles are designed to support firms' own development and implementation of effective stress test model risk management practices. The proposals also

1 Section s2L FSMA.
2 Sections s2B, s2C, s2H(1) FSMA.
3 Section s2H(2) and Section 3B FSMA.
4 Section 30B of the Bank of England Act 1998.

reflect firms' existing risk management and governance obligations under CRD IV and the PRA Rulebook.

Compatibility with the PRA's objectives

3.9 In discharging its general functions of determining general policy and principles, the PRA must, so far as reasonably possible, act in a way that advances its general objective to promote the safety and soundness of the firms it regulates. The proposed principles of model risk management for stress testing would support firms to manage and control the risks associated with the use of stress test models. As safety and soundness involve firms having the resilience to withstand unexpected shocks, the stress-testing process and the role of models within it are directly linked to fulfilment of this objective.

3.10 When discharging its general functions in a way that advances its primary objectives, the PRA has, as a secondary objective, to act 'so far as is reasonably possible' in a way that facilitates competition. While the proposals do not directly promote competition, the proportionate approach outlined in the paper seeks to avoid any anti-competitive effect by ensuring that the regulatory burden, particularly on smaller firms, is commensurate with the benefits of applying the principles.

Regulatory principles

3.11 In developing the proposals in this CP, the PRA has had regard to a number of 'regulatory principles' set out in FSMA. Two of the principles are of particular relevance.

3.12 The first is that a burden imposed on a firm should be proportionate to the benefits expected to result from that burden. The PRA considers that the benefits of enhanced model risk management practices, applied on the proposed proportionate basis, outweigh the burden of doing so. This has been set out in the 'Compatibility with the PRA's objectives' section above.

3.13 The second is the principle that the PRA should exercise its functions as transparently as possible. The PRA considers that the proposal set out in this CP brings greater clarity and transparency to what the PRA considers to be effective model risk management practices for stress testing.

Impact on mutuals

3.14 The PRA has assessed that the impact on mutuals will not be significantly different from the impact on other firms.

HM Treasury recommendation letter

3.15 HM Treasury has made recommendations to the PRC about aspects of the Government's economic policy to which the PRC should have regard when considering how to advance the PRA's objectives and apply the regulatory principles.[1] The aspect of the Government's economic policy most relevant to the proposals in this CP is competition. The PRA has set out this aspect in the 'Compatibility with the PRA's objectives' section above.

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1 Information about the PRC and the recommendations from HM Treasury are available on the Bank's website at www.bankofengland.co.uk/about/Pages/people/prapeople.aspx.

Equality and diversity

3.16 The PRA has performed an assessment of the policy proposals and does not consider that the proposals give rise to equality and diversity implications.

Appendix: Draft supervisory statement 'Model risk management principles for stress testing'

1 Introduction

1.1 This supervisory statement (SS) sets out the PRA's expectations as to the model risk management practices firms should adopt when using stress test models. It supports firms' development and implementation of policies and procedures to identify, manage and control the risks inherent in the use of stress test models.

1.2 This SS is relevant to PRA-authorised banks, building societies and PRA-designated investment firms. Credit unions are not in scope and there is currently no proposal to extend the principles to insurance and reinsurance firms.[1]

1.3 Adopting a proportionate approach, the PRA expects the larger firms that participate in the Bank of England's (Bank's) annual concurrent stress test to apply the principles contained in this SS in full, while firms not participating in the Bank's annual concurrent stress test should apply the principles on a proportionate basis, taking into account their size, complexity, risk profile and the relevance to them of stress test models.

2 Model risk management principles for stress testing

2.1 The PRA's model risk management principles for stress testing are centred around four key principles:

(a) Principle 1 – Banks have an established definition of a model and maintain a model inventory.

(b) Principle 2 – Banks have implemented an effective governance framework, policies, procedures and controls to manage their model risk.

(c) Principle 3 – Banks have implemented a robust model development and implementation process, and ensure appropriate use of models.

(d) Principle 4 – Banks undertake appropriate model validation and independent review activities to ensure sound model performance and greater understanding of model uncertainties.

2.2 The PRA expects firms participating in the Bank's annual concurrent stress test to apply the principles for all stress test models. The assessment of participating firms' stress test model risk management practices will form part of the Bank's qualitative review of the annual concurrent stress tests.

