

Bank of England PRA

Credit risk: Internal ratings based approach

Supervisory statement | SS4/24

October 2025



Bank of England | Prudential Regulation Authority

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1: Introduction

1.1 The purpose of this supervisory statement (SS) is to provide clarification to firms of the Prudential Regulation Authority's (PRA) expectations in respect of the application of the IRB approach in the calculation of credit risk risk-weighted assets. This SS applies to PRA-
authorised banks, building societies, PRA-designated investment firms, and PRA-approved
or PRA-designated financial or mixed financial holding companies (collectively 'firms').

1.2 The Prudential Regulation Authority (PRA) grants permission to use the IRB approach under Rules 1.1 and 1.2, and Articles 143(1) and 143(2A) of the Credit Risk: Internal Ratings Based Approach (CRR) Part of the PRA Rulebook where firms are materially compliant with the requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part. The purpose of this SS is to provide explanation, where appropriate, of the PRA's expectations when assessing whether firms meet those requirements, including in respect of the conservatism applied.

1.3 Responsibility for ensuring that internal models are appropriately conservative and are compliant with the CRR and PRA rules rests with firms themselves. [The PRA's approach to banking supervision](#) states that 'if firms use internal models in calculating their regulatory capital requirements, we expect the models to be appropriately conservative'.

Definitions

1.4 Unless otherwise specified, terms used in this SS have the same meaning as in the relevant part of either the PRA Rulebook or the CRR. In addition, for the purposes of this SS, the following definitions apply:

- (a) risk parameters: one or all of the following – probability of default (PD), loss given default (LGD), best estimate of expected loss (BEEL), LGD in-default, exposure at default (EAD), and conversion factor (CF);
- (b) reference data set (RDS): all the data sets used for the purpose of estimation of risk parameters, including the data sets relevant for model development, as well as the data sets used for calibration of a risk parameter;
- (c) PD model: all data and methods used as part of a rating system (as defined in Rule 1.3 of the Credit Risk: Internal Ratings Based Approach (CRR) Part) which relate to the differentiation and quantification of own estimates of PD and are used to assess the default risk for each obligor or exposure covered by that model;
- (d) ranking method of a PD model: the method, forming part of a PD model, used to rank order the obligors or exposures with respect to the risk of a default;
- (e) scoring method of a PD model: a ranking method of a PD model that assigns ordinal values ('scores') to rank obligors or exposures;

- (f) LGD model: all data and methods used as part of a rating system (as defined in Rule 1.3 of the Credit Risk: Internal Ratings Based Approach (CRR) Part) which relate to the differentiation and quantification of own estimates of LGD, LGD in-default, and BEEL, and which are used to assess the amount of loss in the case of default for each facility covered by that model;
- (g) BEEL: best estimate of expected loss for defaulted exposures as referred to in Article 181(1)(h)(ii) of the Credit Risk: Internal Ratings Based Approach (CRR) Part;
- (h) LGD in-default: loss given default for defaulted exposures as referred to in Article 181(1)(h) of the Credit Risk: Internal Ratings Based Approach (CRR) Part;
- (i) EAD or CF model: all data and methods used as part of a rating system, as defined in Rule 1.3 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, which relate to the differentiation and quantification of own estimates of EAD or CF and are used to assess the exposure amount in the case of default for each facility covered by that model;
- (j) scope of application of a PD, LGD, EAD, or CF model: the type of exposures as defined in Rule 1.3 of the Credit Risk: Internal Ratings Based Approach (CRR) Part covered by a PD model, an LGD model, or an EAD or CF model;
- (k) estimation of risk parameters: the full modelling process related to risk parameters including the selection and preparation of data, model development, and calibration;
- (l) intermediate parameters: parameters estimated as part of a model which are then subsequently used to estimate risk parameters in that model;
- (m) model development: the part of the process of the estimation of risk parameters that leads to an appropriate risk differentiation by specifying relevant risk drivers, building statistical or mechanical methods to assign exposures to obligor or facility grades or pools, and estimating intermediate parameters of the model, where relevant;
- (n) PD calibration sample: the data set on which the ranking or pooling method is applied in order to perform the calibration;
- (o) calibration segment: a uniquely identified subset of the scope of application of the PD or LGD model which is jointly calibrated;
- (p) PD calibration: the part of the process of the estimation of risk parameters that leads to appropriate risk quantification by ensuring that, when the PD ranking or pooling method is applied to a calibration sample, the resulting PD estimates correspond to the long-run average default rate, at the level relevant for the applied method;
- (q) LGD calibration: the part of the process of the estimation of risk parameters that leads to appropriate risk quantification by ensuring that the LGD estimates correspond to the long-run average LGD, or to the downturn LGD estimate where this is more conservative, at the level relevant for the applied method;
- (r) margin of conservatism (MoC): the MoC related to the expected range of estimation errors required by Articles 179(1)(f) and 180(1)(e) of the Credit Risk: Internal Ratings Based Approach (CRR) Part;

- (s) application of risk parameters: the assignment of risk parameters estimated in accordance with the PD or LGD model to the current exposures, performed either automatically with the use of a relevant IT system or manually by qualified personnel of a firm; and
- (t) application portfolio: the actual portfolio of exposures within the scope of application of the PD or LGD model at the time of the estimation of a risk parameter.

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2: Permission to use the IRB approach

Criteria for granting approval of permission to use the IRB approach

2.1 As set out in Article 143(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms applying for permission to use the IRB approach are required to demonstrate that they materially comply with the requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part. The PRA will therefore only grant approval to use the IRB approach where this condition is met.

Assessment of non-compliance and remediation plans

2.2 For the purpose of assessing whether non-compliance is immaterial in accordance with Articles 143(1)(a), 143(2B), 143(3)(b), 146(1)(b) and 149(2A) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects that non-compliance should only be considered immaterial if it results in a minimal impact on the quantitative and qualitative aspects of the firm's IRB approach.

2.3 In accordance with Article 146(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms are required to submit a plan for addressing non-compliance in a timely way to the PRA if they are materially non-compliant with the requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part. The PRA also expects firms to present a plan to the PRA for addressing non-compliance in a timely way such that the effect of non-compliance would become immaterial if they are materially non-compliant with any relevant PRA SSs relating to IRB (including, but not limited to, this SS).

2.4 The PRA expects that firms should agree the content of remediation plans presented under Articles 143B(5) and 146(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part and paragraph 2.3 with the PRA and that firms should realise such remediation plans within a time period agreed with the PRA.

Post-model adjustments

2.5 The PRA expects firms to develop a framework to assess post-model adjustments (PMAs) in accordance with Article 146(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part. This framework should meet the following criteria:

- (a) the framework should be applied at a portfolio level. For this purpose, a 'portfolio' is defined as the set of exposures covered by the IRB model that the adjustment

- is being made for. If adjustments are being made to more than one model (eg both PD and LGD) that cover overlapping assets (eg a global LGD model and regional PD models), then a portfolio should be defined as the subset of assets covered by the same models (eg in the example above, the assets covered by each regional PD model would each be classified as a single portfolio);
- (b) irrespective of which model component the adjustment is for (eg PD, LGD, or EAD or CF), the risk-weighted assets (RWA) and expected loss (EL) adjustments should be made as a portfolio level add-on to the requirements produced by the approved models (ie the underlying models should not be recalibrated or changed in order to give a desired capital requirements outcome);
 - (c) firms' existing PD, LGD, and EAD or CF models should remain in place until approval has been obtained or any required pre-notification has been made for any changes. These models should continue to be monitored as required by the Credit Risk: Internal Ratings Based Approach (CRR) Part;
 - (d) only adjustments that increase RWAs and EL should be made, and there should be no netting of adjustments across portfolios (eg if there are two adjustments in respect of data deficiencies in separate portfolios, one which increases RWAs by £200 million and one that decreases RWAs by £100 million, only the adjustment that increases RWAs by £200 million should be applied). Netting of impacts should only be applied within a portfolio (ie where a model covers a number of portfolios, netting should only be applied at a portfolio level);
 - (e) a list of all model adjustments should be included in the firm's model monitoring information presented to senior management, containing at least the following information:
 - (i) the portfolio and model component affected;
 - (ii) a description of the issue and why it requires the adjustment;
 - (iii) the date when the issue was first identified;
 - (iv) what action is being taken to address the issue and the timeline for this action;and
 - (v) the increase to RWAs and EL as a result of the adjustment;
 - (f) firms may net adjustments across model components (eg PD, LGD, and EAD or CF); however, if the PRA assesses that a firm is not applying the netting across components appropriately, or with the correct degree of conservatism, it expects that netting will then be applied only within a model component (eg if the adjustment to PD increases capital requirements, and the adjustment to LGD decreases capital requirements, the firm would only apply the increased capital requirements that result from the PD adjustment); and
 - (g) the PRA expects firms to apply all parameter and risk-weight floors that are set out in the Credit Risk: Internal Ratings Based Approach (CRR) Part at all times. Therefore, PMAs should be assessed following the application of all relevant floors.

2.6 The PRA expects that firms should address identified model deficiencies in a timely manner and that, as a result, PMAs would only need to be applied on a temporary basis.

Fees

2.7 There will be some circumstances where a fee may be applied, for example, where a firm is applying to move from the foundation internal ratings based (FIRB) approach to the advanced internal ratings based (AIRB) approach, or a special project fee may be applicable in the case of a merger or acquisition.

Application of requirements to UK groups applying the IRB approach on a unified basis

2.8 Rule 2.1A of the Credit Risk: Internal Ratings Based Approach (CRR) Part provides that, where the IRB approach is used on a unified basis by a UK group, certain IRB requirements may be complied with on a collective basis by members of that group. The PRA considers that, where a firm is reliant upon a rating system or data provided by another member of its group, it will not meet the condition that it is using the IRB approach on a unified basis unless:

- (a) the firm only does so to the extent that it is appropriate, given the nature and scale of the firm's business and portfolios, and the firm's position within the UK group;
- (b) the integrity of the firm's systems and controls is not adversely affected;
- (c) the outsourcing of these functions meets the requirements of the Outsourcing Part of the PRA Rulebook; and
- (d) the ability of the PRA to carry out its responsibilities is not adversely affected.

2.9 Prior to reliance being placed by a firm on a rating system, or data provided by another member of the group, the PRA expects the proposed arrangements to have been explicitly considered, and found to be appropriate, by the governing body of the firm.

2.10 If a firm uses a rating system or data provided by another group member, the PRA expects the firm's governing body to delegate those functions formally to the persons or bodies that are to carry them out.

2.11 Where a firm's rating systems are used on a unified basis pursuant to Rule 2.1A of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA considers that the governance requirements in Article 189 of the Credit Risk: Internal Ratings Based Approach (CRR) Part can be met only if the subsidiary undertakings have delegated to the governing body or designated committee of the UK parent institution, UK parent financial holding company, or UK parent mixed financial holding company, responsibility for approval of all material aspects of rating and estimation processes.

Annual attestations

2.12 The PRA expects an appropriate individual in a Senior Management Function (SMF) role to provide the following written attestations to the PRA:

- (a) an annual attestation that the firm is either (i) fully compliant, (ii) materially compliant or (iii) materially non-compliant with the CRR requirements, PRA rules and SSs; and
- (b) where the SMF attests that the firm is materially non-compliant under point (a), the attestation should include confirmation that a credible plan for addressing non-compliance in a timely manner is in place and is being implemented.

2.13 Firms should agree the appropriate SMF for providing these attestations with the PRA. The PRA does not expect to agree to more than two SMFs covering all of a firm's IRB models. In agreeing which SMF(s) may provide the annual attestation, the PRA will consider the firm's arrangements for approving rating and estimation processes under Article 189 of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Submission of applications and notifications relating to the IRB approach

2.14 The PRA expects that where a firm submits an application for a permission relating to the IRB approach or notifies the PRA of an extension or change to an IRB rating system, it should provide the PRA with a self-assessment of whether it complies with all relevant CRR articles, PRA rules, and SS expectations.

2.15 The PRA expects that where a firm with an IRB permission submits an application for a permission relating to the IRB approach or notifies the PRA of an extension or change to its rating systems under Article 143(4)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, it should complete a pro-forma provided by the PRA. The current pro-forma and instructions on its completion can be found on the [Permissions \(CRR firms\)](#) webpage on the PRA website.

Overseas models approach

2.16 Where a firm is using the overseas models approach in accordance with Article 143(6) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects that the contribution to UK consolidated capital requirements calculated using overseas models should reflect any regulatory floors or add-ons mandated by the relevant overseas regulator.

3: Partial use and reversion to less sophisticated approaches

Policy for identifying exposures subject to partial use

3.1 Firms should have a well-documented policy explaining the basis on which exposures would be selected for permanent exemption from the requirements in Article 147C of the Credit Risk: Internal Ratings Based Approach (CRR) Part. This policy should be provided to the PRA when the firm applies for permission and maintained on an ongoing basis thereafter.

3.2 The PRA expects that where a firm submits a roll-out plan in accordance with Article 148(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, this should provide for the continuing application of the policy referred to in paragraph 3.1 on a consistent basis over time.

Roll-out following significant acquisitions

3.3 In the event that a firm with an IRB permission acquires a significant new business, it should discuss with the PRA whether sequential roll-out of the firm's IRB approach to the acquired exposures would be appropriate, and whether any changes to any existing time period and conditions for sequential roll-out are required. Firms should apply for any necessary permissions under Articles 148 and 150 of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Permanent partial use of the Standardised Approach to a roll-out class

3.4 Points (i), (ii) and (iii) of Article 150(1)(k) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, sets out criteria for the permanent use of the SA to a roll-out class. Under these criteria, firms can apply the SA to a roll-out class (with PRA permission) if any of the following applies:

- (a) application of the SA would not result in significantly lower capital requirements than if the IRB approach was applied (point (i));
- (b) the firm cannot reasonably model exposures in the roll-out class (point (ii)); or
- (c) the roll-out class is immaterial (point (iii)).

3.5 In the PRA's experience, SA capital requirements for the qualifying revolving retail exposures and the specialised lending roll-out classes are often materially lower than if the

IRB approach was applied. Firms can usually be reasonably expected to apply the IRB approach to the qualifying revolving retail exposures roll-out class (due to good data availability), and the specialised lending roll-out class (due to the availability of the slotting approach). The PRA therefore considers it likely that firms will only meet the criteria in Article 150(1)(k) of the Credit Risk: Internal Ratings Based Approach (CRR) Part for permanently applying the SA to either of these roll-out classes if the roll-out class in question is immaterial.

Reversion to less sophisticated approaches

3.6 The PRA expects that firms applying for a permission to revert to a less sophisticated approach under Article 149 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, should simultaneously apply for any necessary permissions under Articles 148 and 150 of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

3.7 Under Articles 149(1) and 149(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms must meet a number of conditions in order to revert to less sophisticated approaches for credit risk, including that the reversion is necessary on the basis of the nature and complexity of the firm's exposures. The PRA considers that one-off costs arising from implementing the Basel 3.1 standards is a relevant factor in determining whether these tests are met.

4: Use and experience tests

Use test

4.1 In accordance with Article 144(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should ensure that the estimates of risk parameters used for the purpose of capital requirements calculations play an essential role in internal risk management and decision-making processes. In particular, the PRA expects firms to ensure that:

- (a) any deviations between parameters used for internal purposes and for capital requirements purposes are justified and appropriate for the specific area of use; and
- (b) the rank-ordering in the assignment of obligors or facilities to grades and pools within a calibration segment plays an essential role in the rank-ordering used for internal risk management and decision-making processes.

4.2 The PRA considers that deviations caused by the use of parameters for internal purposes that do not include either:

- (a) a MoC;
- (b) regulatory floors; or
- (c) downturn adjustments in the case of LGD, or EAD or CF estimates

will not normally prevent the criteria in Article 144(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part from being met.

4.3 Where firms use estimates of risk parameters for internal purposes that are different from those used in the calculation of capital requirements, they should periodically reflect this in their internal reporting to senior management by providing information on both sets of parameters. In any case, internal reporting should include all elements specified in Article 189(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part based on the estimates of risk parameters that are used for the purpose of capital requirements calculations.

Prior experience of using the IRB approach

4.4 In order to be satisfied that the requirements in Article 145 of the Credit Risk: Internal Ratings Based Approach (CRR) Part are met, the PRA expects a firm to be able to evidence that:

- (a) its complete IRB governance framework has been through at least one annual cycle since internal approval;

- (b) it has used its internal rating systems in credit decisions, lending policies, risk appetite policies, and credit risk monitoring for at least three years; and
- (c) there has been at least three years of monitoring, validation, and audit of the IRB framework, recognising that the IRB framework is likely to be subject to development and refinement during this period.

4.5 The three years of evidence of using internal rating systems expectation set out in paragraph 4.4(b) need not necessarily relate to the use of the final Credit Risk: Internal Ratings Based Approach (CRR) Part materially compliant approach for all of that period. It could, for example, initially involve the use of internal credit risk models that are broadly in line with Credit Risk: Internal Ratings Based Approach (CRR) Part requirements rather than the final, materially compliant, IRB rating system. The PRA expects, however, that applicants should have undertaken at least one annual review cycle of the completed framework by the point of approval.

4.6 The depth and detail of the monitoring, audit, and annual reviews set out in paragraph 4.4(c) may be proportionately lower at the start of the three-year period, provided that firms provide a sufficiently accurate analysis of progress, and fully meet the required standard by the end of the three-year period. The monitoring of rating systems may include the use of provisioning models, scorecards, and rating assignment processes.

4.7 The PRA's policy is not to accept evidence of a third-party exercising governance of models (eg bureau scores monitored by the bureau) as evidence of a firm's ability to monitor the models itself.

5: Qualifying revolving retail exposures

5.1 Article 147(5A)(d) of the Credit Risk: Internal Ratings Based Approach (CRR) Part specifies that, in order for an exposure to be treated as a qualifying revolving retail exposure, it needs to exhibit relatively low volatility of loss rates. The PRA expects firms to assess the volatility of loss rates for the qualifying revolving retail exposure portfolio relative to the volatilities of loss rates of other relevant types of retail exposures for these purposes. Low volatility should be demonstrated by reference to data on the mean and standard deviation of loss rates over a time period that can be regarded as representative of the long-run performance of the portfolios concerned.

5.2 Article 147(5A)(e) of the Credit Risk: Internal Ratings Based Approach (CRR) Part specifies that in order for an exposure to be treated as a qualifying revolving retail exposure, this treatment should be consistent with the underlying risk characteristics of the sub-portfolio. The PRA considers that a sub-portfolio consisting of credit card or overdraft obligations will usually meet this condition, and that it is unlikely that any other type of retail exposure would do so. If a firm wishes to apply the treatment in Article 147(5A) of the Credit Risk: Internal Ratings Based Approach (CRR) Part to product types other than credit card or overdraft obligations, the PRA expects it to discuss this with the PRA before doing so.

5.3 When identifying qualifying revolving retail exposures as transactor exposures or non-transactor exposures as required under 147(5A) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should apply the expectations set out in paragraphs 4.2 and 4.3 of SS10/13 – [Credit risk Standardised approach](#), paragraphs 4.2 to 4.3.

6: High level expectations

High level expectations for estimation

6.1 The PRA expects the information that a firm produces or uses for the purpose of the IRB approach to be reliable and take proper account of the different users of the information produced (customers, shareholders, regulators, and other market participants).

6.2 The PRA expects firms to establish quantified and documented targets and standards, against which they should test the accuracy of data used in their rating systems. Such tests should cover:

- (a) a report and accounts reconciliation, including whether every exposure has a PD and, if applicable, an LGD and an EAD or CF for reporting purposes;
- (b) whether the firm's risk control environment has key risk indicators for the purpose of monitoring and ensuring data accuracy;
- (c) whether the firm has an adequate business and information technology infrastructure with fully documented processes;
- (d) whether the firm has clear and documented standards on ownership of data (including inputs and manipulation) and timeliness of current data (daily, monthly, real time); and
- (e) whether the firm has a comprehensive quantitative audit programme.

6.3 The PRA expects that in respect of data inputs, the testing for accuracy of data, including the reconciliation referred to above, should be sufficiently detailed so that, together with other available evidence, it provides reasonable assurance that data input into the rating system is accurate, complete, and appropriate. The PRA considers that input data would not meet the required standard if it gave rise to a serious risk of material misstatement of capital requirements, either immediately or subsequently.

6.4 In respect of data outputs, as part of the reconciliation referred to above, the PRA expects a firm to be able to identify and explain material differences between the outputs produced under accounting standards and those produced under the requirements of the IRB approach, including in relation to areas that address similar concepts in different ways (eg EL and accounting provisions).

6.5 The PRA expects a firm to have clear and documented standards and policies about the use of data in practice (including information technology standards) which should in particular cover the firm's approach to the following:

- (a) data access and security;

- (b) data integrity, including the accuracy, completeness, appropriateness and testing of data; and
- (c) data availability.

Quality of data

6.6 The PRA expects that firms should have sound policies, processes, and methods for assessing and improving the quality of data used for the purpose of credit risk measurement and management processes. Firms should ensure that those policies apply to all data used in model development and calibration, as well as to the data used in the application of the risk parameters.

6.7 In order for the data used in the model development and in the application of risk parameters as inputs into the model to meet the requirements of accuracy, completeness and appropriateness specified in Article 174(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, they should be sufficiently precise to avoid material distortions of the outcome of the assignment of exposures to obligors or facility grades or pools, and they should not contain any biases which make the data unfit for purpose. The PRA expects that where firms identify deficiencies in either the quality of data used, or in their processes for maintenance of the data, they take steps to address these deficiencies in a timely manner.

6.8 The PRA expects that firms' documentation relating to data should include clear identification of responsibility for data quality. The PRA expects firms to set standards for data quality, to aim to improve them over time, and to measure their performance against those standards. Furthermore, the PRA expects firms to ensure that their data are of sufficiently high quality to support the firm's risk management processes and the calculation of capital requirements.

Ratings systems: policies

6.9 In order for the PRA to be satisfied that a firm's rating systems are robust, the PRA expects a firm to be able to demonstrate that it has an appropriate policy in respect of its ratings systems in relation to:

- (a) any deficiencies caused by a rating system not being sensitive to movements in fundamental risk drivers or for any other reason;
- (b) periodic review and action in the light of such review;
- (c) providing appropriate internal guidance to staff to ensure consistency in the use of the rating system, including the assignment of exposures or facilities to grades or pools;
- (d) dealing with potential weaknesses of the rating system;
- (e) identifying appropriate and inappropriate uses of the rating system and acting on that identification;

- (f) novel or narrow rating approaches; and
- (g) ensuring the appropriate level of stability over time of the rating system.

6.10 In order to comply with the requirement on the representativeness of data used in the PD and LGD models specified in Articles 174(c), 179(1)(d) and 179(2)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should have sound policies, processes, and methods for assessing the representativeness of data used for the purpose of estimation of risk parameters. Firms should specify in their internal policies the statistical tests and metrics to be used for the purpose of assessing the representativeness of data used for risk differentiation and, separately, for data underlying the risk quantification. Firms should also specify methods for qualitative assessment of data for the cases, defined in their policies, where the application of statistical tests is not possible.

6.11 Firms should use the same standards and methods for the assessment of representativeness of data stemming from different sources, including internal, external, and pooled data, or a combination of these, unless different methods are justified by the specificity of the data source or availability of information.

6.12 Where external or pooled data are used, firms should obtain sufficient information from the data providers to assess the representativeness of such external or pooled data to firms' own portfolios and processes.

Collection of data

6.13 In order to be satisfied that the requirements in Article 179(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part are met, the PRA expects a firm to collect data on what it considers to be the main drivers of the risk parameters PD, LGD, CF or EAD, and EL (as applicable) for each group of obligors or facilities, to document the identification of the main drivers of risk parameters, and to be able to demonstrate that the process of identification is reasonable and appropriate.

6.14 In its processes for identifying the main drivers of risk parameters, the PRA expects that firms should set out their reasons for concluding that the data sources chosen provide in themselves sufficient discriminative power and accuracy, and why additional potential data sources do not provide relevant and reliable information that would be expected to materially improve the discriminative power and accuracy of its estimates of the risk parameter in question. The PRA would not expect this process necessarily to require an intensive analysis of all factors.

Human judgement in estimation of risk parameters

6.15 In order for firms to complement their statistical models with human judgement, as referred to in Articles 174(b), 174(e), 175(4), 179(1)(a) and 180(1)(d) of the Credit Risk:

Internal Ratings Based Approach (CRR) Part, the PRA expects they should do all of the following:

- (a) assess the modelling assumptions and whether the selected risk drivers contribute to the risk assessment in line with their economic meaning;
- (b) analyse the impact of the human judgement on the performance of the model and ensure that any form of human judgement is properly justified; and
- (c) document the application of human judgement in the model, including at least the criteria for the assessment, rationale, assumptions, experts involved, and description of the process.

Documentation

6.16 The PRA expects a firm to ensure that all documentation relating to its rating systems (including any documentation referenced in this SS or required by the PRA Rulebook requirements that relate to the IRB approach) is stored, arranged, and indexed in such a way that it could make them all, or any subset thereof, available to the PRA immediately on demand or within a short time thereafter.

7: Rating systems

Principles for specifying the range of application of a rating system

7.1 The PRA expects that a 'rating system' as defined in Rule 1.3 of the Credit Risk: Internal Ratings Based Approach (CRR) Part should cover all those exposures where the obligors or facilities exhibit common drivers of risk and creditworthiness, and fundamentally comparable availability of credit-related information. The PRA considers that the PD and LGD model within a rating system may comprise various calibration segments. Where all obligors or exposures within the range of application of the PD or LGD model are jointly calibrated, the whole scope of application of the model should be considered to be one calibration segment.

7.2 Exposures covered by the same rating system should be treated similarly by the firm in terms of risk management, decision making and the credit approval process. For exposures to corporates and institutions, such exposures should be assigned to a common obligor rating scale for the purposes of Article 170(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part and, where LGD is estimated, to a common facility rating scale for the purposes of Article 170(1)(e) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

7.3 For the purpose of the quantification of the risk parameters within a rating system, firms should, for a given historical observation, apply the same definition of default to the historical observation in all models for which the historical observation is used. Firms should also apply the same treatment of multiple defaults of the same obligor or exposure across internal, external, and pooled data sources.

Multi-country mid-market corporate PD models

7.4 In order to ensure that a rating system provides a meaningful differentiation of risk, and accurate and consistent quantitative estimates of risk, the PRA expects that firms should usually develop country-specific mid-market PD models. Where firms develop multi-country mid-market PD models, the PRA expects firms to be able to demonstrate that the model rank-orders risk and predicts default rates for each country within the scope of the rating system.

7.5 The PRA expects firms to have challenging standards in place to meaningfully assess whether a model rank-orders risk and accurately predicts default rates. These standards should specify the number of defaults that are needed for a meaningful assessment to be done.

7.6 The PRA expects firms to assess the model's ability to predict default rates using a time series of data (ie not only based on one year of default data).

7.7 The PRA considers that a model is not likely to be materially compliant with the requirements set out in the Credit Risk: Internal Ratings Based Approach (CRR) Part where the firm cannot demonstrate that it rank-orders risk and predicts default rates for each country, regardless of any apparent conservatism in the model.

Retirement interest-only (RIO) mortgages

7.8 The PRA considers that there may be some circumstances where it may be appropriate to model RIO mortgages with other mortgages, but it considers that firms should be able to justify this. The PRA expects that firms wishing to apply the IRB approach in respect of RIO mortgage exposures should apply to the PRA for permission to do so. The PRA would only grant permission once it is satisfied that the relevant requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part are materially met. The PRA would not expect firms to apply to use the IRB approach for RIO mortgages until they have sufficient data to demonstrate that their approach is prudentially appropriate and materially compliant with the requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

7.9 Firms should be able to demonstrate the appropriateness of the treatment of interest-only (IO) mortgages that are converted into RIO mortgages in their IRB models through robust analysis. In particular, as a minimum, consideration should be given to the effect of defaults of IO mortgages on IRB model estimates for IO mortgages. A prudent approach should be applied to the modelling of IO mortgages that return to non-defaulted status only as a result of the borrower being transferred to an RIO product.

8: Data representativeness

Overall assessment

8.1 In accordance with Article 174 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms are required to ensure that data used to build a model is representative of its actual exposures. The PRA expects that where external data are used by a firm to build models, it should consider whether the data are appropriate to its own experience and make any adjustments that are necessary.

Representativeness of data for model development

8.2 Firms should analyse the representativeness of data in the case of statistical models and other mechanical methods used to assign exposures to grades or pools, as well as in the case of statistical default prediction models generating default probability estimates for individual obligors or facilities. Firms should select an appropriate data set for the purpose of model development to ensure that the performance of the model on the application portfolio, in particular in respect of the model's discriminatory power, is not significantly hindered by insufficient representativeness of the data.

8.3 For the purposes of ensuring that the data used in developing the model for assigning obligors or exposures to grades or pools are representative of the application portfolio covered by the relevant model, as required in Article 174(c) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should analyse the representativeness of the data at the stage of model development in terms of all of the following:

- (a) the scope of application;
- (b) the definition of default;
- (c) the distribution of the relevant risk characteristics; and
- (d) lending standards and recovery policies.

8.4 For the purpose of paragraph 8.3(a), firms should analyse the segmentation of exposures and consider whether there were any changes to the scope of application of the model over the period covered by the data used in developing the model for assigning obligors or exposures to grades or pools. Where such changes were observed, firms should analyse the risk drivers relevant for the revised scope of application of the model by comparing their distribution in the RDS before and after the change, as well as with the distribution of those risk drivers in the application portfolio. For this purpose, firms should apply statistical methodologies such as cluster analysis or similar techniques to demonstrate representativeness. In the case of pooled models, the analysis should be performed with regard to the part of the scope of the model that is used by the firm.

8.5 For the purpose of paragraph 8.3(b), firms should ensure that the definition of default reflected in the data used for model development is consistent over time and, in particular, that it is consistent with all of the following expectations:

- (a) that adjustments have been made to achieve consistency with the definition of default used by the firm in accordance with Article 178 of the Credit Risk: Internal Ratings Based Approach (CRR) Part where the definition of default has been changed during the observation period;
- (b) that adequate measures have been adopted by the firm where the model covers exposures in several jurisdictions having or having had different default definitions;
- (c) that the definition of default in each data source has been analysed separately; and
- (d) that the definition of default used for the purposes of model development does not have a negative impact on the structure and performance of the rating model, in terms of risk differentiation and predictive power, where this definition is different from the definition of default used by the firm in accordance with Article 178 of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

8.6 For the purpose of paragraph 8.3(c), firms should analyse the distribution and range of values of key risk characteristics of the data used in developing the model for risk differentiation in comparison with the application portfolio. With regard to LGD models, firms should perform such analysis separately for non-defaulted and defaulted exposures.

8.7 Firms should analyse the representativeness of the data, in terms of the structure of the portfolio by relevant risk characteristics, based on statistical tests specified in their policies to ensure that the range of values observed on these risk characteristics in the application portfolio is adequately reflected in the development sample. Where the application of statistical tests is not possible, firms should carry out at least a qualitative analysis on the basis of the descriptive statistics of the structure of the portfolio, taking into account, in the case of retail exposures, any seasoning effects as referred to in Article 180(2)(f) of the Credit Risk: Internal Ratings Based Approach (CRR) Part. When considering the results of this analysis, firms should take into account the sensitivity of the risk characteristics to economic conditions. Material differences in the key risk characteristics between the data sample and the application portfolio should be addressed, for example by using another data sample or a subset of observations, or by adequately reflecting these risk characteristics as risk drivers in the model.

8.8 For the purpose of paragraph 8.3(d), firms should analyse whether, over the relevant historical observation period, there were significant changes in their lending standards or recovery policies or in the relevant legal environment, including changes in insolvency law, legal foreclosure procedures, and any legal regulations related to realisation of collateral, which may influence the level of risk or the distribution or ranges of the risk characteristics in the portfolio covered by the considered model. Where firms observe such changes, they

should compare the data included in the RDS before and after the change of the policy. Firms should ensure comparability of the current underwriting or recovery standards with those applied to the observations included in the RDS and used for model development.

8.9 While the PRA considers that the proportion of defaulted and non-defaulted exposures in the RDS used for developing the risk differentiation aspect of PD models need not be equal to the proportion of defaulted and non-defaulted exposures in the firm's application portfolio, the PRA expects that firms should however have a sufficient number of defaulted and non-defaulted observations in the development data set, and that they should document any difference in proportions.

Representativeness of data for calibration of risk parameters

8.10 In accordance with Article 179(1)(d) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, and, where pooled data are used, in accordance with Article 179(2)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, in order for a firm to ensure that the data used in risk quantification are representative of the firm's exposures covered by the relevant model, the firm should analyse the comparability of the data used for the purpose of calculating long-run average default rates, long-run average LGDs, and downturn LGDs (as appropriate) with the characteristics of the firm's exposures in terms of all of the following:

- (a) the scope of application;
- (b) the definition of default;
- (c) the distribution of the relevant risk characteristics;
- (d) relevant economic or market conditions; and
- (e) lending standards and recovery policies.

8.11 For the purpose of paragraph 8.10(a), firms should perform an analysis consistent with the analysis specified in paragraph 8.4.

8.12 For the purpose of paragraph 8.10(b), and in order to ensure that the definition of default underlying the data used for risk quantification from each data source is consistent with the definition of default used in accordance with Article 178 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, a firm should compare the definition of default used by the firm in accordance with Article 178 of the Credit Risk: Internal Ratings Based Approach (CRR) Part with the definition of default reflected in the observations included in the data set used for risk quantification. Where the definition of default has changed during the historical observation period, the firm should assess the representativeness of historical data included in the RDS and used for risk quantification in the same way as specified for external data in Chapter 4 – Application of the definition of default in external data of SS3/24 – [Credit risk definition of default](#). Where the definition of default has changed during the historical

observation period more than once, the firm should perform the analysis of each of the past definitions of default separately.

8.13 For the purpose of paragraph 8.10(c), firms should perform an appropriate analysis to ensure that, at the level of the calibration segment, the ranges of values of the key risk characteristics in the application portfolio are comparable to those in the portfolio constituting the RDS for risk quantification to the degree required to ensure that the risk quantification is not biased.

8.14 For the purpose of paragraph 8.10(d), firms should perform the analysis of the market and economic conditions underlying the data in the following manner:

- (a) with regard to the PD estimation, in accordance with paragraphs 11.12 to 11.19; and
- (b) with regard to the LGD estimation, in accordance with paragraphs 14.1 to 14.4 and in accordance with paragraphs 15.1 to 15.3 when taking into account economic downturn conditions in accordance with Article 181(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

8.15 For the purpose of paragraph 8.10(e), firms should analyse whether there were significant changes in the lending standards or recovery policies over the relevant historical observation period that may influence the level of risk or the distribution or ranges of the characteristics of relevant risk drivers in the portfolio covered by the considered model. Where firms observe such changes, they should analyse the potential bias in the estimates of risk parameters resulting from these changes in the following manner:

- (a) for PD estimation, in terms of the level of default rates and the likely range of variability of default rates; and
- (b) for LGD estimation, in terms of loss rates, average duration of recovery processes, frequencies of use of certain recovery scenarios, and loss severity distributions.

8.16 Where the representativeness of data assessed in accordance with paragraphs 8.10 to 8.15 is insufficient and leads to a bias or increased uncertainty of risk quantification, firms should introduce an appropriate adjustment to correct the bias and they should apply a margin of conservatism in accordance with Chapter 9 – Model deficiencies and margin of conservatism.

PD – use of external data for residential mortgages

8.17 The PRA expects that, for residential mortgages, where a firm's internal experience of defaults for a rating system is low, it may use external data to supplement internal data for rank-ordering different borrowers by credit quality and to help adjust for seasoning as credit quality changes with loan vintage. This is in addition to use of external data for calibration

purposes. The PRA expects that firms attempting to evidence comparability with third-party data should include a comparison of default rates.

8.18 The PRA considers that internal data may be treated as being the ‘primary source’ of data for residential mortgages where a firm assigns sufficient weight to internal data, including security (loan to value), loan (arrears history) and borrower (applicant information) factors, as inputs into their rank-ordering but uses external data to achieve greater discrimination.

8.19 The PRA expects firms to apply an appropriate MoC to account for uncertainty in their estimates and to make conservative adjustments in respect of incomplete data and external data that are not wholly representative.

8.20 Where firms lack sufficient internal defaults to evidence rank-ordering or a reliable calibration, firms may use models that rank-order on an early arrears definition (which tends to be correlated with default), provided they are calibrated with sufficient conservatism.

9: Model deficiencies and margin of conservatism

Identification of deficiencies

9.1 Firms should identify all deficiencies related to the estimation of risk parameters that lead to a bias in the quantification of those parameters, or to increased uncertainty that is not fully captured by the general estimation error, and classify each deficiency into one of the following groups:

- (a) Group A: identified data and methodological deficiencies; and
- (b) Group B: relevant changes to underwriting standards, risk appetite, collection and recovery policies, and any other source of additional uncertainty.

9.2 For the purposes of identifying and classifying all deficiencies referred to in paragraph 9.1, firms should take into account all relevant deficiencies in methods, processes, controls, data, or IT systems that have been identified by the credit risk control unit, validation function, internal audit function, or any other internal or external review, and should analyse at least all of the following potential sources of additional uncertainty in risk quantification:

- (a) under Group A:
 - (i) missing or materially changed default triggers in historical observations, including changed criteria for recognition of materially past due credit obligations;
 - (ii) missing or inaccurate date of default;
 - (iii) missing, inaccurate, or outdated rating assignment used for assessing historical grades or pools for the purpose of calculation of default rates or average realised LGDs per grade or pool;
 - (iv) missing or inaccurate information on the source of cash flows;
 - (v) missing, inaccurate or outdated data on risk drivers and rating criteria;
 - (vi) missing or inaccurate information used for the estimation of future recoveries as referred to in paragraph 14.13;
 - (vii) missing or inaccurate data for the calculation of economic loss;
 - (viii) limited representativeness of the historical observations due to the use of external data;
 - (ix) potential bias stemming from the choice of the approach to calculating the average of observed one-year default rates in accordance with paragraph 11.10;

- (x) necessity of adjusting the average of observed one-year default rates in accordance with paragraph 11.18; and
 - (xi) missing information for the purpose of estimating loss rates or for the purpose of reflecting economic downturn in LGD estimates;
- (b) under Group B:
- (i) changes to underwriting standards, collection or recovery policies, risk appetite, or other relevant internal processes;
 - (ii) unjustified deviations in the ranges of values of the key risk characteristics of the application portfolio compared with those of the data set used for risk quantification;
 - (iii) changes to the market or legal environment; and
 - (iv) forward-looking expectations regarding potential changes in the structure of the portfolio or the level of risk, especially based on actions or decisions that have already been taken but which are not reflected in the observed data.

9.3 In order to overcome biases in risk parameter estimates stemming from the identified deficiencies referred to in paragraphs 9.1 and 9.2, firms should apply adequate methodologies to correct the identified deficiencies to the extent possible. The PRA expects that the impact of these methodologies on the risk parameter ('appropriate adjustment') should result in a more accurate estimate of the risk parameter ('modelled estimate') and that the appropriate adjustment may either result in an increase or a decrease in the value of the risk parameter. A firm should ensure and provide evidence that the application of an appropriate adjustment results in its most accurate modelled estimate.

9.4 The PRA expects that firms should document the methods used to apply appropriate adjustments to rectify identified deficiencies and should document their justification of these methods.

9.5 The PRA expects that firms should regularly monitor the adequacy of appropriate adjustments. The PRA considers that the adoption of an appropriate adjustment by a firm does not replace the need to address identified model deficiencies.

Margin of conservatism

9.6 As required Articles 179(1)(f) and 180(1)(e) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should add an MoC to parameter estimates that is related to the expected range of estimation errors. The PRA expects that firms should implement a framework for the quantification, documentation, and monitoring of these estimation errors.

9.7 The final MoC added to a risk parameter estimate should reflect the uncertainty of estimation in respect of all of the following:

Category A: the MoC related to data and methodological deficiencies identified under Group A as referred to in paragraph 9.1(a);

Category B: the MoC related to relevant changes to underwriting standards, risk appetite, collection and recovery policies, and any other source of additional uncertainty identified under Group B as referred to in paragraph 9.1(b); and

Category C: the general estimation error.

9.8 In order to quantify the applicable MoC, firms should do all of the following:

- (a) quantify the Category A and Category B MoC for the identified deficiencies referred to in paragraphs 9.1 and 9.2, to the extent not covered by the general estimation error, at least at the level of the calibration segment ensuring that:
 - (i) where appropriate adjustments as referred to in paragraph 9.3 are used, the MoC accounts for any increase in the uncertainty or additional estimation error associated with these adjustments;
 - (ii) the MoC quantified at category level for the identified deficiencies referred to in paragraphs 9.1 and 9.2 related to the appropriate adjustments as referred to in paragraph 9.3 is proportionate to the uncertainty around these adjustments; and
 - (iii) the MoC is applied to address the uncertainty of the risk parameter estimate stemming from any deficiencies among those referred to in paragraphs 9.1 and 9.2 that have not been corrected via appropriate adjustments as referred to in point (i);
- (b) quantify the general estimation error for the Category C MoC referred to in paragraph 9.7 associated with the underlying estimation method at least for every calibration segment; the MoC for the general estimation error should reflect the dispersion of the distribution of the statistical estimator.

9.9 For the purpose of paragraph 9.8(a), and for each of the Categories A and B, firms may group all or selected deficiencies, where justified, for the purpose of quantifying the MoC.

9.10 Firms should quantify the final MoC as the sum of:

- (a) the Category A MoC as referred to in paragraph 9.7;
- (b) the Category B MoC as referred to in paragraph 9.7; and
- (c) the Category C MoC for the general estimation error as referred to in paragraph 9.7.

9.11 Firms should add the final MoC to the modelled estimate of the risk parameter.

9.12 Firms should ensure that the impact of the final MoC does not result in a reduction of parameter estimates and in particular that:

- (a) the Category C MoC is either greater than zero, or equal to zero where the firm has demonstrated that the general estimation error is immaterial; and
- (b) the Category A MoC and the Category B MoC are proportionate to the increased uncertainty in the modelled estimate of risk parameters caused by the identified deficiencies relevant to each category. The Category A MoC and the Category B MoC should each be greater than or equal to zero.

9.13 Firms should consider the overall impact of the identified deficiencies and the resulting final MoC on the soundness of the model and ensure that estimates of risk parameters and resulting capital requirements are not distorted by the need for excessive adjustments.

9.14 For each rating system, the MoC applied should be documented in relevant model documentation and methodology manuals. The documentation should contain at least the following:

- (a) a complete list of all identified deficiencies, including errors and uncertainties, and the potentially affected model components or risk parameters;
- (b) the group under which these deficiencies are classified, as referred to in paragraph 9.1; and
- (c) a description of the methods for quantification of the MoC related to identified deficiencies as referred to in paragraph 9.8(a) and, in particular, the methodologies used to quantify the MoC per category.