2.3 In line with previous concurrent stress test qualitative review practices,[1] feedback on the status of a firm's practices will be provided confidentially to each firm. In addition, the PRA will

1 Insurance and reinsurance firms are currently not in scope as requirements on model management for firms subject to Solvency II are set out in Commission Delegated Regulation (EU) 2015/35 Title I, Chapter VI and PRA expectations are set out in SS17/16 'Solvency II: internal models – assessment, model change and the role of non-executive directors', available at: www.bankofengland.co.uk/pra/Pages/publications/ss/2016/ss1716.aspx.

retain the flexibility to publish a high level (anonymised) overview of findings together with the stress test results publication.

2.4 All other firms should take into account their size, nature, scale, complexity of business activities and use of stress test models when seeking to apply the principles. For these firms the PRA expects at a minimum:

(a) implementation of Principles 1 and 2 (ie establish a model definition, maintain a model inventory and implement an effective governance framework, policies and procedures); and

(b) application of Principles 3 and 4 (ie implement a robust model development process and undertake validation and independent review) of the models they have identified as material.

2.5 For firms not participating in the Bank's annual concurrent stress test the PRA will review their stress test model risk management practices as part of the Supervisory Review and Evaluation Process (SREP). The PRA's assessment will form part of the supervisory assessment of risk management and controls and management governance and culture as set out in 'The PRA's approach to banking supervision', March 2016.[2]

2.6 All firms applying the principles are expected to do a self-assessment of their stress test model risk management practices against the principles as part of their Internal Capital Adequacy Assessment Process (ICAAP) and report the findings in the ICAAP documents from 1 January 2019 onwards.

2.7 The four principles on model risk management for stress testing are detailed in the boxes below.

Principle 1 – Banks have an established definition of a model and maintain a model inventory

P1.1 Definition of a model: Banks should establish their own definition of a model. When identifying models banks are expected to take into consideration:

(a) Calculation methods or systems that are based on statistical, financial or economic assumptions (eg impairment models, income models).

(b) Calculation mechanisms used to transform a set of parameters or values into a quantitative measure (eg scenario expansion models, probability of default models).

(c) Frameworks or systems where qualitative judgement is applied to generate quantitative results (eg where adjustments are made to address known model limitations).

(d) Calculation mechanisms where outputs of other models are used to calculate financial/risk measures (eg expected loss which uses the output of probability of default, loss given default and exposure at default models).

In cases where calculation mechanisms are not classified as models, banks should ensure the risks associated with the implementation and use of such calculations are adequately understood, controlled, and documented as part of an established management control

1 The Bank of England's approach to stress testing the UK banking system, October 2015, available at: [INSERT LINK].
2 Available at: www.bankofengland.co.uk/publications/Pages/other/pra/supervisoryapproach.aspx.

process.

P1.2 Model inventory: Banks should maintain a comprehensive set of information on models ‘implemented for use’, ‘under development’, or ‘recently retired’. The information should clearly identify model owners and users, and should also include all model uses and dependencies, ie models that depend or use the output of other models. A designated internal party should be responsible for maintaining the bank-wide inventory of all models. Any variation of a model which requires separate validation and approval should be classified as a separate model.

Principle 2 – Banks have implemented an effective governance framework, policies, procedures and controls to manage their model risk

P2.1 Board of directors and senior management responsibility:[1] The board of directors should establish a framework for the management of model risk and this should be adequately documented. Senior management is responsible for the execution and maintenance of the framework and should designate the roles and responsibilities for the framework to model owners, model users, and control and compliance functions. The board of directors and senior management are expected to provide challenge to model outputs and understand model capabilities, the model limitations, and the potential impact of model uncertainty.

P2.2 Model risk management policies: These should cover all aspects of model risk management, including model definitions; model development standards; model change; implementation; use; validation; review; and management sign-off. The policies should set out appropriate governance and challenge frameworks, and the roles and responsibilities of model owners, model users, and control and compliance functions. The prioritisation, scope and frequency of validation, review, and monitoring activities should also be set out in the policies.

P2.3 Model owners and control functions: Model owners should have accountability for model use and performance. Model owners should be responsible for ensuring that models are appropriately developed, implemented, used as intended, have undergone appropriate validation and approval, and are recorded and maintained in the model inventory. Control staff should have the authority to restrict the use of models and monitor any limits on model use.