9.15 The PRA expects firms to regularly monitor the levels of MoCs. The PRA considers that the adoption of a MoC by a firm does not replace the need to address the causes of errors or uncertainties, or to correct the models to ensure material compliance with the requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

9.16 When reviewing the levels of the MoC firms should ensure all of the following:

- (a) that the MoC stemming from Categories A and B referred to in paragraph 9.7 is included in internal reporting separately for each category and may be reduced over time and eventually eliminated once the deficiencies are rectified in all parts of the rating system that were affected;
- (b) that the MoC stemming from the general estimation error referred to in paragraph 9.7 is included in internal reporting in a separate category ('C'); and
- (c) that the level of the MoC is assessed as part of the regular reviews referred to in Chapter 21 – Review of estimates (validation) and, in particular, that the level of MoC related to the general estimation error remains appropriate after the inclusion of the most recent data relevant for the risk parameter estimation.

9.17 Firms should ensure that necessary changes in the MoC are identified and either notified to the PRA or submitted to the PRA for approval (as determined by Articles 143A to 143D of the Credit Risk: Internal Ratings Based Approach (CRR) Part) in a timely manner.

Near-final

10: PD – model development

Assignment of obligors and exposures

10.1 For the purpose of assigning obligors to an obligor grade as part of the credit approval process in accordance with Article 172(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, as well as for the purpose of the review of those assignments, in accordance with Article 173(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should ensure that each and every natural or legal person in respect of which an IRB exposure exists is rated by the firm with the model approved to be used for the applicable type of exposures. The model should rate original obligors within the applicable rating system including where unfunded credit protection is recognised in accordance with Article 160(4) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

10.2 For the purpose of assigning retail exposures to grades or pools as part of the credit approval process in accordance with Article 172(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, as well as for the purpose of the review of those assignments in accordance with Article 173(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should ensure that each and every IRB exposure is rated by the firm with the model approved to be used for the applicable type of exposures as defined in Rule 1.3 of the Credit Risk: Internal Ratings Based Approach (CRR) Part. This model should rate original obligors or exposures within the applicable rating system including where unfunded credit protection is recognised in accordance with Article 163(4) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

10.3 The PRA considers that a PD model may contain several different methods for ranking the obligors or exposures as well as various calibration segments.

Data for model development

10.4 The PRA expects that, for the purpose of model development, firms should ensure that the RDS contains the values of the risk drivers for appropriate points in time. These points in time may vary between different risk drivers. In the selection of appropriate points in time, firms should take into account the dynamics as well as the update frequency of the risk drivers throughout the whole period in which an obligor was in the portfolio and, in the case of a default, throughout the year prior to default.

Risk drivers and rating criteria

10.5 In the process of selecting risk drivers and rating criteria, firms should consider a broad set of information relevant to the type of exposures covered by the rating system. Potential risk drivers analysed by firms should, in particular, include the following where relevant:

- (a) obligor characteristics, including sector and geographic location for corporates;
- (b) financial information, including financial statements or income statements;
- (c) trend information, including growing or shrinking sales or profit margin;
- (d) behavioural information, including delinquency and the use of credit facilities; and
- (e) for retail exposures, transaction information, including product type, collateral type, seasoning effects, and seniority.

10.6 In respect of seasoning effects for retail exposures, the PRA expects that firms should analyse the representativeness of the age of the facilities (measured as time since origination) in the data used to derive PD estimates. The PRA considers that default rates peak several years after origination for some portfolios in some jurisdictions, and as a result the PRA expects firms to adjust their estimates with an adequate MoC in accordance with Chapter 9 to account for any consequential lack of data representativeness as well as any anticipated implications of rapid exposure growth should they identify any shortcomings in the model's ability to accurately reflect seasoning effects.

10.7 Firms should ensure that for the purpose of selecting risk drivers and rating criteria, the relevant experts from business areas of the firm are consulted with respect to the business rationale and risk contribution of the considered risk drivers and rating criteria.

10.8 Firms should ensure that the decrease of reliability of information over time, for instance of information on obligor characteristics obtained at the time of the loan origination, is appropriately reflected in the PD estimation. Firms should also ensure that the model estimates the proper level of risk with respect to all relevant, currently available and most up-to-date information, and that an adequate MoC is applied where a higher degree of uncertainty exists due to the lack of up-to-date information.

10.9 Where there is a significant proportion of customers using multiple facilities of the same type within a retail rating system, firms should analyse the level of risk of such customers compared with customers with only one facility of the relevant type and, where necessary, reflect the difference in the level of risk in the model through appropriate risk drivers.

Rating philosophy

10.10 'Rating philosophy' describes the point at which a rating system sits on the spectrum between the stylised extremes of a point-in-time (PiT) rating system and a through-the-cycle (TtC) rating system. Points (a) and (b) explain these concepts further:

- (a) PiT: firms seek explicitly to estimate default risk over a fixed period, typically one year. Under such an approach the increase in default risk in a downturn results in a general tendency for migration to lower grades. When combined with the fixed estimate of the long-run default rate for the grade, the result is a higher capital requirement. Where data are sufficient, grade level default rates tend to be stable and relatively close to the PD estimates; and
- (b) TtC: firms seek to remove cyclical volatility from the estimation of default risk, by assessing borrowers' performance across the economic cycle. TtC ratings do not react to changes in the cycle, so there is no consequent volatility in capital requirements. Actual default rates in each grade diverge from the PD estimate for the grade, with actual default rates relatively higher at weak points in the cycle and relatively lower at strong points.

10.11 The PRA considers that most rating systems sit between these two extremes. Rating philosophy is determined by the cyclical nature of the risk drivers and criteria used in the rating assessment and should not be confused with the requirement for grade level PDs to be 'long-run'. The calibration of even the most PiT rating system needs to be targeted at the long-run default rates for its grades; the use of long-run default rates does not convert such a system into one producing TtC ratings or PDs.

10.12 Firms should choose a rating philosophy for each rating system, taking into account all of the following principles:

- (a) firms should assess whether the method used to quantify the risk parameter is adequate for the rating philosophy and ensure they understand the characteristics and dynamics of the assignment of obligors or exposures to grades or pools ('rating assignment') and the risk parameter estimates that result from the method used;
- (b) firms should assess the adequacy of the resulting characteristics and dynamics of the rating assignment and risk parameter estimates that result from the method used, with regard to their various uses, and should understand their impact on the dynamics and volatility of capital requirements; and
- (c) the rating philosophy should also be taken into account for back-testing purposes. On the one hand, rating philosophies sensitive to economic conditions tend to estimate PDs that are better predictors of each year's default rates. On the other hand, rating philosophies less sensitive to economic conditions tend to estimate PDs that are closer to the average PD across the various states of the economy, but that differ from observed default rates in years where the state of the economy is above or below its average. Deviations between observed default rates and the long-run average default rate of the relevant grade will therefore be more likely in rating systems less sensitive to economic conditions. In contrast, migrations among grades will be more likely in rating systems that are more sensitive to economic conditions. These patterns should

be taken into account when assessing the results of back-testing and, where relevant, benchmarking analysis.

10.13 The PRA expects firms to apply rating philosophies consistently over time and to analyse the appropriateness of each rating philosophy underlying the assignment of obligors or exposures to grades or pools, taking into account all of the following:

- (a) the design of risk drivers;
- (b) migration across grades or pools; and
- (c) changes in the yearly default rates of each grade or pool.

10.14 Where firms use different rating systems characterised by different rating philosophies, they should use the information on the rating assignments or risk parameters estimates with caution, especially when making use of rating information or default experience obtained from external rating agencies. Where firms use different rating systems with different characteristics, such as different rating philosophies or different levels of objectivity, accuracy, stability, or conservatism, they should ensure that the rating systems have an appropriate level of consistency and that any differences between them are well understood. Such understanding should at least enable a firm to define an appropriate way to combine or aggregate the information produced by the various rating systems when this is necessary according to the firm's policies. Firms should have full understanding of the assumptions and potential inaccuracies arising from such a combination or aggregation.

10.15 The cyclicity of the rating system is a measure of its degree of responsiveness to economic changes and is inherently linked to rating philosophy. At one extreme, a fully cyclical PiT rating system would result in an economic downturn being picked up through migration of exposures to lower rating grades and therefore there would be no increase in the default rate within a grade. At the other extreme, a non-cyclical or TtC rating system does not respond to an economic downturn with grade migration, but the default rate within a grade increases instead. The PRA expects firms to be aware of the cyclicity of their rating systems to enable them to calibrate, monitor and stress test their systems. The PRA defines cyclicity for a rating system as follows:

$$\text{cyclicity}\% = \left(\frac{PD_t - PD_{t-1}}{DR_t - DR_{t-1}} \right) \cdot 100$$

Where:

- PD_t means the long-run average PD at time t
- DR_t means the observed default rate at time t

Homogeneity of obligor grades or pools

10.16 In order to comply with the requirements of Articles 170(1) and 170(3)(c) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should assess the homogeneity of obligors or exposures assigned to the same grades or pools. In particular, grades and pools should be defined in such a manner that each obligor within each grade or pool has a reasonably similar risk of default and that significant overlaps of the distributions of the default risk between grades or pools are avoided.

Use of external rating agency grades

10.17 The PRA expects a firm using external rating agency grades as the primary driver in an IRB model to be able to demonstrate (and document) that it meets the following criteria:

- (a) the firm has its own internal rating scale;
- (b) the firm has systems and processes in place that allow it continuously to collect and analyse all relevant information. The 'other relevant information' considered by the firm in accordance with Article 171(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part reflects the information collected and analysed by the firm when extending credit to new or existing obligors;
- (c) the 'other relevant information' considered by the firm is included in an IRB model in a transparent and objective way and is subject to challenge. The PRA expects the firm to be able to demonstrate what information was used and why, and how it was included; and if no additional information is included, to be able to document what information was discarded and why;
- (d) the development of final grades includes the following steps:
 - (i) the firm takes into account all available information (eg external rating agency grades and any 'other relevant information') prior to allocating obligors to internal grades. The firm does not automatically assign obligors to grades based on the external rating agency grade;
 - (ii) any overrides are applied to these grades; and
 - (iii) the firm has systems and processes in place that allow it to continuously collect and analyse final rating overrides;
- (e) the grades to which obligors are assigned are reassessed at least annually and the firm is able to demonstrate that the grades are reassessed on a more frequent than annual basis when new relevant information becomes available (including how this is done); and
- (f) the firm can demonstrate that a modelling approach is being applied, both in terms of the choice of the external rating agency grade as the primary driver and, where information is found materially and consistently to add to the accuracy or predictive power of the internal rating grade, that they have incorporated this information as an

additional driver. The PRA expects this work to be analytical (rather than entirely subjective) and that it could form part of the annual independent review of the model.

10.18 If a firm does not have any additional information to add to the external ratings for a significant part of a portfolio for which it applies the IRB approach the PRA expects that the firm would not materially meet the requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Recognition of third-party support

10.19 The PRA expects that a firm that recognises third-party support (including parental support) in the assignment of exposures to obligor grades should meet the following risk management expectations:

- (a) the firm should perform a comprehensive assessment of the support provider's willingness, capacity and likelihood to provide the support, including in instances where the obligor is in financial distress;
- (b) the firm should document the assessment undertaken in point (a). The documentation should include the rationale underpinning the firm's assessment of the likelihood that the support will be provided; and
- (c) where the firm reflects explicit support arrangements in the assignment of exposures to obligor grades it should:
 - (i) ensure that the support has been confirmed by an appropriate and suitably senior representative of the support provider;
 - (ii) reconfirm the support annually; and
 - (iii) where the support arrangement has not been confirmed in writing, document a record of the conversation in which the support was confirmed.

10.20 Where a firm reflects parental support in the assignment of obligors or facilities to grades using a notched grading approach, the PRA considers that approaches which notch down from the parent entity risk rating and notch up from the subsidiary standalone risk rating are both acceptable in principle. The PRA expects that the firm should assign a standalone rating to the subsidiary regardless of the type of notched grading approach used.

Parameter Substitution Method

10.21 The PRA expects that firms applying the Parameter Substitution Method in accordance with Article 191A of the Credit Risk Mitigation (CRR) Part of the PRA Rulebook should nonetheless collect and store information on the characteristics and performance of the obligor and use this information in PD estimation where appropriate.

11: PD – calibration

Data requirements for the calculation of observed default rates

11.1 For the purpose of calculating the one-year default rate defined in CRR Article 4(1)(78), firms should ensure the completeness of the quantitative and qualitative data, and other information in relation to the denominator and numerator (as outlined in paragraphs 11.4 and 11.5) that are used for the calculation of the observed average default rate. In particular, firms should ensure that at least the following data for the relevant observation period referred to in paragraph 11.16 are properly stored and available:

- (a) the criteria for identifying the relevant type of exposures covered by the PD model under consideration;
- (b) the criteria for identifying the calibration segments;
- (c) the risk drivers used for risk differentiation. Where a newly relevant risk driver has been included in the model for which no historical data are available, firms should make efforts to minimise missing data on risk drivers over time as outlined in paragraph 9.16(a), and apply an appropriate adjustment and a MoC in accordance with Chapter 9; and
- (d) all identification numbers of obligors and exposures relevant for default rate calculation, taking into account situations where the identification number has changed over time, including changes due to restructuring of exposures.

11.2 Exclusion of observations from the one-year default rate calculation should be undertaken only in the following two situations:

- (a) obligors wrongly included in the data set of defaults, as they did not default according to the criteria set out in Article 178 of the Credit Risk: Internal Ratings Based Approach (CRR) Part (and further specified in SS3/24), should not be included in the numerator of the one-year default rate; and
- (b) obligors wrongly assigned to the rating model, despite not falling in the range of application of that rating model, should be excluded from both the numerator and the denominator of the one-year default rate.

11.3 Firms should document all data cleansing with respect to the one-year default rate calculation and in particular:

- (a) for non-retail PD models, a list of all observations within the data set that were excluded according to paragraph 11.1, with a case-by-case justification; and
- (b) for retail PD models, information on the reasons and quantity of exclusions of observations made in accordance with paragraph 11.1.

Calculation of one-year default rates

11.4 For the purpose of calculating the one-year default rate referred to in CRR Article 4(1)(78), firms should ensure both of the following:

- (a) that the denominator consists of the number of non-defaulted obligors with any credit obligation observed at the beginning of the one-year observation period; in this context a credit obligation refers to both of the following:
 - (i) any on-balance sheet item, including any amount of principal, interest, and fees; and
 - (ii) any off-balance sheet item, including guarantees issued by the firm as a guarantor;
- (b) that the numerator includes all those obligors considered in the denominator that had at least one default event during the one-year observation period.

11.5 When assigning the obligors or exposures to grades or pools for the purpose of the one-year default rate calculation, firms should take overrides into account, but they should not reflect in this assignment any effect of applying the Parameter Substitution Method in accordance with Article 191A of the Credit Risk Mitigation (CRR) Part, nor any ex-post conservative adjustments applied in accordance with paragraphs 19.1 to 19.8. Where the one-year default rate is calculated by rating grade or pool, the denominator should refer to all obligors assigned to a rating grade or pool at the beginning of the observation period. Where the one-year default rate is calculated at the calibration segment level, the denominator should refer to all obligors assigned to the relevant calibration segment at the beginning of the observation period.

11.6 For the purposes of paragraphs 11.4 to 11.5, an obligor or exposure should be included in the denominator and, where relevant, the numerator, in the event that the obligor or exposure migrates to a different rating grade, pool, rating model, rating system, or approach for calculating credit risk capital requirements during the observation period, or where the corresponding credit obligations were sold, written off, repaid or otherwise closed during the observation period. Firms should analyse whether such migrations or sales of credit obligations bias the default rate and, if so, they should reflect this in an appropriate adjustment and application of an adequate MoC.

11.7 In any case, firms should ensure that each defaulted obligor is counted only once in the numerator and the denominator of the one-year default rate calculation, even where the obligor defaulted more than once during the relevant one-year period.

11.8 In order to choose an appropriate calculation approach in accordance with paragraph 11.10, firms should evaluate the observed one-year default rates within the historical observation period at least quarterly.

Calculation of the observed average default rate

11.9 The observed average of one-year default rates ('observed average default rate') should be calculated for each rating grade or pool and additionally for the type of exposures covered by the relevant PD model as well as for any relevant calibration segment.

11.10 Firms should choose an approach to calculate the observed average default rate that is either based on overlapping one-year time windows or based on non-overlapping one-year time windows in light of a documented analysis. This analysis should include at least the following:

- (a) an analysis of possible bias due to the proportion of short-term and terminated contracts that cannot be observed during the relevant one-year periods;
- (b) an analysis of possible bias due to the specific calculation dates chosen;
- (c) for firms using overlapping one-year time windows, an analysis of potentially significant bias due to implicit over-weighting of the overlapping time period; and
- (d) an analysis of potentially significant bias due to seasonal effects related to the chosen calculation dates.

11.11 For the purposes of paragraphs 11.9 and 11.10, firms should calculate the observed average default rates as the arithmetic average of all one-year default rates calculated in accordance with paragraphs 11.4 to 11.6.

Long-run average default rate

11.12 In accordance with Articles 180(1)(a) and 180(2)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects that in order to estimate PDs that are long-run averages of one-year default rates for an obligor grade or pool, a firm should estimate expected default rates for the grade or pool over a representative mix of good and bad economic periods, rather than simply taking the historic average of default rates actually incurred by the firm over a period of years. The PRA expects firms to change a long-run estimate when there is reason to believe that the existing long-run estimate is no longer accurate but does not expect firms to automatically update an estimate to incorporate the experience of additional years, as these periods may not be representative.

11.13 For the purpose of assessing whether a mix of good and bad economic periods is representative, firms should take into account all of the following:

- (a) the variability of all observed one-year default rates;
- (b) the relative frequency of good and bad years as reflected by economic indicators that are relevant for the type of exposures within the selected period; and
- (c) significant changes in the economic, legal, or business environment within the mix of periods.

11.14 The PRA expects that in defining a representative mix of good and bad economic periods for UK residential mortgages (as referred to in paragraph 11.12), firms should incorporate economic conditions equivalent to those observed in the UK during the early 1990s. The PRA has set this expectation in light of UK economic experience and may revise it in the future as appropriate.

11.15 Firms should use a historical observation period that meets the requirements of Article 180(1)(h) or Article 180(2)(e) of the Credit Risk: Internal Ratings Based Approach (CRR) Part as applicable. Where the historical observation period includes a representative mix of good and bad economic periods, the long-run average default rate should be computed as the observed average of the one-year default rates in that period.

11.16 Where the historical observation period does not reflect a representative mix of good and bad economic periods, firms should apply the following:

- (a) where insufficient bad years are included in the historical observation period, the average of observed one-year default rates should be adjusted in order to estimate a long-run average default rate; and
- (b) where bad years are over-represented in the historical observation period, the average of observed one-year default rates may be adjusted to estimate a long-run average default rate where there is a significant correlation between economic indicators referred to in paragraph 11.13(b) and the available one-year default rates.

11.17 Firms should ensure that, as a result of the adjustments referred to in paragraphs 11.16(a) and 11.16(b), the adjusted long-run average default rate reflects a representative mix of good and bad economic periods.

11.18 In the exceptional case where the long-run average default rate is below the average of all observed one-year default rates due to any adjustment made in accordance with paragraph 11.16, firms should compare their adjusted long-run average default rates with the higher of the following:

- (a) the observed average of the one-year default rates of the most recent five years; and
- (b) the observed average of all available one-year default rates.

11.19 Where paragraph 11.18 applies, firms should justify the direction and magnitude of the adjustment made in accordance with paragraph 11.16 in light of the comparison referred to in paragraph 11.18. For this purpose, firms should also justify the MoC assessed in accordance with Chapter 9. In addition, where the adjusted long-run average default rate is lower than the higher of the two values referred to in paragraphs 11.18(a) and 11.18(b), firms should specifically justify why these two values are not appropriate.

Calibration to the long-run average default rate

11.20 The PRA expects firms to have sound and well-defined processes in place which ensure sound calibration and to include all of the following in their calibration process:

- (a) quantitative calibration tests by rating grade or pool;
- (b) quantitative calibration tests on calibration segment level; and
- (c) supplementary qualitative analyses such as expert judgements on the shape of the resulting obligor distribution, minimum obligor numbers per grade, and avoidance of undue concentration in certain grades or pools.

11.21 Firms should store the calibration sample associated with each calibration segment and describe these in the PD model documentation.

11.22 Firms should conduct the calibration after taking into account any overrides applied in the assignment of obligors to grades or pools, and before the application of the MoC and the floors to PD estimates referred to in Articles 160(1) and 163(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part. Where a ranking method or overrides policy has changed over time, firms should analyse the effects of these changes on the frequency and scope of overrides and take them into account appropriately.

11.23 The PRA considers that the process of grouping ranked obligors or exposures to grades or pools, in particular where firms conduct this grouping by identification of intervals of score values reflecting a predefined PD level assigned to a grade of a master scale, may be performed during the calibration.

11.24 The PRA expects that firms should, taking into account the availability of data, the structure of the model and portfolio, as well as the business requirements, choose an appropriate method to perform the calibration in accordance with the following principles:

- (a) for exposures to corporates and institutions, firms may choose one of the following types of calibration:
 - (i) a calibration based on a mapping to the rating scale used by an external credit assessment institution (ECAI) or similar organisation in accordance with Article 180(1)(f) of the Credit Risk: Internal Ratings Based Approach (CRR) Part; or
 - (ii) for a statistical default prediction model where the PDs are estimated as simple averages of default probability estimates for individual obligors in a given grade or pool in accordance with Article 180(1)(g) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, a calibration at the level of appropriate calibration segments of the relevant default probability estimates;
- (b) for retail exposures, firms may choose a calibration based on total losses and LGDs in accordance with Articles 180(2)(b) and 180(2)(d) of the Credit Risk: Internal Ratings Based Approach (CRR) Part; and

- (c) for corporate purchased receivables, firms may choose a calibration based on ELs and LGDs in accordance with Articles 180(1)(b) and 180(1)(c) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

11.25 For the purpose of determining the PD estimates referred to in paragraph 11.24, the calibration should consider either:

- (a) the long-run average default rate at the level of grade or pool, in which case firms should provide additional calibration tests at the level of the relevant calibration segment; or
- (b) the long-run average default rate at the level of the calibration segment, in which case firms should provide additional calibration tests at the level of the relevant grades or pools.

11.26 Irrespective of which of the approaches mentioned in paragraph 11.25 firms choose, firms should assess the potential effect of the chosen calibration method on the behaviour of PD estimates over time.

11.27 For the purpose of determining PD estimates based on a mapping to an external rating agency scale as referred to in paragraph 11.24(a)(i), firms should base the default rates observed for the external organisation's grades on a time series representative of the likely range of variability of default rates for the grades and pools of the given portfolio.

11.28 Where firms derive PD estimates from the estimates of losses and LGDs in accordance with Articles 161(2) and 180(2)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part they should use a RDS that includes realised losses on all defaults identified during the historical observation period specified in accordance with paragraphs 14.1 to 14.2 and relevant drivers of loss.

11.29 Firms may split exposures covered by the same PD model into as many different calibration segments as needed where one or more subsets of these exposures carry a significantly different level of risk. For this purpose, firms should use relevant segmentation drivers, and they should justify and document the use and scope of the calibration segments.

11.30 The PRA expects that, where scoring methods are used, firms should ensure that:

- (a) where there is a change in the scoring method used, firms consider whether it is necessary to recalculate scores of obligors or exposures based on the original data set instead of using scores that were calculated based on previous versions of the scoring method, and, where such recalculation is not possible, that firms assess potential effects and take those effects into account via an appropriate increase in the MoC applied to their PD estimates; and

- (b) where a firm applies the approach in Article 180(1)(g) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PD estimates which are derived as a count weighted average of individual PD estimates are adequate for relevant grades, as determined by applying calibration tests to these estimates at grade level that are based on one-year default rates representative of the likely range of variability of default rates.

11.31 The PRA expects that the calibration should not influence the rank-ordering of obligors or exposures within a calibration segment other than within each grade or pool.

11.32 In order to demonstrate compliance with Article 180 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects a firm to take into account the following factors in understanding differences between their historic default rates and their PD estimates, and in adjusting the calibration of their estimates as appropriate:

- (a) the rating philosophy of the system and the economic conditions in the period over which the defaults have been observed;
- (b) the number of defaults, as a low number is less likely to be representative of a long-run average. Moreover, where the number of internal defaults is low, there is likely to be a greater need to base PDs on external default data as opposed to purely internal data;
- (c) the potential for under-recording of actual defaults; and
- (d) the level of conservatism applied.

Calibration of residential mortgage portfolios

11.33 Article 180(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part requires firms to estimate PDs by obligor grade from long-run averages of one-year default rates. However, for some types of residential mortgages ('low historical data' portfolios) such as buy-to-let, self-certification and sub-prime, there may be an absence of, or insufficient, relevant internal or external data over a representative economic cycle. For such exposures, the PRA expects firms to model how book-level default rates in a given low historical data portfolio would have performed under the economic conditions that would be experienced in an economic cycle containing a representative mix of good and bad periods. The outputs of this model should then be used in order to calibrate long-run average PDs for each rating grade.

11.34 The PRA expects rating systems referred to in paragraph 11.33 above to result in long-run average PDs that include an appropriate MoC. For each low historical data mortgage portfolio, the PRA will undertake an assessment of whether the resultant degree of uplift in PDs relative to comparable mortgages in a firm's prime portfolio is sufficient.

11.35 The PRA considers that the amount of available data for non-UK mortgages varies by jurisdiction. Where a firm has insufficient internal or external data to calibrate long-run average PDs for these portfolios, it should apply the approach set out in paragraph 11.33. For each portfolio of non-prime non-UK mortgages, where the approach in paragraph 11.33 has been applied, the PRA will assess whether the degree of uplift in PDs relative to comparable mortgages in a firm's prime portfolio for the jurisdiction in question is sufficient.

11.36 The PRA would not normally expect low historical data and prime portfolios to be combined within the same rating system as it is challenging for firms to demonstrate a meaningful differentiation of risk and accurate and consistent quantitative estimates of risk in such cases. In the event that a firm is able to demonstrate to the PRA that such an approach is appropriate, the PRA expects the low historical data subset of the rating system to meet the expectations contained within paragraphs 11.33 to 11.35.

11.37 The PRA expects that PDs for portfolios in run-off are calibrated to reflect how a firm's existing portfolio would perform in an economic cycle containing a representative mix of good and bad periods. Where a firm has insufficient internal or external data to calibrate PDs, the techniques outlined in paragraph 11.33 should be applied.

11.38 The PRA considers that firms often have difficulty in practice in understanding the cyclicity of their residential mortgage rating systems (further detail on cyclicity can be found in paragraph 10.15). To mitigate the risk of under-calibration of these rating systems due to inaccurate estimation of their cyclicity, the PRA expects that when firms calibrate their residential mortgage rating systems by uplifting internal observed default rates to a long-run average, they should do so on the assumption that the cyclicity of each rating system is no more than 30% in those years where grade level internal observed default rates are not available. This cyclicity cap is the PRA's expectation of what firms should assume is the maximum level of cyclicity when imputing missing historical default rates. If 30% of the change in portfolio default rates comes from grade migration, the remaining 70% would come from change in default rates within grades. Therefore, when calibrating the long-run average default rates to assign to each rating grade, the PRA expects firms to assume that at least 70% of the portfolio change in default rate reflects grade level changes in default rate. This level reflects the PRA's current view of an appropriately conservative assumption for rating system cyclicity in light of recent experience. This expectation may be adjusted by the PRA if it judges that there has been a change in the risk of under-calibration.

11.39 When a firm is calibrating or recalibrating a residential mortgage rating system using internal observed default rates taken predominantly from a downturn period (ie the firm is reducing the internal observed default rates to a long-run average), the PRA's expectation of a 30% cap on cyclicity does not apply. Instead, firms should determine an appropriately conservative adjustment to allow for uncertainty in their estimates of cyclicity in such circumstances.

11.40 As an alternative to the expectations on risk mitigation methodology in paragraph 11.38, the PRA may be satisfied that a firm has taken steps to mitigate these risks if the residential mortgage PD rating system meets the following standards:

- (a) the firm is able to convincingly articulate how the risk drivers in a rating system will generate the migration into other grades, scores, or ratings assumed in its estimates of cyclical; and
- (b) the firm is able to demonstrate that the assumed changes have occurred in practice across an economic cycle; and
- (c) the above analysis is able to isolate the impact on the existing exposures covered by the rating system from changes in composition of the portfolio over the period being analysed.

11.41 The PRA has found in its experience that for residential mortgage portfolios, firms using TtC approaches are unable to distinguish sufficiently between movements in default rates that result from cyclical factors and those that result from non-cyclical factors, and this results in risks not being sufficiently captured. The PRA therefore expects that firms should not use fully TtC approaches for residential mortgage portfolios.

11.42 Highly cyclical PiT models do not always adequately capture risks over the long-run, and this is particularly an issue for residential mortgage portfolios where default rates are highly cyclical. The PRA therefore expects firms not to use an artificial highly cyclical PiT approach achieved through dynamic recalibration of the score to PD relationship in their application and behavioural scorecards for residential mortgage models.

11.43 The PRA expects recalibrations of rating systems applying the cyclical assumptions set out in paragraph 11.38 to be rare and to be symptomatic of failures of the rating system's assumptions rather than part of rating system design. For these purposes, any calculation mechanism embedded in a rating system that changes the PD applied to exposures with a given set of characteristics should be treated as a recalibration. The PRA expects that any recalibration of such a rating system would include:

- (a) a robust assessment of the cyclical of the rating system;
- (b) a robust assessment and explanation of the cause of the need to recalibrate, including whether it is due to changes in default risk that are not purely related to changes in the cycle. This should include an assessment of the firm's own lending profile, its historical performance, wider industry performance against historical levels, and changes in economic factors; and
- (c) a review of the appropriateness of undertaking a recalibration by an independent validation function.

Retail exposures: obligor level definition of default

11.44 Where a firm has not chosen to apply the definition of default at the level of an individual credit facility in accordance with Article 178(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects it to ensure that the PD associated with unsecured exposures is not understated as a result of the presence of any collateralised exposures.

11.45 The PRA expects the PD of a residential mortgage would typically be lower than the PD of an unsecured loan to the same borrower.

Retail exposures: facility level definition of default

11.46 Where a firm chooses to apply the definition of default at the level of an individual credit facility in accordance with Article 178(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part and a customer has defaulted on a facility, then default on that facility is likely to influence the PD assigned to that customer on other facilities. The PRA expects firms to take this into account in its estimates of PD.

Low default portfolios

11.47 The PRA expects a firm to estimate PDs for a rating system in accordance with this section where a firm's internal experience of defaults for that rating system is 20 or fewer, and reliable estimates of PD cannot be derived from external sources of default data including the use of market price related data. In order to estimate PDs for all exposures covered by such a rating system, the PRA expects firms to:

- (a) use a statistical technique to derive the distribution of defaults implied by the firm's experience, estimating PDs (the 'statistical PD') from the upper bound of a confidence interval set by the firm in order to produce conservative estimates of PDs in accordance with Article 179(1)(f) of the Credit Risk: Internal Ratings Based Approach (CRR) Part;
- (b) use a statistical technique to derive the distribution of default which takes account, as a minimum, the following modelling issues:
 - (i) the number of defaults and number of obligor years in the sample;
 - (ii) the number of years from which the sample was drawn;
 - (iii) the interdependence between default events for individual obligors;
 - (iv) the interdependence between default rates for different years; and
 - (v) the choice of the statistical estimators and the associated distributions and confidence intervals;
- (c) further adjust the statistical PD to the extent necessary to take account of the following:

- (i) any likely differences between the observed default rates over the period covered by the firm's default experience and the long-run PD for each grade required by Articles 180(1)(a) and 180(2)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part; and
- (ii) any other information that indicates (taking into account the robustness and cogency of that information) that the statistical PD is likely to be an inaccurate estimate of PD.

11.48 The PRA expects firms to only take into account defaults that occurred during periods that are relevant to the validation of the rating system in accordance with the requirements when determining whether there are 20 defaults or fewer.

Near-final

12: LGD – General expectations and model development

General expectations – LGD estimation methodologies

12.1 Firms using the AIRB approach should assign an LGD estimate to each non-defaulted exposure and an estimate of LGD in-default and BEEL to each defaulted exposure within the range of application of the rating system. Firms should estimate LGDs for all facility grades of the distinct facility rating scale or for all pools that are incorporated in the rating system. For the purpose of LGD estimation, firms should treat each defaulted facility as a distinct default observation, unless more than one independent default was recognised on a single facility which does not meet the criteria of paragraph 12.2.

12.2 For the purpose of LGD estimation, with regard to defaults recognised on a single facility, where the time between the moment of the return of the exposure to non-defaulted status and the subsequent classification as default is shorter than nine months, firms should treat such an exposure as having been constantly defaulted from the first moment when the default occurred. Firms may specify a period longer than nine months for the purpose of considering two subsequent defaults as a single default in the LGD estimation if this is adequate for the specific type of exposures and reflects the economic meaning of the default experience.

12.3 Firms should estimate their own LGDs based on their own loss and recovery experience, as it is reflected in historical data on defaulted exposures. Firms may supplement their own historical data on defaulted exposures with external data. In particular, firms should not derive their LGD estimates only from the market prices of financial instruments, including, but not limited to, marketable loans, bonds, or credit default instruments, but they may use this information to supplement their own historical data.

12.4 Where, in the case of retail exposures and purchased corporate receivables, firms derive LGD estimates from realised losses and appropriate estimates of PDs in accordance with Articles 161(2) and 181(2)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, they should ensure that:

- (a) the process for estimating total losses meets the requirements of Article 179 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, and the outcome is consistent with the concept of LGD as set out in Article 181(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part and this SS, in particular with the concept of economic loss as specified in paragraphs 13.1 to 13.23; and

- (b) the process for estimating PD meets the requirements of Articles 179 and 180 of the Credit Risk: Internal Ratings Based Approach (CRR) Part as well as the expectations specified in Chapter 10 – PD – model development and Chapter 11 – PD – calibration of this SS.

12.5 The PRA considers that an LGD model can contain several different methods, especially with respect to different types of collateral, which are then combined to arrive at an LGD for a given facility.

12.6 Firms should be able to demonstrate that the methods that they choose for the purpose of LGD estimation are appropriate to their activities and the type of exposures to which the estimates apply, and they should be able to justify the theoretical assumptions underlying those methods. The methods used in the LGD estimation should in particular be consistent with the collection and recovery policies adopted by the firm and should take into account possible recovery scenarios as well as potential differences in the legal environment in relevant jurisdictions.

12.7 The PRA expects that the methods used by the firm when estimating LGD consider any downturn effect, the length of data series used, the MoC, human judgement and, where applicable, the choice of risk drivers, should be appropriate to the type of exposures to which they are applied.

General expectations – use of SA and FIRB approach parameters for LGD estimation

12.8 The PRA expects that firms which make reference to SA or FIRB approach parameters in an IRB model for LGD estimation should provide appropriate justification. The PRA considers that the provisions of the Credit Risk: Internal Ratings Based Approach (CRR) Part and this SS relating to modelling standards apply in such circumstances.

General expectations – use of LGD Modelling Collateral Method

12.9 The PRA considers that, where a firm is recognising non-financial collateral using the LGD Modelling Collateral Method, for the purposes of Article 169B(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part it will only have sufficient data to model a given type of collateral in a particular jurisdiction where it has 20 or more relevant data points of recovery values for that type of collateral. Where the firm does not have 20 or more relevant data points for that type of collateral, the PRA expects that the firm should apply the methodology set out in Article 169B(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

12.10 For the purpose of the assessment of relevant data points referred to in paragraph 12.9 the PRA expects that:

- (a) the firm should ensure that each data point is independent, representative, accurate; and
- (b) the firm should usually not treat recoveries from collateral located in a different jurisdiction than that of the collateral itself as relevant, but it may exceptionally do so if it can evidence that recovery values from that type of collateral in the two jurisdictions are not materially different.

Data requirements for LGD estimation

12.11 For the purpose of LGD estimation, firms should use an RDS covering all of the following items:

- (a) all defaults identified during the historical observation period as specified in accordance with paragraphs 14.1 to 14.2;
- (b) all data necessary for calculating realised LGDs in accordance with paragraphs 13.1 to 13.23; and
- (c) relevant factors that can be used to group the defaulted exposures in meaningful ways and relevant drivers of loss, including their values at the moment of default and at least within the year before default when available.

12.12 Firms should include in the RDS information on the results of the recovery processes, including recoveries and costs, related to each individual defaulted exposure. For this purpose, firms should include:

- (a) information on the results of incomplete recovery processes until the reference date for LGD estimation;
- (b) information on the results of recovery processes at portfolio level, where such aggregation of the information is justified, and in particular in respect of indirect costs and in the case of the sale of a portfolio of credit obligations; and
- (c) information on external or pooled data used in the estimation of LGDs.

12.13 The RDS should contain at least the following information:

- (a) obligor-related, transaction-related and institution-related risk characteristics, as well as external factors as referred to in paragraph 12.25 that are potential risk drivers at the relevant reference dates specified in paragraph 12.27;
- (b) moment (date) of default;
- (c) all default triggers that have occurred, including both past due events and unlikelihood to pay events, even after the identification of default; in the case of exposures subject

- to distressed restructuring the amount by which the financial obligation has diminished calculated in accordance with SS3/24 'Credit risk definition of default';
- (d) the outstanding amount of the exposure at the moment of default including principal, interest, and fees;
 - (e) the amounts and timing of the additional drawings after default;
 - (f) the amounts and timing of write-offs;
 - (g) to the extent that the firm is applying the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the value of collateral associated with the exposure and, where applicable, the type of valuation, date of valuation, a flag of whether the collateral has been sold and the sale price;
 - (h) information on any dependence between the risk of the obligor and the risk of the collateral or collateral provider;
 - (i) to the extent that the firm is applying the LGD Adjustment Method in accordance with Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the types, amounts, and maturities of unfunded credit protection including the specification and credit quality of the protection provider;
 - (j) the amounts, timing, and sources of recoveries;
 - (k) the amounts, timing, and sources of direct costs associated with recovery processes;
 - (l) a clear identification of the type of termination of the recovery process;
 - (m) where applicable, currency mismatches between two or more of the following elements: the currency unit used by the institution for financial statements, the underlying obligation, any funded or unfunded credit protection, and any cash flows from the liquidation of the obligor's assets; and
 - (n) amount of realised loss.

12.14 Firms applying the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part may use various methods for the valuation of collateral in the form of immovable property. Where firms use valuation approaches with regard to immovable properties that secure exposures included in the range of application of a certain rating system, they should collect and store in the RDS the information on the type of valuation and they should use this information consistently in the LGD estimation and in the application of LGD estimates.

12.15 Where firms derive LGD estimates from realised losses and appropriate estimates of PDs in accordance with Articles 161(2) and 181(2)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, they should use an RDS that includes realised losses on all defaults identified during the historical observation period specified in accordance with paragraphs 14.1 to 14.2 and relevant drivers of loss.

12.16 Where aggregated information is collected and stored, firms should develop an appropriate methodology for the allocation of recoveries and costs to individual defaulted exposures and should apply this methodology consistently across exposures and over time. The PRA expects firms to demonstrate that the process of allocation of recoveries and costs is effective and that it does not lead to biased LGD estimates.

12.17 The PRA expects firms to demonstrate that they collect and store in their databases all information required to calculate direct and indirect costs. All material indirect costs should be allocated to the corresponding exposures. This cost allocation process should be based on the same principles and techniques that firms use in their own cost accounting systems. For the purpose of indirect cost allocation, firms may use methods based on exposure weighted averages, or statistical methods based on a representative sample within the population of defaulted obligors or facilities.

12.18 Firms should take reasonable steps to recognise the sources of the recovery cash flows and allocate them appropriately to the specific collateral or unfunded credit protection that has been realised. Where the source of the cash flows cannot be identified, firms should specify clear policies for the treatment and allocation of such cash flows, including in respect of whether these are classified as arising from:

- (a) collateral or unfunded credit protection that the firm recognises when using the LGD Modelling Collateral Method or the LGD Adjustment Method in accordance with Article 169A(1)(a) or Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part;
- (b) collateral or unfunded credit protection which the firm does not recognise; and
- (c) other sources;

in a way that results in LGDs being estimated in a conservative manner.

Recoveries from collateral

12.19 For the purpose of applying the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, or not recognising the effect of collateral in LGD estimates where the LGD Modelling Collateral Method is not applied, a firm should recognise recoveries as stemming from collateral in all of the following situations:

- (a) the collateral is sold by the obligor and the obtained price has been used to cover parts or all of the outstanding amount of the defaulted credit obligation;
- (b) the collateral is repossessed or sold by the firm, the parent undertaking, or any of its subsidiaries on behalf of the firm;

- (c) the collateral is sold in a public auction of the property by court order or in a similar procedure in accordance with the applicable legal framework;
- (d) the credit obligation is sold together with the collateral and the sale price for the credit obligation included the existing collateral;
- (e) in the case of leasing, the leasing object is sold by the firm; and
- (f) the collateral is realised by any other method that is eligible under the legal framework of the relevant jurisdiction.

12.20 For the purpose of paragraph 12.19(b) firms should determine the value of repossession as the value by which the credit obligation of the obligor has been diminished as a result of the repossession of the collateral, and, where relevant, with which the repossessed collateral was recorded as an asset on the balance sheet of the firm. Where these values are different, firms should consider the lower of the two to be the value of repossession. The value of repossession should be considered a value of recovery at the date of repossession and should be included in the calculation of the economic loss and realised LGD in accordance with paragraphs 13.1 to 13.23.

12.21 Firms should consider whether the value of repossession adequately reflects the value of the repossessed collateral, consistently with any established internal requirements for collateral management, legal certainty, and risk management. Where the collateral repossessed meets the criteria for high quality liquid assets at Level 1, as defined in Article 10 of the Liquidity Coverage Ratio (CRR) Part of the PRA Rulebook, firms may take into account directly as a realised recovery the market value of the collateral at the time of the repossession. In all other cases, firms should apply an appropriate haircut to the value of repossession and include in the calculation of economic loss a recovery in the amount of the value of repossession after applying the appropriate haircut. Firms should estimate this haircut taking into account all of the following conditions:

- (a) the haircut should reflect possible errors in the valuation of the collateral at the moment of repossession, taking into account the type of valuation available at the moment of repossession, the date it was performed, and the liquidity of the market for this type of asset;
- (b) the haircut should be estimated with the assumption that the firm intends to sell the repossessed collateral to an independent third-party and should reflect the potential price that could be achieved from such sale, the costs of the sale, and the discounting effect for the period from the sale to the moment of repossession, taking into account the liquidity of the market for this type of assets;
- (c) where there are observations available regarding the repossession and subsequent sales of similar types of collateral, the estimation of the haircut should be based on these observations and should be regularly back-tested; for this purpose firms should take into account all of the following:

- (i) the difference between the value of repossession and the sale price, especially where there were no significant changes in market and economic conditions between the moment of the repossession and the moment of the sale;
 - (ii) any income and costs related to this asset that were observed between the date of repossession and the moment of the sale;
 - (iii) discounting effects; and
 - (iv) whether the firm repossessed the collateral with the intention of immediate sale or whether another strategy was adopted;
- (d) where historical observations regarding the repossessions and subsequent sales of similar types of collateral are not available, the estimation of the haircut should be based on a case-by-case assessment, including the analysis of current market and economic conditions; and
- (e) the fewer data a firm has on previous repossessions, and the less liquid the market for the given type of assets is, the more uncertainty is attached to the resulting estimates, which should be adequately reflected in the MoC in accordance with paragraphs 9.6 to 9.17.