P2.4 Role of Internal Audit (IA): IA should assess the overall effectiveness of the model risk management framework. IA should evaluate and independently verify whether model risk management practices are comprehensive, rigorous, and effective.

P2.5 Use of external resources: If external resources are used for any model development, validation, or review activities, banks should be able to verify that these are conducted in accordance with their model risk management standards. Designated internal staff should be responsible for the work delivered by the external party, and should be able to address any issues identified either with model development or as a result of model validation.

1 When assigning the responsibilities of the management of model risk to senior management functions, firms should consider the relevant prescribed responsibilities in ‘Allocation of Responsibilities’ 4.1 or 5.2 in the PRA Rulebook.

Principle 3 – Banks have implemented a robust model development and implementation process and ensure appropriate use of models

P3.1 Model purpose and design: The purpose, design, choice of parameters, mathematical theory, and underlying assumptions of a model should be appropriately documented and conceptually sound (appropriate for the intended business purpose), and supported by published research and generally accepted industry practice where appropriate. Particular emphasis should be placed on model limitations and, where possible, model results should be supported by a comparison with alternative theories/approaches, or by assessing the sensitivities of changes in model inputs.

P3.2 Use of data: The data used to develop a model should be assessed for quality and relevance. Where adjustments are made, proxies are used, or where the data are not representative of the bank's portfolio or asset mix, the impact should be justified and documented so that users are aware of the potential model limitations.

P3.3 Testing: Appropriate testing of models should be conducted to take into account potential limitations, assess their robustness and stability over time, and across a variety of economic and market conditions, in particular those relating to periods of stress. Testing activities should be appropriately documented.

P3.4 Documentation: Banks should have sufficiently detailed model documentation so that an independent third party with relevant expertise is able to understand how the model operates, identify its key assumptions and limitations, and replicate any parameter estimation and model results. Where a bank uses vendor models, it should have appropriate documentation on the approach to be able to validate the model.

P3.5 Use of judgement: Any judgements or model overlays that are used to modify the parameters, inputs and/or outputs of a model due to known model limitations should form a part of the development process, should be appropriately understood and documented, and should be subject to review and challenge by independent parties.

P3.6 Supporting systems: Model calculations should be implemented in information systems or environments which have been thoroughly tested for this purpose. The findings of any system/implementation tests should be documented.

P3.7 Business involvement: Frontline business should play an integral part in the design and testing of models and should challenge the methods, the underlying assumptions, and the output of the models – both at inception and on an ongoing basis.

P3.8 Model uncertainty: Banks should demonstrate that model uncertainties are adequately understood, managed, monitored, reported, and accounted for in the results. Where conservatism is used to mitigate model uncertainty, banks should justify and document any such adjustments and demonstrate that the adjustments are intuitive from a business and economic perspective.

P3.9 Monitoring: Banks should perform periodic monitoring of model performance with a frequency commensurate with the nature and materiality of the models and risks, with due consideration given to model complexity.

Principle 4 – Banks undertake appropriate model validation and independent review activities to ensure sound model performance and greater understanding of model uncertainties

P4.1 Scope of validation and review: All model components (inputs, calculations and reporting outputs) should be subject to independent validation for both in-house developed models and vendor models. Any validation work undertaken by model developers and users as well as any material changes to already validated models or overlays should be subject to review by an independent party. The extent of validation and independent review should be appropriate with the overall use, complexity, and materiality of the models or changes to a model.

P4.2 Independence: The staff performing model reviews should be independent of the model development process to be able to provide a robust and objective view. The effectiveness of the independent challenge should be judged by the quality of the issues identified and the actions taken by model owners and management to address them.

P4.3 Staff competence and influence: Banks should consider whether validation staff have: the necessary knowledge, skills, and expertise to perform model validations; an adequate degree of familiarity with the business, product, risk, and intended use of the model; and sufficient influence and stature within the bank to ensure that issues and deficiencies are escalated and addressed in a timely manner.

P4.4 Treatment of model issues/deficiencies: When significant model deficiencies and/or errors are identified during the validation process, banks should consider whether the use of models should either be prohibited or only be permitted under strict controls and mitigants. The process of managing identified model issues should include the tracking of the outstanding issues and should be adequately documented.

P4.5 Frequency of model validation: Banks should undertake regular revalidation of models to track known limitations and to identify potential new issues. Periodic reviews should be carried out with a frequency and level of rigour commensurate with the overall use, complexity, and materiality of the models.