12.22 In any case, the repossession of collateral should be recognised at the moment of repossession and should not prevent the firm from closing the recovery process in accordance with paragraph 14.7.

12.23 Any sale of credit obligations in accordance with paragraph 12.19(d) should be included in the LGD estimation in a manner appropriate to the LGD estimation methodology taking into account all of the following conditions:

- (a) where firms regularly sell credit obligations as part of their recovery processes, they should appropriately reflect the observations related to credit obligations subject to such sales in the model development process;
- (b) firms should not treat recoveries from the sales of secured credit obligations as recoveries realised without the use of collateral; and
- (c) in any case, firms should include all observations, including where there are sales of credit obligations, in the calculation of long-run average LGD.

12.24 In accordance with paragraph 12.19(f), firms may recognise other methods of realising collateral that are recognised under the applicable legal framework. When recognising such other methods of realising collateral, firms should take into account the fact that the collateral may take various forms and that various forms of collateral may be related to the same asset. Where different forms of collateral refer to the same asset but the realisation of one form of collateral does not decrease the value of the other, firms should consider them separate collateral in the process of LGD estimation. In particular, firms should recognise separately the form of collateral which gives a right to repossess or sell the asset (such as a mortgage)

and the form of collateral which gives a right to collect cash flows generated by the asset (such as a cession of rent or fees).

Risk drivers

12.25 Firms should identify and analyse potential risk drivers that are relevant to their specific circumstances and to the specific characteristics of the type of exposures covered by the rating system. Potential risk drivers analysed by firms should include in particular the following:

- (a) transaction-related risk characteristics, including:
 - (i) in all cases: type of product, seniority, seasoning, recovery procedures, and exposure size;
 - (ii) where the firm is applying the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part: type of collateral, geographical location of the collateral, and loan to value (LTV); and
 - (iii) where the firm is applying the LGD Adjustment Method in accordance with Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part: unfunded credit protection;
- (b) obligor-related risk characteristics, including, where applicable, size, capital structure, geographical region, industrial sector, and line of business;
- (c) institution-related factors, including internal organisation and internal governance, relevant events such as mergers, and existence of specific entities within the group dedicated to recoveries; and
- (d) external factors, including interest rates, legal framework, and other factors influencing the expected length of the recovery process.

12.26 In respect of seasoning effects for retail exposures, the PRA expects that firms should analyse the representativeness of the age of the facilities (in terms of time from the date of default) in the data used to derive LGD estimates. The PRA considers that recovery rates reach a low point several years after default for some portfolios in some jurisdictions, and as a result, the PRA expects firms to adjust their estimates with an adequate MoC, in accordance with Chapter 9, should they identify any shortcoming in the model's ability to accurately reflect seasoning effects.

12.27 Firms should analyse risk drivers not only at the moment of default but also at least within a year before default. Firms should use a reference date for a risk driver that is representative of the realisation of the risk driver within a year before default. When choosing the appropriate reference date for a risk driver, firms should take into account its volatility over time. Firms should apply these practices also with regard to the reference date of the

valuation of collateral; the value of the collateral at the reference date should not reflect the impact of the decrease in credit quality of the exposure shortly before default.

12.28 The PRA expects that, for the purpose of the application of LGD estimates, firms should specify or calculate the risk drivers in the same way as they are specified or calculated for the purpose of modelling LGD.

Eligibility of collateral

12.29 In accordance with Article 169A(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms using the LGD Modelling Collateral Method must only take into account in their LGD estimates the existence of types of collateral for which they have established internal requirements for collateral management, operational procedures, legal certainty, and risk management that are generally consistent with those applicable under the FIRB approach. Where types of collateral are not eligible under the FIRB approach, the PRA expects that firms should only take such collateral into account in their LGD estimates if the criteria in Article 169A(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part are met and if they have established policies and procedures relating to collateral valuation that are appropriate for the type of collateral.

12.30 Firms using the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part should take into account information on all main types of collateral that are used within the scope of application of the LGD model as either a risk driver or segmentation criterion. Firms should clearly define in their internal policies the main and other types of collateral used for the type of exposures covered by the rating system, and should ensure that, to the extent that LGD estimates take into account the existence of collateral, the policies regarding the management of these types of collateral comply with the requirements set out in Article 169A(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

12.31 The PRA expects that collateral which does not meet the requirements of Article 169A(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part should not be included as a risk driver in the LGD estimation and the cash flows received from such collateral should be disregarded.

Inclusion of collateral in LGD estimation when applying the LGD Modelling Collateral Method

12.32 For the purpose of LGD estimation, firms using the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part may group types of collateral that are homogeneous in terms of recovery

patterns, taking into account both the average time of the collection process and the recovery rates on these types of collateral.

12.33 The PRA expects that the approach developed by firms to include the effect of collateral in the LGD estimation should meet all of the following criteria:

- (a) where firms estimate separate recovery rates for specific types of collateral, they should avoid a bias that may stem from including in the estimation sample the observations where the exposure was secured by only a part of the value of the collateral. For this purpose, firms should take reasonable steps to obtain data on the total value of the collateral and total sale price of the collateral and include this information in the estimation where it is available;
- (b) where firms estimate separate recovery rates for specific types of collateral they should recognise and include in this estimation direct costs related to the collection on each of these specific types of collateral separately as well;
- (c) where firms estimate separate recovery rates for specific types of collateral they should include in this estimation all recoveries realised from a specific type of collateral including those realised on exposures where the realisation of the collateral has been completed but the overall recovery process has not yet been closed;
- (d) where the same collateral covers several exposures, firms should specify an adequate allocation methodology in order to avoid double counting of collateral; the allocation methodology should be consistent across the methodology used for LGD estimation, the application of the LGD estimates, and the methodology used for accounting purposes;
- (e) the estimates should not be based solely on the estimated market value of the collateral, but they should also take into account the realised recoveries from past liquidations and the potential inability of a firm to gain control and liquidate the collateral. For this purpose, firms should take into account in the estimation those historical observations where the collateral could not be realised or where the recovery process was longer than expected, due to an inability or difficulty in gaining control of or liquidating the collateral. Where firms estimate the recovery rates related to specific types of collateral, they should take into account the time between the moment of default and the time when the cash flows related to the collection on these types of collateral have been received and should include in the estimation those observations where the collateral has not been realised as a result of inability to gain control;
- (f) the estimates should take into account the potential decreases in collateral value from the point of LGD estimation to the eventual recovery, in particular those resulting from changes in the market conditions, the state and age of the collateral and, where relevant, currency fluctuations. Where firms have experienced decreases in values of collateral, and these are already reflected in observed recoveries, no further adjustments to LGD estimates based on these observations should be made. Where potential decreases in values of collateral are not reflected in historical observations,

or where firms predict further, potentially more severe decreases in the future, they should be included in the quantification of LGD estimates by means of an appropriate adjustment based on forward-looking expectations. However, the LGD estimates should not be adjusted to take into account any potential increases in collateral value; and

- (g) the estimates should take into account, in a conservative manner, the degree of dependence between the risk of the obligor and the risk of the diminishing value of the collateral as well as the cost of liquidating the collateral.

Unfunded credit protection

12.34 To the extent that firms use the LGD Adjustment Method in accordance with Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part to take into account the existence of unfunded credit protection, firms should specify their criteria and methodology for recognising and including protection in the form of guarantees and credit derivatives in LGD estimates.

12.35 The PRA expects that firms using the LGD Adjustment Method in accordance with Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part should have clear policies for assessing the effects of unfunded credit protection on risk parameters. A firm's policies should be consistent with its internal risk management practices and should reflect the requirements of Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part and the expectations set out in this SS.

12.36 Where firms apply the LGD Adjustment Method in accordance with Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, they should consider, and, if relevant, take the following elements into account in the LGD estimates in a conservative manner:

- (a) any currency mismatch between the underlying obligation and the unfunded credit protection;
- (b) the degree to which the protection provider's ability to fulfil the contractual obligation under the unfunded credit protection agreement is correlated with the obligor's ability to repay; and
- (c) the defaulted status of the protection provider and its resulting reduced ability to fulfil the contractual obligation under the unfunded credit protection.

12.37 The PRA expects that, where a firm is not applying the LGD Adjustment Method in accordance with Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, including where it is applying either the Risk Weight Substitution Method or the Parameter Substitution Method in accordance with Article 191A of the Credit Risk Mitigation (CRR) Part,

it should estimate LGDs as if there was no unfunded credit protection. The PRA expects that for this purpose firms should apply the following principles:

- (a) cash flows received from the guarantor should not be taken into account;
- (b) cash flows received from funded credit protection associated with the exposure may be taken into account in respect of the part of the exposure covered by the funded credit protection;
- (c) indirect costs should be taken into account in line with the principles and techniques that firms use in their own cost accounting systems;
- (d) direct costs that are directly linked to the exercising of the unfunded credit protection need not be taken into account, but all other direct costs should be taken into account; and
- (e) direct costs relating to the realisation of funded credit protection should be taken into account in respect of the part of the exposure covered by the funded credit protection.

Funded credit protection securing unfunded credit protection obligations

12.38 Criteria for recognising funded credit protection that secures unfunded credit protection are set out in the flowchart in Part 4 of Appendix 1 of the Credit Risk Mitigation (CRR) Part. For exposures subject to the AIRB approach, the reference to Article 201 of the Credit Risk Mitigation (CRR) Part does not apply where direct exposures to the protection provider would also be subject to AIRB approach, unless the firm is applying the Parameter Substitution Method in accordance with Article 191A of the Credit Risk Mitigation (CRR) Part. Where the reference to Article 201 does not apply, the PRA expects however that firms should only recognise the unfunded credit protection where this meets any guarantor eligibility criteria that they have set in accordance with the requirement in Article 183(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

12.39 Where a firm is recognising the funded credit protection, the PRA expects firms to reflect the funded credit protection in their LGD model only to the extent to which the benefit that can be derived from the collateral is not limited by the value of the guarantee. For this purpose, where a firm is not applying the LGD Adjustment Method in accordance with Article 183 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the value of the guarantee should be determined in accordance with Article 233 of the Credit Risk Mitigation (CRR) Part, further adjusted for any maturity mismatch as laid down in Articles 237 to 239 of the Credit Risk Mitigation (CRR) Part. The funded credit protection should be reflected in LGD floors consistently with how it would be reflected under Articles 230 or 231 of the Credit Risk Mitigation (CRR) Part if the firm was applying the Foundation Collateral Method following the application of Article 191A(2)(e) of the Credit Risk Mitigation (CRR) Part.

Homogeneity of facility grades or pools

12.40 Firms should assess the homogeneity of exposures assigned to the same grades or pools based on the data in the RDS, and they should ensure in particular that grades are defined in such a manner that individual grades are sufficiently homogeneous with respect to loss characteristics.

Treatment of cures

12.41 Where firms wish to include cures in their LGD estimates, the PRA expects them to do so on a cautious basis with reference to both their current experience and how this is expected to change in downturn conditions. In particular, this involves being able to articulate clearly both the precise course of events that will allow such cures to take place and any consequences of such actions for other elements of their risk quantification. For example:

- (a) where cures are driven by the firm's own policies, the PRA expects firms to consider whether this is likely to result in longer realisation periods and larger forced sale discounts for those exposures that do not cure, and higher default rates on the book as a whole, relative to those that might be expected to result from a less accommodating attitude. To the extent feasible, the PRA expects cure assumptions in a downturn to be supported by relevant historical data; and
- (b) the PRA expects firms to be aware of, and to properly account for, the link between cures and subsequent defaults. In particular, an earlier cure definition is, other things being equal, likely to result in a higher level of subsequent defaults.

Incomplete workouts

12.42 In order to ensure that estimates of LGDs take into account the most up-to-date experience in accordance with Article 179(1)(c) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects firms to take account of data in respect of relevant incomplete workouts (ie defaulted exposures for which the recovery process is still in progress, with the result that the final realised losses in respect of those exposures are not yet certain).

Unsecured LGDs where the obligor's assets are substantially used as collateral

12.43 The extent to which an obligor's assets are already given as collateral will affect the recoveries available to unsecured creditors. The PRA considers that if the degree to which assets are pledged is substantial, this would typically be a material risk driver of LGDs on such exposures and should be taken into account in accordance with Article 171(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part. Although potentially present in all

transactions, the PRA expects firms to be particularly aware of this risk driver in situations in which borrowing on a secured basis is the normal form of financing, leaving relatively few assets available for the unsecured debt. Specialist lending (including property), hedge funds, some small and medium-sized enterprises (SME) lending, and some mid-market lending are examples of such cases.

12.44 The PRA expects firms estimating LGDs to take into account the effect of assets being substantially used as collateral for other obligations where this is the case. The PRA expects firms not to use unadjusted data sets that ignore this impact, and notes that this effect should be assessed under downturn conditions. In the absence of relevant data to estimate this effect, the PRA expects firms to apply a suitable MoC which may result in LGD estimates being increased to 100% in some cases.

LGD – use of external data for residential mortgages

12.45 The PRA expects that, for residential mortgages, where a firm's internal experience of defaults for a rating system is low, the firm may use external data to supplement internal data when modelling LGD.

12.46 Where a firm uses external data, the PRA expects the firm to apply an additional MoC in order to:

- (a) recognise the difference between downturn recoveries achieved by established firms with the experience and processes to realise higher recoveries, and downturn recoveries achieved by firms with more limited experience and less established processes;
- (b) recognise any differences in portfolio comparability between the external data and the firm's lending; and
- (c) address unobservable differences that relate to risk drivers or risk characteristics that cannot be derived from external data.

12.47 The PRA expects the level of added conservatism applied in accordance with paragraph 12.46 to be significant until sufficient internal data are available to support a reduction.

12.48 Firms using external data in their LGD estimates should run a Forced Sale Discount (FSD) model and Probability of Possession Given Default (PPGD) model with appropriate governance and monitoring in line with the requirements set out in the Credit Risk: Internal Ratings Based Approach (CRR) Part. Firms with no internal repossession data for use in their FSD modelling may rely on external data, along with an internal expectation on costs and an additional MoC, as part of their FSD estimation.

12.49 The PRA considers that firms would be unlikely to be able to demonstrate that third-party recovery data from non-UK legal regimes are comparable to UK data. The PRA therefore expects only UK data to be used when estimating LGD for UK residential mortgage exposures. For non-UK mortgage exposures, the PRA expects firms to demonstrate that external data are representative for the local mortgage market in order for them to be used to supplement internal data.

12.50 The PRA expects that as the amount of internal data builds up, firms should revise their modelling approaches to incorporate the additional data.

LGD estimates for exposures to corporates

12.51 The PRA expects that firms should do all of the following in respect of LGD estimates for exposures to corporates:

- (a) apply LGD estimates at transaction level;
- (b) where there is a paucity of observations, ensure that long-run average and downturn LGD estimates are cautious, conservative, and justifiable. In accordance with Article 179(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, estimates must be derived using both historical experience and empirical evidence, and not be based purely on judgemental consideration. The PRA expects firms to document their justification of why they consider their estimates to be sufficiently conservative;
- (c) identify and explain at a granular level how each estimate has been derived. This should include an explanation of how internal data, external data, expert judgement, or a combination of these have been used to produce the estimate;
- (d) clearly document the process for determining and reviewing estimates, and the parties involved in the process in cases where expert judgement was used;
- (e) demonstrate an understanding of the impact of the economic cycle on collateral values and be able to use that understanding in deriving downturn LGD estimates;
- (f) demonstrate sufficient understanding of any external benchmarks used, and identify the extent of their relevance and suitability, to the extent that the firm can satisfy itself that they are fit for purpose;
- (g) evidence that they are aware of any weaknesses in their estimation process and set standards, for example related to accuracy, that their estimates are designed to meet;
- (h) demonstrate that they have sought and utilised relevant and appropriate external data, including through identifying all relevant drivers of LGD and how these will be affected by a downturn;
- (i) ensure that in most cases estimates incorporate effective discrimination on the basis of at least security type and geography. In cases where these drivers are not incorporated into LGD estimates, the PRA expects firms to be able to demonstrate why they are not relevant; and

- (j) have an ongoing data collection framework to collect all relevant internal loss and exposure data required for estimating LGD and a framework to start incorporating these data in LGD models as soon as any meaningful information becomes available.

Near-final

13: LGD – calibration (general)

Definition of economic loss and realised LGD

13.1 The PRA expects that, for the purpose of LGD estimation as referred to in Article 181(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should calculate realised LGDs for each exposure as a ratio of the economic loss to the outstanding amount of the credit obligation at the moment of default, including any amount of principal, interest, or fee.

13.2 For the purpose of paragraph 13.1, firms should calculate the economic loss realised on an exposure (ie defaulted facility) as referred to in CRR Article 5(2) as the difference between:

- (a) the outstanding amount of the credit obligation at the moment of default, without prejudice to paragraph 13.14, including any amount of principal, interest, or fee, increased by material direct and indirect costs associated with collecting on that exposure, discounted to the moment of default; and
- (b) any recoveries realised after the moment of default, discounted to the moment of default.

13.3 For the purpose of calculation of the economic loss realised on an exposure in accordance with paragraph 13.2, firms should not take the following into account:

- (a) recoveries related to collateral if they are not applying the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part; and
- (b) recoveries related to collateral types that do not meet the requirements set out in Article 169A(2)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

13.4 The PRA expects that where a firm recognises on-balance sheet netting, or recognises master netting agreements when applying the Financial Collateral Comprehensive Method (FCCM) or the securities financing transactions value-at-risk (SFT VaR) Method, in accordance with Article 191A of the Credit Risk Mitigation (CRR) Part:

- (a) in the case of on-balance sheet netting, the outstanding amount of the credit obligation at the moment of default should be the exposure value calculated in accordance with Article 219(1) of the Credit Risk Mitigation (CRR) Part, including any amount of principal, interest or fee realised so far;
- (b) in the case of master netting agreements, the outstanding amount of the credit obligation at the moment of default should be the fully adjusted exposure value (E^*)

reflecting the netting agreement calculated in accordance with Article 220(3) or 221(6) of the Credit Risk Mitigation (CRR) Part, including any amount of principal, interest, or fee realised so far; and

- (c) for the purpose of calculating economic loss in accordance with paragraph 13.1, no cash flows from netting should be included as recoveries after default.

13.5 Where, relating to a default event, any part of an exposure has been forgiven or written off before or at the date of default, and the amount forgiven or written off is not included in the outstanding amount of the credit obligation at the moment of default, the amount of the exposure that was forgiven or written off should be added to the outstanding amount of the credit obligation at the moment of default for both the calculation of economic loss as specified in paragraph 13.2 in the numerator, and the calculation of the outstanding amount of the credit obligation in the denominator of the realised LGD.

13.6 In the case of exposures that return to non-defaulted status, firms should calculate economic loss as for all other defaulted exposures with the only difference that an additional recovery cash flow ('artificial cash flow') should be added to the calculation in line with paragraph 13.7 as if a payment had been made by the obligor at the date of the return to non-defaulted status. Where exposures meet the criteria of paragraph 12.2, realised LGDs should be calculated with reference to the date of the first default event, taking into account all cash flows observed from the date of the first default event, including those observed during the period between the first and the second defaulted status, without adding an artificial cash flow.

13.7 For the purpose of applying paragraph 13.6, the PRA expects that:

- (a) the artificial cash flow should reflect:
 - (i) principal: total outstanding amount of the full loan at the moment of cure, but only the amount of missed payments (ie actual past due payments) accrued up to the moment of cure should be discounted;
 - (ii) interest: amount accrued between the moment of default and the moment of cure;
 - (iii) fees: amount accrued between the moment of default and the moment of cure;
 - (iv) additional observed recoveries: total amount received up to the moment of cure;
 - (v) additional drawings: firms should follow the requirements of the last sentence of Article 181(1) and Article 182(1)(ca) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, and paragraphs 13.11 to 13.14. Additional drawings included in the artificial cash flow should be treated in the same way as the principal; and
 - (vi) costs: amount accrued between the moment of default and the moment of cure;
- (b) for the purpose of paragraph 13.7(a)(i), the 'moment of cure' is defined as the start of the final period when no triggers of default continue to apply prior to the exposure

- being rated as a non-defaulted exposure as referred to in Articles 178(5) to 178(5C) of the Credit Risk: Internal Ratings Based Approach (CRR) Part; and
- (c) the artificial cash flow should be discounted over the actual period of default only (ie between the moment of default and the moment of cure) and, therefore, should not be discounted over any additional time period after the moment of cure, such as the period where no triggers of default continue to apply but the exposure is rated as being in default in accordance with Articles 178(5) to 178(5C) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

13.8 Where firms open new facilities to replace previously defaulted facilities as part of restructuring or for technical reasons, they should calculate the realised LGDs based on the originally defaulted facilities. For this purpose, firms should have a sound mechanism to allocate observed costs, recoveries, and any additional drawings to original facilities.

Treatment of fees, interest, and additional drawings after default

13.9 The PRA expects that, for the purpose of Article 181(1)(i) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should take into account in the calculation of realised LGD any fees for delays in payments that have been capitalised in the firm's income statement before the moment of default by including them in the outstanding amount of the credit obligation at the moment of default in the numerator and the denominator of the realised LGD. Where the fees were extended to the obligor in order to recover direct costs already incurred by the firm and these costs are already included in the calculation of the economic loss, firms should not add these amounts to the economic loss or outstanding amount again. Any fees capitalised after the moment of default should not increase the amount of economic loss or amount outstanding at the moment of default. However, all recoveries, including those related to fees capitalised after default, should be included in the calculation of economic loss.

13.10 Firms should apply the treatment specified in paragraph 13.9 to any interest capitalised in their income statement before and after the moment of default.

13.11 In accordance with Article 182(1)(ca) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms using the AIRB approach and modelling CFs or EADs are required to reflect the possibility of additional drawings by the obligor up to the time of default in their estimates of CFs or EADs. Firms modelling CFs or EADs are also required to reflect additional drawings by the obligor after the moment of default in their CF or EAD estimates where post-default additional drawings have not been reflected in LGD estimates in accordance with the last sentence of Article 181(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

13.12 Where firms choose not to recognise additional drawings by the obligor after the moment of default in LGDs, in accordance with the last sentence of Article 181(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, they should calculate realised LGD as the ratio of the economic loss to the outstanding amount of the credit obligation at the moment of default increased by the amount of additional drawings by the obligor after the moment of default, discounted to the moment of default.

13.13 Where firms choose to recognise additional drawings by the obligor after the moment of default in LGDs, in accordance with the last sentence of Article 181(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, they should calculate realised LGD as the ratio of the economic loss to the outstanding amount of the credit obligation at the moment of default, and they should not increase the denominator of the ratio by the value of additional drawings by the obligor after the moment of default.

13.14 Irrespective of whether firms reflect additional drawings after the moment of default in their LGD estimates, they should calculate the economic loss used in the numerator of the realised LGD including all additional drawings after the moment of default and all realised recoveries discounted to the moment of default.

Discount rate

13.15 In order to ensure that their LGD estimates incorporate material discount effects, the PRA expects firms' methods for discounting cash flows to take account of the uncertainties associated with the receipt of recoveries with respect to a defaulted exposure. This could be, for example, by adjusting cash flows to certainty equivalents, by using a discount rate that embodies an appropriate risk premium, or by a combination of the two.

13.16 For the purpose of estimating long-run average LGD, the PRA expects firms to use a discount rate of Sterling Overnight Index Average (SONIA) at the moment of default plus five percentage points for exposures denominated in Pound Sterling (GBP). For the purpose of estimating long-run average LGD for exposures denominated in currencies other than GBP, firms should use a comparable liquid interest rate in the currency of that exposure.

13.17 For the purpose of estimating downturn LGD, the PRA expects firms to use a discount rate of at least 9%.

13.18 For defaulted exposures, the PRA expects firms to use a discount rate in line with paragraph 13.16 for estimating BEEL; and to use a discount rate in line with paragraph 13.17 for estimating LGD in-default.

13.19 For determining the discount rate to be used for defaults that occurred before 2 January 1997 (ie the first SONIA rate available from the Bank of England), the PRA expects firms to develop a suitable approach. This could for example be an extrapolation based on

available data or use of an appropriate alternative such as the relevant central bank rate for that period.

13.20 The PRA expects that the amount of recoveries that can be recognised as a cashflow and discounted should not be higher than the amount of recoveries the firm is contractually entitled to retain for the exposure.

Direct and indirect costs

13.21 The PRA expects that, for the purpose of the calculation of the realised LGDs, firms should take into account all material direct and indirect costs related to the recovery process. Where any such costs have been incurred before the moment of default, firms should include these costs in the LGD estimation unless at least one of the following conditions is met:

- (a) these costs are clearly included in the outstanding amount of the credit obligation at the moment of default; or
- (b) these costs are associated with the previous default of the same obligor, which is not considered a multiple default in accordance with paragraph 12.2.

13.22 Direct costs should include the costs of outsourced collection services, legal costs, the cost of hedges and insurances, and all other costs directly attributable to the collection on a specific exposure. Firms should consider all direct costs as material.

13.23 Indirect costs should include all costs stemming from the running of the firm's recovery processes, overall costs of outsourced collection services not included as direct costs, and all other costs related to the collection on defaulted exposures that cannot be directly attributed to collection on a specific exposure. Firms should include in their estimation of indirect costs an appropriate percentage of other ongoing costs such as overheads related to the recovery processes unless they can demonstrate that these costs are immaterial.

Low LGDs

13.24 The PRA expects firms to justify any low LGD estimates using analysis on volatility of sources of recovery, notably on collateral (where the firm is applying the LGD Modelling Collateral Method in accordance with Article 169A(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part), and cures (as referred to in paragraph 12.41). This includes, where relevant:

- (a) recognising that the impact of collateral volatility on low LGDs is asymmetric as surpluses over amounts owed need to be returned to borrowers and that this effect may be more pronounced when estimating downturn rather than normal period LGDs; and

- (b) recognising the costs and discount rate associated with realisations and the requirements of Article 181(1)(e) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Near-final

14: LGD – calibration (long-run average)

14.1 The PRA considers that the historical observation period for calibrating long-run average LGD estimates should be as broad as possible and should contain data from various periods with differing economic circumstances. For this purpose, firms should at a minimum select a historical observation period in such a way that:

- (a) the length of the historical observation period, ie the timespan between the oldest default considered in the RDS and the moment of the LGD estimation, covers at least the minimum length specified in Article 181(1)(j) of the Credit Risk: Internal Ratings Based Approach (CRR) Part for exposures to corporates and, for retail exposures, the period specified in the final sentence of Article 181(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part;
- (b) it ensures that the RDS includes a sufficient number of closed recovery processes in order to provide robust LGD estimates;
- (c) it is composed of consecutive periods and includes the most recent periods before the moment of LGD estimation;
- (d) it includes the full period for which the firm is reasonably able to replicate the currently applicable definition of default;
- (e) for exposures to corporates, all available internal data are considered ‘relevant’, as referred to in Article 181(1)(j) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, and are included in the historical observation period; and
- (f) for retail exposures, all internal data are included in the historical observation period.

14.2 In assessing whether the RDS includes a sufficient number of closed recovery processes in accordance with paragraph 14.1(b), firms should take into account the number of closed recovery processes in the total number of observations.

Calculation of long-run average LGD

14.3 In accordance with Article 181(1)(a) Credit Risk: Internal Ratings Based Approach (CRR) Part, firms are required to calculate long-run average LGD separately for each facility grade or pool. Firms should also calculate long-run average LGD at the level of the calibration segment covered by the LGD model where they apply the approach to calibration set out paragraph 14.15(b). Firms should use all defaults observed in the historical observation period that fall within the scope of the LGD model in the calculation of long-run average LGD.

14.4 Firms should calculate the long-run average LGD as an arithmetic average of realised LGDs over a historical observation period weighted by the number of defaults. Firms should

not use for that purpose any averages of LGDs calculated on a subset of observations, in particular any yearly average LGDs.

Treatment of incomplete recovery processes

14.5 The PRA expects that, for the purpose of calculating long-run average LGD based on all observed defaults in accordance with Article 181(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should ensure that relevant information from incomplete recovery processes is taken into account in a conservative manner.

14.6 Firms should calculate the observed average LGD taking into account realised LGDs on all defaults observed in the historical observation period related to closed recovery processes, in accordance with paragraphs 14.7 to 14.11, without including any expected future recoveries. The observed average LGD should be weighted by the number of defaults included in the calculation.

14.7 Firms should clearly specify in their internal policies the moment of closing the recovery processes. All recovery processes that have been closed should be treated as such for the purpose of the calculation of the observed average LGD.

14.8 Firms should define the maximum period of the recovery process for a given type of exposures from the moment of default that reflects the expected period of time observed on the closed recovery processes during which the firm realises the vast majority of the recoveries, without taking into account the outlier observations with significantly longer recovery processes. The maximum period of the recovery processes should be specified in a way that ensures sufficient data for the estimation of the recoveries within this period for the incomplete recovery processes. The length of the maximum period of the recovery processes may be different for different types of exposures.

14.9 The specification of the maximum period of the recovery process in accordance with paragraph 14.8 should be clearly documented and supported by evidence of the observed recovery patterns and should be coherent with the nature of the transactions and the type of exposures. The PRA expects that specification of the maximum period of the recovery process for the purpose of long-run average LGD estimation should not prevent firms from taking recovery actions where necessary, even with regard to exposures which remain in default for a period of time longer than the maximum period of the recovery process specified for this type of exposures.

14.10 For the purpose of the calculation of the observed average LGD, firms should, without undue delay, recognise as closed recovery processes all exposures in default which fall into at least one of the following categories:

- (a) exposures for which the firm does not expect to take any further recovery actions;

- (b) exposures that remain in defaulted status for a period of time longer than the maximum period of the recovery process specified for the type of exposures;
- (c) exposures fully repaid or written-off; or
- (d) exposures that have been reclassified to non-defaulted status.

14.11 With regard to the defaulted exposures falling under the categories in paragraphs 14.10(a) and 14.10(b), all recoveries and costs realised before or at the time of estimation should be considered for the purpose of the calculation of the observed average LGD, including any recoveries realised after the maximum period of the recovery processes.

14.12 Firms should obtain the long-run average LGD by adjusting the observed average LGD taking into account the information related to processes that were not closed ('incomplete recovery processes') and where the time from the moment of default until the moment of estimation is shorter than the maximum period of the recovery process specified for this type of exposures. For these processes, firms should do both of the following:

- (a) take into account all observed costs and recoveries; and
- (b) either estimate future costs and recoveries or assume zero future costs and recoveries. Where a firm estimates future costs and recoveries, these may include both those stemming from the realisation of the existing collateral and those to be realised without the use of collateral within the maximum period of the recovery processes.

14.13 The PRA expects that the estimation referred to in paragraph 14.12(b) should be consistent with the following principles:

- (a) for the purpose of estimation of the future costs and recoveries, firms should analyse the costs and recoveries realised on these exposures until the moment of estimation, in comparison with the average costs and recoveries realised during a similar period of time on similar exposures; for this purpose firms should analyse the recovery patterns observed on both closed and incomplete recovery processes, taking into account only costs and recoveries realised up to the moment of estimation;
- (b) the assumptions underlying the expected future costs and recoveries, as well as the adjustment to the observed average LGD, should be:
 - (i) proven accurate through back-testing;
 - (ii) based on a reasonable economic rationale; and
 - (iii) proportionate, taking into consideration that LGD estimates should be based on the long-run average LGD that reflects the average LGDs weighted by the number of defaults using all defaults observed during the historical observation period;
- (c) in estimating future recoveries, firms should take into account the potential bias stemming from incomplete recovery processes being characterised by longer

average recovery processes or lower average recoveries than closed recovery processes;

- (d) for firms applying the LGD Modelling Collateral Method in accordance with Article 169A(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, in estimating future recoveries stemming from the realisation of collateral, firms should take into account the legal certainty of the claims on the collateral and realistic assumptions regarding the possibility of its realisation;
- (e) the adjustment of the observed average LGD may be estimated at the level of individual exposures, at the level of grade or pool, at calibration segment level, or at the level of portfolio covered by the LGD model; and
- (f) any uncertainty related to the estimation of the future recoveries on incomplete recovery processes should be reflected in an adequate MoC applied in accordance with Chapter 9.

Treatment of cases with no loss or positive outcome

14.14 Where firms observe that they realised profit on their observations of defaults, the realised LGD on these observations should equal zero for the purpose of calculation of the observed average LGD and the estimation of long-run average LGD. Firms may use the information on the realised LGDs before the application of this floor in the process of model development for the purpose of risk differentiation.

Calibration to the long-run average LGD

14.15 Firms should calibrate their LGD estimates to the long-run average LGD calculated in accordance with paragraphs 14.1 to 14.14. For this purpose, firms should choose a calibration method that is appropriate for their LGD estimation methodology from the following approaches:

- (a) the calibration of LGD estimates to the long-run average LGD calculated for each grade or pool, in which case they should provide additional calibration tests at the level of the relevant calibration segment; or
- (b) the calibration of LGD estimates to the long-run average LGD calculated at the level of the calibration segment, in particular where they use direct LGD estimates in accordance with Article 169(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, including where they use an LGD estimation methodology based on intermediate parameters. In this case, firms should at least compare this long-run average LGD with the average LGD estimate applied to the same set of observations as those used for calculating the long-run average LGD and, where necessary, correct the individual LGD estimates for the application portfolio accordingly, for instance by using a scaling factor. Where realised values are higher than estimated values at the

level of calibration segment, firms should correct the estimates upwards or further adjust their estimates in order to reflect their loss experience.

14.16 Where firms observe extremely high values of realised LGDs that are significantly above 100%, especially for exposures with small outstanding amounts at the moment of default, they should identify relevant risk drivers to differentiate these observations and adequately reflect these specific characteristics in the assignment of exposures to facility grades or pools. Where firms use a continuous rating scale in the LGD estimation, they may create a separate calibration segment for such exposures.

14.17 In order to comply with the requirement of Article 181(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part to use all observed defaults in LGD quantification, firms should not exclude any defaults observed in the historical observation period that fall within the scope of application of the LGD model.

14.18 The PRA expects that in their analysis of the representativeness of data in accordance with paragraphs 8.10 to 8.15, firms should take into account not only the current characteristics of the portfolio but also, where relevant, the changes to the structure of the portfolio that are expected to happen in the foreseeable future due to specific actions or decisions that have already been taken. Adjustments made on the basis of the changes expected in the foreseeable future should not lead to a decrease in the estimates of LGD parameter.

15: LGD – calibration (downturn)

General requirements on downturn LGD estimation

15.1 The PRA expects that for the purpose of quantifying downturn LGD, a firm should apply the following expectations specific to downturn LGD estimates by facility grade or pool:

- (a) calibrate downturn LGD at least at the same level at which the firm calculates the corresponding long-run average LGD for the purpose of calibrating LGD in accordance with paragraph 14.15; and
- (b) split the set of facilities covered by the same LGD model into as many different calibration segments as needed, where each calibration segment carries a significantly different loss profile and might thus be affected differently by different downturn periods. For this purpose, the firm should at least consider the appropriateness of introducing calibration segments that cover material shares of exposure in different geographical areas, in different industry sectors and, for retail exposures, of different product types.

15.2 As set out in Article 181C(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, for the purpose of identifying an economic downturn, firms are required to examine economic indicators over a historical timespan that provides values that are representative of the likely range of variability in the future, and the historical timespan selected must have a duration of at least 20 years. The PRA expects that firms should select a historical timespan which enables the identification of economic indicator values that represent sufficiently severe downturn conditions. If the economic indicator values in a selected timespan do not represent sufficiently severe downturn conditions, firms should extend their historical timespan beyond the minimum 20-year period.

15.3 Where firms identify multiple distinct downturn periods in accordance with Article 181A(2)(c) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, they should perform each of the following steps in sequence:

- (a) calibrate downturn LGD for each identified downturn period in accordance with paragraph 15.9 for each calibration segment, except where firms can provide evidence that the economic factors are not relevant for a given calibration segment;
- (b) for each of those downturn periods, apply the resulting downturn LGD estimates to their current non-defaulted exposures of the type of exposures under consideration;
- (c) identify the 'finally relevant downturn period' as being the downturn period that results in the highest average downturn LGD, including the final MoC as set out in paragraph 9.10, on a given calibration segment of their current non-defaulted exposures as referred to in point (b);

- (d) use the downturn LGDs resulting from the finally relevant downturn period referred to in point (c) to determine the downturn LGD in accordance paragraph Article 181(b)(i) of the Credit Risk: Internal Ratings Based Approach (CRR) Part for each calibration segment; and
- (e) if a firm can calibrate downturn LGD in accordance with this SS for one or more downturn periods, but is unable to do this for one or more other downturn periods, it should add an appropriate Category A MoC in accordance with paragraph 9.7.

Adjustments to downturn LGDs where risk drivers are sensitive to the economic cycle

15.4 Where risk drivers are sensitive to the economic cycle, firms should undertake the analysis set out in Article 181(1)(b)(ii)(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part and make any adjustments to the downturn LGDs referred to in paragraph 15.3(c) that are required by Article 181(1)(b)(ii)(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

15.5 For the purpose of applying paragraph 15.4 in respect of exposures to corporates, firms should consider whether any adjustments they already make to address cyclicity in LGD estimates, for example through conservative approaches to haircutting collateral values, are sufficient such that no further adjustment to downturn LGDs is required by Article 181(1)(b)(ii)(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Final downturn LGD estimates

15.6 For the purpose of ensuring that the resulting downturn LGDs are used if they are more conservative than the long-run average LGDs in accordance with Article 181(1)(b)(i) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, a firm should apply the following:

- (a) where the firm uses separate estimation methodologies for long-run average LGD and downturn LGD, the firm should compare their final downturn LGDs used for calibration plus the final MoC as set out in paragraph 9.10, to their long-run average LGDs plus the final MoC as set out in paragraph 9.10 at the level where the long-run average LGD is calculated for the purpose of calibrating LGD in accordance with paragraph 14.15; and
- (b) where the firm sets a single LGD estimate, which involves a long-run average LGD estimation and a downturn adjustment added to the long-run average LGD estimation, it should ensure that the final MoC as set out in paragraph 9.10 applied to downturn LGD estimates encompasses the uncertainties stemming from both the long-run average LGD estimation and the calculation of the downturn adjustment.

Calculation of reference values

15.7 Firms should calculate a reference value at least at the level of each calibration segment in accordance with the following sequence of steps:

- (a) using all available loss data, firms should select the two individual years with the highest observed economic loss by:
 - (i) grouping all defaults according to the year in which the defaults occurred;
 - (ii) for each year, as identified in point (i), calculating for the defaults that occurred in the applicable year, the ratio of total economic loss as specified in paragraphs 13.1 to 13.23 to the total outstanding amount of the relevant credit obligations at the moment of default; and
 - (iii) selecting the two individual years with the highest annual ratio of total economic loss to total outstanding amount resulting from point (ii) as the two individual years with the highest observed economic losses;
- (b) firms should calculate the reference value as the simple average of the average realised LGDs from the two individual years with the highest observed economic losses, as identified in paragraph 9.2(a)(iii).

15.8 Firms should compare the final downturn LGD with the reference value calculated in accordance with paragraph 15.7 at least at the level of calibration segments. Firms should justify any material difference between the final downturn LGD and the reference value.

15.9 When comparing the final downturn LGD with the reference value in line with paragraph 15.8, firms should take into account all of the following:

- (c) a material difference between the final downturn LGD plus the final MoC as set out in paragraph 9.10 and the reference value can be justified if the period of losses identified by the reference value does not stem from an identified or unidentified downturn period. Where the underlying downturn LGD is based on the methodology in paragraphs 15.14 to 15.16, firms may consider the evidence gathered from the impact assessment in paragraph 15.14; and
- (d) if the material difference between the final downturn LGD and the reference value cannot be justified, firms should re-assess their quantification of downturn LGD ensuring in particular that the downturn periods have been identified comprehensively and that, where intermediate parameters are used, the impact of the relevant downturn period observed (based on paragraphs 15.14 to 15.16) or estimated (based paragraphs 15.17 to 15.23) on intermediate parameters has been aggregated adequately. If a firm has re-assessed its quantification of downturn LGD and found the methodology to be adequate, this assessment can be used to justify a material difference between the final LGD and the reference value.

Downturn LGD estimation for a considered downturn period

15.10 For the purpose of calibrating downturn LGD for each distinct downturn period identified in accordance with Articles 181A, 181B and 181C of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should either:

- (a) estimate downturn LGD based on observed impact as set out in paragraphs 15.14 to 15.16; or
- (b) estimate downturn LGD based on estimated impact as set out in paragraphs 15.17 to 15.22.

15.11 The PRA considers that either a component-based modelling approach or a direct estimate modelling approach can be used when LGD is estimated based on observed impact, and that a component-based approach can be used when LGD is estimated based on estimated impact. However, the PRA considers that it is unlikely that firms will be able to produce robust direct estimate downturn LGD models for residential mortgages. Therefore, the PRA expects firms to use a component-based approach for these exposures.

15.12 The PRA expects firms using a component-based approach to modelling downturn LGD to ensure that all components reflect a downturn, and that each component reflects the same downturn. Firms should take into account any time lags between the downturn period and the potential impact on their loss data. Therefore, while model components should reflect the same downturn, a time lag may be necessary so that the peak value within the same downturn is used for each model component. Firms should ensure the time lags are not so long that they result in LGD estimates that are reflective of an upturn or improved economic conditions.

15.13 Regardless of the approach used for calibrating downturn LGD, firms should adhere to the following principles:

- (a) where the approach used involves the estimation or analysis of different intermediate parameters, the aggregation of these intermediate parameters for the purpose of calibrating downturn LGD should start with the parameter where the highest impact is observed in accordance with paragraphs 15.13 to 15.16 or estimated in accordance with paragraphs 15.17 to 15.23, and any additional impact observed or estimated on other parameters should be added where necessary; and
- (b) the downturn LGD estimates should not be biased by observed or estimated cash flows that are received with a significantly longer time lag than the period referred to in paragraphs 14.8 and 14.9 and which might reflect an upturn or improved economic conditions following the considered downturn period.

Downturn LGD estimation based on observed impact

15.14 In order to calibrate downturn LGD based on the observed impact of a considered downturn period, firms should carry out an analysis of the impact of this downturn period on the loss data related to the considered calibration segment.

- (a) The analysis should comprise at least all of the following:
 - (i) evidence of elevated levels of realised LGDs, driven by the considered downturn period, taking into account all of the following:
 - 1. the realised LGDs should be calculated as averages related to all defaults that occurred in a considered year and that have either reached their maximum time of recovery in accordance with paragraphs 14.8 and 14.9 or have been closed before; and
 - 2. for all incomplete recovery processes of defaulted exposures that have not reached their maximum time of recovery in accordance with paragraphs 14.8 and 14.9, the marginal recoveries reached in each year after default should be computed. The resulting recovery patterns should be compared to the recovery patterns of the defaults considered in point (1) for each year in which the defaults occurred;
 - (ii) evidence of decreased annual recoveries by sources of recoveries that are relevant for the considered calibration segment. These annual recoveries should be analysed with and without reposessions where applicable and irrespective of the date of default;
 - (iii) evidence of decreased numbers of exposures that defaulted and returned back to non-defaulted status in accordance with Article 178(5) of the Credit Risk: Internal Ratings Based Approach (CRR) Part within a predefined fixed horizon for all defaults that occurred in a given year. The predefined fixed horizon should be appropriate for the type of exposures under consideration;
 - (iv) evidence of increased time in default per year related to all defaults in a given year.
- (b) the analysis expected in paragraph 15.14(a) should take into account as many points in time as possible where sufficient relevant loss data are available. Otherwise, if only scarce relevant loss data are available on an annual basis, firms should merge consecutive years of observations provided this adds value to the analysis; and
- (c) the analysis expected in paragraphs 15.14(a) and 15.14(b), should take into account any lag between a downturn period and the time when its potential impact is observed on the relevant loss data.

15.15 Based on the evidence obtained from the impact analysis referred to in paragraph 15.14, firms should calibrate downturn LGD by applying an estimation methodology which is coherent with the evidence obtained from the impact analysis.

15.16 Where the impact analysis conducted in accordance with paragraph 15.14 shows no impact of a downturn period on a firm's relevant loss data, such that the average observed realised losses in this downturn period are not different from those under other economic conditions, the firm may use the long-run average LGD as downturn LGD, where all of the following apply:

- (a) the firm ensures and documents that the deficiencies identified and MoC applied in accordance with Chapter 9 incorporate all additional elements of uncertainty related to the identified downturn periods; and
- (b) for the purpose of point (a), the firm in particular verifies that, for the considered downturn period, none of the deficiencies identified resulting in a Category A MoC in accordance with paragraph 9.7 are of higher severity and that no additional deficiencies or adjustments necessitating a Category B MoC in accordance with paragraph 9.7 are applicable.

Downturn LGD estimation based on estimated impact

15.17 In order to estimate downturn LGD based on estimated impact, firms should calibrate downturn LGD using one of the methodologies specified in paragraph 15.19 ('haircut approach') and paragraph 15.20 ('extrapolation approach'), or a combination of those. Prior to quantifying downturn LGD estimates, firms should choose the most relevant methodology based on:

- (a) the appropriateness of the methodology to estimate the impact of the downturn period under consideration on realised LGDs, intermediate parameters or risk drivers; and
- (b) where relevant, the need to use a combination of the methodologies to ensure that the resulting downturn LGDs for the downturn period under consideration adequately reflect a potential downturn impact on all material components of economic loss in accordance with paragraphs 13.1 to 13.23 and in accordance with the principles set out in paragraph 15.13.

15.18 In particular, the haircut approach specified in paragraph 15.19 should be considered most appropriate for the above purposes where the market value or an index related to a relevant type of collateral serves as a direct or transformed input into a firm's model for LGD estimation and has been identified as a relevant economic factor in accordance with Article 181B of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

15.19 A 'haircut approach' refers to an approach for the estimation of the impact of the downturn period on realised LGDs, intermediate parameters, or risk drivers in which one or several economic factors as referred to in Article 181B of the Credit Risk: Internal Ratings Based Approach (CRR) Part are direct or transformed input(s) in the LGD model and, where for the purpose of this estimation, these input(s) are adjusted to reflect the impact of the

downturn period under consideration. In particular, where the considered economic factor relates to the downturn period under consideration, the haircut should be based on the most severe observation of this economic factor in accordance with the specification of the severity of an economic downturn laid down in Article 181A(2)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

15.20 An ‘extrapolation approach’ refers to the estimation of the impact of the downturn period under consideration on LGDs, intermediate parameters, or risk drivers if all of the following are met:

- (a) where a statistically significant dependency between the realised LGDs, intermediate parameters, or risk drivers, averaged over appropriate periods in time, and the economic factors selected in accordance with Article 181B of the Credit Risk: Internal Ratings Based Approach (CRR) Part which are relevant for the downturn period under consideration, can be established, the resulting estimates are based on the extrapolated values of the average realised LGDs, intermediate parameters or risk drivers to the period reflecting the impact of the downturn period; and
- (b) where no statistically significant dependency as described in paragraph 15.20(a) can be established for an intermediate parameter or risk driver, firms may estimate the impact of the downturn period under consideration on an intermediate parameter or risk driver based on observed data from a different period, where all of the following are met:
 - (i) at least those components of economic loss that explain the major share of the total economic loss should be estimated by either a haircut approach in accordance with paragraph 15.19 or an extrapolation approach in accordance with paragraph 15.20(a);
 - (ii) the firm has observed data for the intermediate parameter or risk driver for a sufficient period reflecting economic downturn conditions; and
 - (iii) the intermediate parameter or risk driver under consideration shows low volatility in the periods referred to in point (ii).

15.21 Where firms have observed data covering the downturn period and reflecting the impact of the respective downturn conditions under consideration on an intermediate parameter or risk driver, they should use the observed data in combination with the haircut or extrapolation approach to calibrate downturn LGD for the considered downturn period in accordance with paragraph 15.17.

15.22 Where firms apply any of the approaches outlined in paragraphs 15.19 to 15.21 for the purpose of estimating intermediate parameters or risk drivers, they should ensure that the dependency structure between intermediate parameters or risk drivers is reflected appropriately in the aggregation of these intermediate parameters or risk drivers in accordance with paragraph 15.17.

15.23 Firms should quantify a Category A MoC in accordance with paragraph 9.7 for all approaches in this chapter. In particular, firms applying an extrapolation approach:

- (a) as referred to in paragraph 15.20(a), should quantify the Category A MoC by using an appropriate confidence interval to reflect the uncertainty related to the statistical model used to describe the dependency between the realised LGDs, intermediate parameters, or risk drivers and the relevant economic factors; and
- (b) for an intermediate parameter or risk driver as referred to in paragraph 15.20(b), should quantify the Category A MoC taking into account the ratio of the value(s) of the economic factor(s) underlying the relevant downturn period identified in accordance with Article 181A of the Credit Risk: Internal Ratings Based Approach (CRR) Part and value(s) of the relevant economic factor(s) observed in the periods referred to in paragraph 15.20(b)(ii).

LGD – UK residential mortgage property sales reference point

15.24 The PRA considers that an average reduction in property sales prices of 40% from their peak price, prior to the market downturn, forms an appropriate reference point when assessing downturn LGD for UK residential mortgage portfolios and expects a firm's rating systems to assume a reduction at least as severe as this. This reduction captures both a fall in the value of the property due to market value decline as well as a distressed forced sale discount. The PRA expects the assumption for the fall in the value of the property due to house price deflation not to be lower than 25%.

15.25 Where firms adjust assumed house price values within their LGD models to take account of current market conditions (for example, with reference to appropriate house price indices) realised falls in market values may be captured automatically. Firms adopting such approaches may remove observed house price falls from their downturn house price adjustment so as not to double count. The PRA expects all firms wishing to apply such an approach to be able to demonstrate that the following criteria are met:

- (a) the adjustment applied to the market value decline element of a firm's LGD model is explicitly derived from the decrease in indexed property prices (ie the process is formulaic, not judgemental);
- (b) the output from the adjusted model has been assessed against the 40% peak-to-trough property sales prices decrease expectation referred to in paragraph 15.24 (after inclusion of a forced sale discount);
- (c) a minimum 5% market value decline applies at all times in the LGD model; and
- (d) the firm has set a level for reassessment of the property market price decline from its peak. For example, if a firm has initially assumed a peak-to-trough market decline of 25%, then it should set a level of market value decline where this assumption will be reassessed.

Probability of possession given default (PPGD) estimates for UK residential mortgage exposures

15.26 The PRA expects firms to ensure that PPGD estimates appropriately reflect economic downturn conditions. The PRA expects (in line with paragraphs 15.24 and 15.25 above) downturn PPGD estimates to be consistent with a fall in the value of property due to house price deflation not lower than 25% from the previous peak price, and not lower than 5% from the current price.

15.27 Firms should reflect these economic downturn conditions in their PPGD models by ensuring that:

- (a) the allocation of exposures to rating grades is consistent with the reductions in property values set out above; and
- (b) the calibration of possession rates for a given rating grade is based on data reflecting the reductions in property values set out above. If the data reflect reductions in property values that are lower than either reduction above, firms should appropriately adjust their calibration within grades to be consistent with these property values.

15.28 If a firm's PPGD model is not sensitive, or is less sensitive, to falls in property values, for example if the model uses values at origination and not current values to assign exposures to rating grades, the firm should ensure that its calibration of possession rates reflects economic conditions where property values are at least 25% below their peak values. The firm should also demonstrate to the PRA that the model achieves similar outcomes as it would if it was using current property values to assign exposures to rating grades, including in stressed scenarios.

15.29 Firms with limited data from a downturn should apply an additional MoC in respect of PPGD estimation relative to that which would otherwise be calculated under paragraph 9.7.

15.30 For firms with low internal experience of possessions, the PRA expects firms to assess the appropriate MoC in the calculation of PPGD against the reference points set out in paragraph 15.31.

15.31 The PRA considers the following reference points to be appropriate for the assessment referred to in paragraph 15.30:

- (a) a PPGD reference point of 100% where there are very low default volumes, regardless of the length of observed outcomes; and
- (b) a PPGD reference point of 70% where firms are able to demonstrate they have greater, but still not considerable, volume and history of data to estimate future possession rates.

15.32 The PRA expects firms to assess whether, on a case-by-case basis, they can apply a PPGD level above or below the reference point relevant to their circumstances. Indicators supporting a PPGD level set higher than 70% include: high LTV lending, buy-to-let lending, and levels of default data towards the lower end of the mortgage lenders cohort. Indicators supporting a PPGD level set lower than 100% or 70% include: low LTV lending, owner-occupied lending, and more data than typical of the cohort. The PRA will consider a firm's proposal to use a lower level of PPGD than the relevant reference point on a case-by-case basis.

15.33 In accordance with the requirements of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms using the reference points referred to in paragraph 15.31 as a basis for calculating the MoC referred to in paragraph 15.30 still need to maintain an LGD model subject to appropriate governance and monitoring requirements. As a firm gains additional data, and the modelled PPGD estimates rely upon internal data to a greater extent, the PRA expects the appropriate MoC referred to in paragraph 15.30 to decline.

16: LGD – In-default estimation

Estimation methodologies for best estimate of expected loss (BEEL) and LGD in-default

16.1 The PRA expects that firms using the AIRB approach should assign a BEEL estimate and an LGD in-default estimate to each defaulted exposure within the range of application of each rating system for which this approach is used.

16.2 Firms should estimate BEEL and LGD in-default for each of the facility grades of the distinct facility rating scale or for each of the pools that are used within the rating system.

16.3 For the purposes of BEEL and LGD in-default estimation, and unless otherwise specified in this chapter, firms should use the same estimation methods used for estimating LGD for non-defaulted exposures, as set out in Chapter 13 – LGD – calibration (general) and Chapter 14 – LGD – calibration (long-run average).

16.4 Firms should take into consideration all relevant post-default information in their BEEL and LGD in-default estimates in a timely manner, in particular where events from the recovery process invalidate the recovery expectations underlying the most recent estimates.

16.5 Firms should assess and duly justify situations where the estimates of LGD in-default shortly after the date of default systematically deviate from the LGD estimates immediately before the date of default at the facility grade or pool, where these deviations do not stem from the use of risk drivers that are applicable only from the date of default onwards.

16.6 Firms should perform back-testing and benchmarking of their BEEL and LGD in-default estimates in accordance with Articles 185(b) and 185(c) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Reference dates

16.7 The PRA expects that, for the purposes of BEEL and LGD in-default estimation, firms should set the reference dates to be used for grouping defaulted exposures in accordance with the recovery patterns observed. These reference dates should be used in the estimation of BEEL and LGD in-default instead of the date of default. For the purposes of setting the reference dates, firms should use information only on closed recovery processes, taking into account costs and recoveries only if observed up to the date of estimation.

16.8 The PRA considers that each of the reference dates referred to in paragraph 16.7 could be any of the following:

- (a) a specific number of days after the date of default; this option would be appropriate in particular where the estimation refers to a portfolio of exposures showing a stable recovery pattern through time;
- (b) a relevant date associated with a specific event at which significant breaks in the recovery profile are observed; this option would be appropriate in particular where the estimation refers to a portfolio of exposures that are subject to significant changes of the recovery patterns associated with certain specific events, for instance at the date of realisation of collateral;
- (c) any combination of the cases referred to in points (a) and (b) that better reflects the recovery patterns; this option would be appropriate in particular where the estimation refers to a portfolio of exposures showing a stable recovery pattern through time but for which breaks in such recovery patterns are observed around certain specific events, for instance at collection, and where the reference dates following those events are defined as a specific number of days after the recovery event, rather than after the date of default; or
- (d) where appropriate, the reference date can have any value between zero and the number of days until the end of the maximum period of the recovery process set by the firm for the type of exposures in question.

16.9 For the purposes of BEEL and LGD in-default estimation, the same defaulted exposures in the RDS should be used at all relevant reference dates considered in the model.

16.10 Firms should monitor, on a regular basis, potential changes in recovery patterns and in relevant recovery policies which may affect the estimation of BEEL and LGD in-default at each reference date.

Data requirements for BEEL and LGD in-default estimation

16.11 For the purposes of BEEL and LGD in-default estimation, firms should use the same RDS referred to in paragraphs 12.11 to 12.18, complemented by any relevant information observed during the recovery process and at each reference date, specified in accordance with paragraphs 16.7 to 16.10, and in particular at least the following additional information:

- (a) all relevant factors that can be used to group defaulted exposures, and all relevant drivers of loss, including those that may become relevant after the date of default and at each reference date;
- (b) the amount outstanding at each reference date; and
- (c) the values of any collateral associated with the defaulted credit obligations and their dates of valuation after the date of default.

Model development in the estimation of BEEL and LGD in-default

16.12 Firms may take into account information on the time in-default and recoveries realised so far either directly as risk drivers, or indirectly, for example by setting the reference date for estimation as referred to in paragraphs 16.7 to 16.10.

16.13 For the purpose of BEEL and LGD in-default estimation, firms should analyse the potential risk drivers referred to in paragraph 12.25 not only until the moment of default but also after the date of default and until the date of termination of the recovery process. Firms should also analyse other potential risk drivers that might become relevant after the date of default, including in particular the expected length of the recovery process and the status of the recovery process. Firms should use the values of risk drivers as well as the values of collateral adequate to the reference dates specified in accordance with paragraphs 16.7 to 16.10.

Calculation of realised LGD and long-run average LGD for defaulted exposures

16.14 For the purposes of BEEL and LGD in-default estimation, firms should calculate realised LGDs for defaulted exposures in accordance with Chapter 13 with the exception that this should be done with regard to each of the reference dates specified in accordance with paragraphs 16.7 to 16.10, rather than the date of default. In the calculation of the realised LGD at a given reference date, firms should include all fees and interest capitalised before the reference date, and they should discount all subsequent cash flows and drawings to the reference date.

16.15 Where, after the moment of default, firms write off part of the exposure, the calculation of the economic loss and the realised LGD should be based on the full amount of the outstanding credit obligation without taking into account the partial write-off. However, where firms regularly write-off parts of exposures based on a consistent policy in terms of the time and proportion of the write-off, they may include this information in the calibration of final BEEL and LGD in-default. Where firms perform write-offs in a less regular manner, they may reflect the information about the partial write-off of a specific exposure in the application of these parameters to this exposure by overriding the output of the rating assignment process in accordance with paragraphs 19.9 to 19.16 in order to ensure consistency between the LGD estimation and the application of the LGD estimates.

16.16 For the purposes of BEEL and LGD in-default estimation, firms should calculate the long-run average LGD of the realised LGDs for defaulted exposures referred to in paragraph 16.14, in accordance with the expectations set out in paragraphs 14.1 to 14.2, with the exception that, for each reference date, incomplete recovery processes should only be used

if their relevant reference date for the application of the BEEL and LGD in-default parameters is posterior to the reference date under consideration for the estimation.

16.17 In accordance with paragraphs 14.8 to 14.12, firms should not estimate any future recoveries for exposures that remain in defaulted status for a period of time longer than the maximum length of the recovery process as specified by the firm. However, relevant information regarding specific exposures, in particular information about the existence of collateral, may be reflected in the application of these parameters by overriding the output of the rating assignment process in accordance with paragraphs 19.9 to 19.16 and subject to the restriction set out in the last sub-paragraph of Article 172(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Consideration of MoC in BEEL estimation

16.18 The PRA expects that the BEEL referred to in Article 181(1)(h) of the Credit Risk: Internal Ratings Based Approach (CRR) Part should not include any MoC as referred to in paragraphs 9.6 to 9.17.

Current economic circumstances

16.19 The PRA expects that, for the purposes of considering current economic circumstances in their BEEL estimates referred to in Article 181(1)(h) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should take into account economic factors, including macroeconomic and credit factors, which are relevant for the type of exposures under consideration.

16.20 The PRA expects that the BEEL should be estimated based on the long-run average LGD, referred to in paragraph 16.16. Firms are not expected to make any further adjustments to reflect current economic conditions where the long-run average LGD reflects current economic conditions due to one or more of the following being met:

- (a) the model includes directly at least one macroeconomic factor as a risk driver;
- (b) at least one material risk driver is sensitive to economic conditions; or
- (c) the realised LGD for defaulted exposures, referred to in paragraph 16.14, is not sensitive to the economic factors relevant for the type of exposures under consideration.

16.21 Where necessary, firms should adjust the long-run average LGD for defaulted exposures to reflect current economic conditions. In this case, firms should document separately the long-run average LGD for defaulted exposures as referred to in paragraph 16.16 and the adjustment to current economic conditions.

Relation of BEEL to specific credit risk adjustments

16.22 Where a firm's model used for credit risk adjustments satisfies or can be adjusted to satisfy the requirements for own estimates of LGD set out within Articles 169 to 191 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA considers that the firm may use specific credit risk adjustments as BEEL estimates.

16.23 Where specific credit risk adjustments are assessed individually for a single exposure or a single obligor, the PRA considers that firms may override the BEEL estimates based on specific credit risk adjustments where they are able to prove that this would improve the accuracy of the BEEL estimates and that the specific credit risk adjustments reflect or are adjusted to the requirements set in paragraphs 13.1 to 13.23 relating to the calculation of economic loss.

Downturn LGD estimation for defaulted exposures

16.24 For downturn LGD estimation for defaulted exposures, firms should use the same downturn period as identified for the corresponding non-defaulted exposures.

16.25 For downturn LGD estimation for defaulted exposures, the PRA expects firms to do all of the following for the downturn period referred to in paragraph 16.24:

- (a) for the downturn component of LGD estimation for defaulted exposures as referred to in paragraph 16.28(b)(i):
 - (i) calibrate downturn LGD for the defaulted exposures relevant for each reference date in accordance with paragraphs 15.10 to 15.13 by inferring the downturn component of the LGD in-default for each reference date based on the difference between the downturn LGD estimate and the BEEL; or
 - (ii) first calibrate downturn LGD in accordance with paragraphs 15.10 to 15.13 for the defaulted exposures under consideration for the moment of default and subsequently infer the downturn component of the LGD in-default at other reference dates based on the difference between the downturn LGD estimate at the moment of default and the BEEL at the moment of default;
- (b) for the purpose of applying paragraph 16.25(a)(ii), firms may use the downturn component of LGD estimates for non-defaulted exposures instead of the downturn component for defaulted exposures at the moment of default where the firm can provide evidence that this results in more conservative estimates; and
- (c) for the purpose of applying paragraph 16.25(b), and where firms use separate estimation methodologies for long-run average and downturn LGD in accordance with paragraph 15.6(a), the downturn component of LGD estimates for non-defaulted exposures may be inferred by considering the difference between the resulting

downturn LGD estimates and the corresponding long-run average LGDs, taking into account the information documented according to paragraph 16.28.

Specific requirements for LGD in-default estimation

16.26 The PRA expects firms to ensure that the LGD in-default is higher than the BEEL, or in exceptional cases is equal to the BEEL, for each exposure.

16.27 To the extent that the reasons for any overrides of the outputs of BEEL estimation are also relevant to LGD in-default, a consistent override should also be applied to the assignment of LGD in-default in such a way that the add-on to BEEL covers any increase of loss rate caused by possible additional unexpected losses during the recovery period in accordance with Article 181(1)(h) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

16.28 The PRA expects firms should separately document all of the following:

- (a) the breakdown of LGD in-default into the following components:
 - (i) the BEEL;
 - (ii) the difference between BEEL and LGD in-default;
- (b) the breakdown of LGD in-default into the following components:
 - (i) the downturn LGD as referred to in Article 181(1)(h)(i) of the Credit Risk: Internal Ratings Based Approach (CRR) Part;
 - (ii) any increase to the downturn LGD to reflect potential additional unexpected losses during the recovery period as referred to in Article 181(1)(h)(ii) of the Credit Risk: Internal Ratings Based Approach (CRR) Part; and
- (c) the MoC component of LGD in-default as referred to in paragraphs 9.6 to 9.17.

16.29 The PRA considers that firms need only apply increases to downturn LGDs to reflect potential additional unexpected losses during the recovery period as referred to in Article 181(1)(h)(ii) of the Credit Risk: Internal Ratings Based Approach (CRR) Part in exceptional circumstances where the potential additional losses are not sufficiently reflected in downturn LGDs, including the MoC component applied.

17: EAD – model development and calibration

Methodology for estimating EAD or conversion factors

17.1 Firms may choose to provide own estimates of EAD in place of the own estimates of CF in accordance with Article 166D(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part. Firms are also required to estimate EAD for certain exposures according to Article 166D(4) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

17.2 The PRA considers that there are a number of potentially compliant approaches to estimate EAD and that an acceptable approach is to estimate EAD as a percentage of total limit (Limit Factor estimation).

17.3 The PRA considers that firms estimating Limit Factors may either:

- (a) use Limit Factor estimates as an intermediate step to obtain formulaically derived long-run average and downturn CF estimates in accordance with Articles 182(1)(a) and 182(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part; or
- (b) use long-run average and downturn Limit Factors to obtain estimates of EAD in accordance with Article 182(1)(a) and Article 182(1)(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

17.4 CRR Article (4)(1)(56) defines CF such that the extent of a commitment is determined by the advised limit. The PRA therefore does not expect firms to include unadvised limits when determining the limit at the point of observation for the purpose of calculating realised and estimated CFs.

17.5 The PRA expects however that firms should reflect the total balance at default of a facility in realised and estimated CFs, regardless of whether this balance arises from an advised or unadvised limit. Similarly, the PRA also expects that firms reflect the total balance at default of a facility in realised and estimated EADs, regardless of whether this balance arises from an advised or unadvised limit.

General expectations for estimating EAD or CF

17.6 Downturn EAD or CF estimates should reflect the exposure expected to be outstanding under a current facility should it go into default in the next year, assuming that:

- (a) economic downturn conditions occur in the next year; and
- (b) the firm's policies and practices for controlling exposures remain unchanged, other than changes that result from the economic downturn conditions.

17.7 To the extent that a firm makes available multiple facilities, the PRA expects the firm to be able to demonstrate:

- (a) how it deals with the potential for exposures on one facility to become exposures under another on which the losses are ultimately incurred; and
- (b) the impact of its approach on its capital requirements.

17.8 The PRA expects firms using own estimates of EAD or CF to do all of the following in respect of EAD or CF estimates:

- (a) apply EAD or CF estimates at the level of the individual facility;
- (b) where there is a paucity of observations, ensure that long-run average and downturn EAD or CF estimates are cautious, conservative and justifiable. In accordance with Article 179(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, estimates must be derived using both historical experience and empirical evidence, and must not be based purely on judgemental consideration. The PRA expects firms to document their justification of why they consider their estimates to be sufficiently conservative;
- (c) identify and explain at a granular level how each estimate has been derived. This should include an explanation of how internal data, any external data, expert judgement, or a combination of these has been used to produce the estimate;
- (d) clearly document the process for determining and reviewing estimates, and the parties involved in the process in cases where expert judgement was used;
- (e) demonstrate an understanding of the impact of the economic cycle on exposure values and be able to use that understanding in deriving downturn EAD or CF estimates;
- (f) demonstrate sufficient understanding of any external benchmarks used and identify the extent of their relevance and suitability to the extent that the firm can satisfy itself that they are fit for purpose;
- (g) evidence that they are aware of any weaknesses in their estimation process and set standards, for example related to accuracy, that their estimates are designed to meet;
- (h) ensure that in most cases estimates incorporate effective discrimination on the basis of at least product features and customer type. In cases where these risk drivers are not incorporated into EAD or CF estimates, then the PRA expects the firm to be able to demonstrate why they are not relevant;
- (i) have an ongoing data collection framework to collect all relevant internal exposure data required for estimating EADs or CFs and a framework to start using this data as soon as any meaningful information becomes available;
- (j) make use of data that have been collected to identify all relevant drivers of EAD or CF and understand how these drivers would be affected by a downturn; and
- (k) identify dependencies between default rates and EADs or CFs for various products and markets when estimating downturn EADs. Firms are expected to consider how

they expect their own policies regarding exposure management to evolve in a downturn.

Adjustments to downturn EADs or CFs where risk drivers are sensitive to the economic cycle

17.9 Where risk drivers are sensitive to the economic cycle, firms should undertake the analysis set out in Article 182(1)(b)(ii)(1) of the Credit Risk: Internal Ratings Based Approach (CRR) Part and make any adjustments to the downturn EADs or CFs that are required by Article 181(1)(b)(ii)(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

Distortions to CF estimates caused by low undrawn limits

17.10 The PRA expects that firms directly estimating CFs, in accordance with Article 182(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, should ensure that their CF estimates are appropriate for the exposures upon which they are based and that the potential for modelled CF estimates to be biased by facilities that are close to being fully drawn at the observation date are minimised.

17.11 In order to ensure that CF estimates are not biased due to facilities being close to fully drawn at observation date in accordance with paragraph 17.8, the PRA expects that where RDSs contain a significant number of such observations, firms should:

- (a) investigate the distribution of realised CFs in the RDS;
- (b) base the estimated CF on an appropriate point along that distribution that results in the choice of a CF appropriate for the exposures to which it is being applied and a CF consistent with the requirement in Article 179(1)(f) of the Credit Risk: Internal Ratings Based Approach (CRR) Part for estimates to include a MoC related to estimation errors;
- (c) be cognisant that while the median of the distribution might be a starting point, they should not assume without analysis that the median represents a reasonable unbiased estimate. The PRA expects firms to consider whether the pattern of distribution in realised CFs means that some further segmentation is needed (eg treating facilities that are close to full utilisation differently); and
- (d) apply the more conservative of the long-run average CF or the downturn CF estimate, including where percentile approaches to estimation are used.

Identification of exposures for which an EAD or CF must be estimated

17.12 The cases where an EAD or CF shall be modelled are set out in Article 166D of the Credit Risk: Internal Ratings Based Approach (CRR) Part. .

17.13 The PRA has not set an expectation that firms should include the probability of increases in limits between observation and default date in their EAD or CF estimates. If the impact of such increases is reflected in the RDS, firms may adjust EAD or CF estimates to reflect what the exposure would have been at default if the limit had not been increased. The PRA expects that firms should only make such adjustments if they can be made in a robust manner.

EAD or CF reference data

17.14 The PRA expects that accrued interest as referred to in paragraph 17.15, other due payments, and limit excesses should be included in EAD or CF reference data.

17.15 The PRA expects that estimation of accrued interest should take account of changes in the contractual interest rate over the time horizon up to default, in a way that is consistent with the scenario envisaged in the estimation of the long-run average, or downturn EADs or CFs.

17.16 The PRA considers that inclusion of post-default interest does not need to be included in estimates of either EAD or CF, or LGD.

17.17 The PRA expects that measures of realised EADs or CFs in reference data should not be capped to the principal amount outstanding or facility limits.

17.18 The PRA expects that firms directly estimating CFs should exclude exposures at, or in excess of, limit at observation from the RDS used to model under-limit accounts.

17.19 The PRA expects that EAD or CF estimates for accounts in excess of their limit should reflect the risk of further drawings.

Netting

17.20 Firms may estimate EADs or CFs for exposures with undrawn limits on the basis of net limits provided the conditions in Article 205 of the Credit Risk Mitigation (CRR) Part are met. The PRA considers however that as EAD or CF estimates should reflect the amount that would be outstanding in the event of a default a firm's estimates should reflect that the firm's ability to constrain the drawdown of credit balances in such a scenario will be particularly

tested. Moreover, the PRA expects the appropriate CF estimate to be higher when measured as a percentage of a net limit than of a gross limit.

17.21 The PRA considers that the lower the net limit as a percentage of gross limits or exposures, the greater the need on the part of the firm to ensure that it is restricting exposures below net limits in practice and that it will be able to continue to do so should borrowers encounter difficulties. The PRA considers that application of a zero net limit is acceptable in principle, but that there is consequently a very high need for a firm applying a zero net limit to ensure that breaches of it are not tolerated.

Underwriting commitments

17.22 Estimation of EADs or CFs for facilities that are underwritten in the course of primary market syndication may take account of anticipated sell down to other parties.

17.23 The PRA expects that as EADs or CFs need to be estimated conditional on default by a borrower taking place in a one-year horizon subject to downturn conditions, any reduction in EADs or CFs in anticipation of syndication should take account of this scenario.

18: The slotting approach

Mapping criteria

18.1 Criteria for mapping exposures to slotting categories are set out in Appendix 1 of the Credit Risk: Internal Ratings Based Approach (CRR) Part. While firms are required to map exposures to slotting categories using these criteria, the PRA expects that the slotting categories should broadly correspond to a range of EL-based credit assessments of BBB- or better (Strong), BB+ or BB (Good), BB- or B+ (Satisfactory) and B to C- (Weak) (or their equivalents). The fifth category covers default.

18.2 For the purpose of assessing whether a firm's underwriting of an exposure and an exposure's other characteristics are substantially stronger than required by the 'Strong' rating grade in accordance with Articles 153(5)(e)(i) and 153(5)(f) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects that exposures meeting this criterion should broadly correspond to a range of EL-based credit assessments of BBB+ or better.

18.3 When a firm assesses exposures against the 'stress analysis' slotting subfactor, the PRA expects that it should assess the obligor's ability to meet its obligations without the firm refinancing the exposure to extend it beyond its current maturity or the firm otherwise providing any forbearance.

Definition of high volatility commercial real estate (HVCRE) exposures

18.4 The PRA expects that, in the UK and in other jurisdictions with similar commercial real estate markets and planning systems, the following types of exposures would be classified as HVCRE exposures:

- (a) exposures where the real estate is bought for speculative purposes; and
- (b) exposures where a change of planning use is sought for the real estate.

18.5 An example of an exposure that the PRA would expect to meet condition (3)(b) of the HVCRE exposure definition set out in Rule 1.3 of the Credit Risk: Internal Ratings Based Approach (CRR) Part is an exposure where the property has not yet been leased to the occupancy rate prevailing in that geographic market for that type of commercial real estate.

19: Application of risk parameters

New information

19.1 The PRA expects that in the application of a PD or LGD model, and where firms receive new information with respect to a relevant risk driver or rating criterion, they should take this information into account in rating assignments in a timely manner, particularly by ensuring both of the following:

- (a) that the relevant IT systems are updated in a timely manner and that the corresponding rating and PD or LGD assignment is reviewed as soon as possible; and
- (b) where the new information results in the obligor or exposure being classified as being in default according to Article 178 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, that the PD of the obligor or exposure as applicable is set equal to 1 in all relevant IT systems in a timely manner.

Conservatism in the application of risk parameters

19.2 The PRA expects that, for the purpose of Article 171(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should apply additional conservatism to the outcomes of the rating assignment where any deficiencies are identified related to the implementation of the model in the IT system or to the process of assignment of risk parameters to obligors or facilities in the current portfolio (application of risk parameters), especially when those deficiencies relate to data used in the rating assignment process.

19.3 The PRA expects that, for the purpose of applying paragraph 19.2, firms should establish a framework that covers all of the following:

- (a) identification of deficiencies in the implementation of the model in the IT system or in the application of risk parameters;
- (b) specification of the form of conservatism to be applied and quantification of the appropriate level of conservatism;
- (c) monitoring the deficiencies and correcting them; and
- (d) documentation.

19.4 For the purpose of paragraph 19.3(a), firms should have a robust process for identifying all implementation and application deficiencies in the assignment process, whereby each deficiency leads to additional conservative treatment in the affected assignment to a grade or pool. Firms should consider at least the following triggers when assessing additional conservatism:

- (a) missing data in the application portfolio;
- (b) a lack of up-to-date information as referred to in paragraph 10.8; and
- (c) outdated ratings in the application portfolio.

19.5 The PRA expects that, for the purpose of paragraph 19.3(b), firms should ensure that the occurrence of any of the triggers referred to in paragraph 19.4 results in the application of additional conservatism to the risk parameter for the purpose of the calculation of capital requirements. Where more than one trigger occurs, the estimate should be more conservative. The additional conservatism related to each trigger should be proportionate to the uncertainty in the estimated risk parameter introduced by the trigger.

19.6 Firms should consider the overall impact of the identified deficiencies and the resulting conservatism on the soundness of the assignments to grades or pools at the level of the portfolio covered by the relevant model and ensure that capital requirements are not distorted by the necessity of excessive adjustments.

19.7 The PRA expects that, for the purpose of paragraph 19.3(c), firms should regularly monitor the implementation and application deficiencies and the levels of additional conservatism applied in relation to them and should take steps to address the identified deficiencies in a timely manner.

19.8 The PRA expects that, for the purpose of paragraph 19.3(d), firms should specify adequate manuals and procedures for applying additional conservatism and should document the process applied in addressing implementation and application deficiencies. Such documentation should contain at least the triggers considered and the effects that the activation of such triggers had on the final assignment to a grade or pool, on the level of risk parameters, and on capital requirements.

Human judgement in the application of risk parameters

19.9 The PRA considers that firms may use human judgement in the application of a model in all of the following cases:

- (a) in the application of the qualitative variables used within the model;
- (b) via overrides of the inputs of the rating assignment process; and
- (c) via overrides of the outputs of the rating assignment process.

19.10 Firms should specify clear criteria for the use of qualitative model inputs, and they should ensure a consistent application of such inputs by all relevant personnel. Firms should ensure that a consistent assignment of obligors or facilities posing similar risk to the same grade or pool takes place, as required by Article 171(1)(a) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

19.11 For the purpose of Article 172(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should specify the policies and criteria for the use of overrides in the rating assignment process. These policies should refer both to possible overrides of inputs and outputs of such processes and should be specified in a conservative manner such that, subject to paragraph 19.14, the scale of conservative overrides should not be limited. In contrast, the scale of potential decreases of the estimates resulting from the model, either by overriding the inputs or outputs of the rating assignment process, should be limited. In applying the overrides, firms should take into account all relevant and up-to-date information subject to paragraph 19.14.

19.12 Firms should document the scale of and rationale for each override. Wherever possible, firms should specify a predefined list of possible justifications of the overrides to choose from. Firms should also store information on the date of override and the person that performed and approved it.

19.13 The PRA expects that firms should regularly monitor the level of, and justifications for, overrides of the inputs to, and the outputs of, the rating assignment process, and that they should specify in their policies the maximum acceptable rate of overrides for each model. Where these maximum levels are breached, adequate measures should be taken by the firm. The PRA expects that the rates of overrides should be specified and monitored at the level of calibration segment, and that where there is a high number of overrides, firms should adopt adequate measures to improve the model.

19.14 In accordance with the last sentence of Article 172(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms are required to ensure that overrides are not made in respect of the information covered in Article 171(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part. The PRA expects that firms' documentation of the use of overrides in the rating assignment process should include the policies and criteria they use to ensure that such overrides are not made.

19.15 Firms should regularly analyse the performance of exposures in relation to which an override of an input or an output of the rating assignment process has been performed in accordance with Article 172(3) of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

19.16 Firms should regularly assess the performance of the model before and after overrides of the outputs of the rating assignment process. Where the assessment concludes that the use of overrides significantly decreased the model's capacity to accurately quantify the risk parameters ('predictive power' of the model), firms should adopt adequate measures to ensure the correct application of overrides.

20: Stress tests used in the assessment of capital adequacy

20.1 In order to be satisfied that the credit risk stress test undertaken by a firm pursuant to Article 177(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part is meaningful and that it considers the effects of severe, but plausible, recession scenarios, the PRA expects that the stress test is based on an economic cycle that is consistent with SS31/15 – [The Internal Capital Adequacy Assessment Process \(ICAAP\) and the Supervisory Review and Evaluation Process \(SREP\)](#).

20.2 The level of cyclical assumption used in calculating the long-run average PD for residential mortgages referred to in paragraph 11.38 above should not be relied on when undertaking the credit risk stress test required under Article 177(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part and the PRA expects firms to consider the possibility that the model proves more cyclical than anticipated.

21: Review of estimates (validation)

21.1 Firms should specify internal policies for changes of models and estimates of risk parameters used within a rating system. Such policies should provide that changes to models should be made as a result of at least the following:

- (a) regular review of estimates;
- (b) independent validation;
- (c) changes in the legal environment;
- (d) internal audit review; and
- (e) PRA review.

21.2 Where material deficiencies are identified as a result of the reviews referred to in paragraph 21.1, firms should take appropriate action depending on the severity of the deficiency in accordance with Article 146 of the Credit Risk: Internal Ratings Based Approach (CRR) Part.

21.3 For the purpose of regular reviews of estimates, a firm should have a framework in place which includes at least the following elements:

- (a) a minimum scope and frequency of analyses to be performed, including predefined metrics chosen by the firm to test data representativeness, model performance, its predictive power, and stability;
- (b) predefined standards, including predefined thresholds and significance levels for the relevant metrics; and
- (c) predefined actions to be taken in case of adverse results of the review, depending on the severity of the deficiency. Firms may rely on the results of independent validation in their regular reviews of estimates where such results are up to date.

21.4 The reviews of estimates to be performed at least annually in accordance with Article 179(1)(c) of the Credit Risk: Internal Ratings Based Approach (CRR) Part should be performed taking into account the metrics, standards, and thresholds defined by the firm in accordance with paragraph 21.3. The scope of such reviews should comprise at least the following elements:

- (a) an analysis of data representativeness, including all of the following:
 - (i) an analysis of potential differences between the RDS used to quantify the risk parameter and the application portfolio, including the analysis of any changes in the portfolio or any structural breaks relevant to assessing data representativeness in accordance with Chapter 8 – Data representativeness; and

- (ii) an analysis of potential differences between the RDS used to develop the model and the application portfolio; for this purpose, firms should:
 - 1. perform the analysis set out in paragraphs 8.6, 8.7, and 8.8;
 - 2. consider that data used for model development is sufficiently representative in terms of paragraphs 8.3(a) and 8.3(b) if the performance of the model as referred to in paragraph 21.4(b) is sound; and
 - 3. perform the analysis set out in paragraphs 8.4 and 8.5 where the performance of the model as referred to in paragraph 21.4(b) is deteriorating;
- (b) an analysis of the performance of the model and its stability over time, which should have both of the following characteristics:
 - (i) the analysis should identify any potential deterioration of the model performance, including the model's discriminatory power, through the comparison of its performance at the time of the development against its performance on each subsequent observation period of the extended data set as well as against predefined thresholds. This analysis should be performed on relevant subsets, for instance with and without delinquency status in the case of PD estimates, and for various recovery scenarios in the case of LGD estimates; and
 - (ii) the analysis should be performed with regard to the whole application portfolio, without any data adjustments or exclusions performed in model development; for comparison purposes, the performance at the time of model development should also be obtained for the whole application portfolio, prior to any data adjustments or exclusions;
- (c) an analysis of the predictive power of the model, including at least:
 - (i) an analysis of whether the inclusion of the most recent data in the data set used to estimate risk parameters leads to materially different risk estimates and in particular:
 - 1. for PD, whether including the most recent data leads to a significant change in the long-run average default rate; this analysis should take into account that PD estimates should reflect a representative mix of good and bad economic periods in accordance with paragraph 11.12; and
 - 2. for LGD, whether including the most recent data leads to a significant change in the long-run average LGD or downturn LGD;
 - (ii) a back-testing analysis, which should include a comparison of the estimates used for the calculation of capital requirements against observed outcomes for each grade or pool; for this purpose firms may take into account the results of back-testing performed as part of internal validation in accordance with Article 185(b) of the Credit Risk: Internal Ratings Based Approach (CRR) Part or they may perform additional tests, for instance with regard to a different time frame of the data set.

21.5 A Firm should specify conditions under which the analyses referred to in paragraph 21.4(a) should be performed more frequently than annually, such as major changes in the risk profile of the firm, credit policies, or relevant IT systems. A firm should perform a review of a PD or LGD model whenever it observes significant changes in economic conditions compared with the economic conditions underlying the relevant data set used for the purpose of model development.

21.6 For the purpose of performing the tasks referred to in Article 190(2) of the Credit Risk: Internal Ratings Based Approach (CRR) Part, firms should define a regular cycle for the full review of the rating systems, taking into consideration their materiality, and covering all aspects of model development, quantification of risk parameters and, where applicable, the estimation of model components. Such review should include all of the following:

- (a) a review of the existing and potential risk drivers and an assessment of their significance based on the predefined standards of review referred to in paragraph 21.3; and
- (b) an assessment of the modelling approach, its conceptual soundness, the fulfilment of the modelling assumptions and alternative approaches. Where the results of this review recommend changes to model design, appropriate actions should be taken following the results from this analysis.

21.7 For the purpose of the reviews specified in paragraphs 21.3 to 21.6, firms should apply consistent policies for data adjustments and exclusions and ensure that any differences in the policies applied to the relevant data sets are justified and do not distort the results of the review.

21.8 In accordance with Article 185 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, the PRA expects a firm to have a validation process that includes all of the following:

- (a) standards of objectivity, accuracy, stability, and conservatism that it designs its ratings systems to meet and processes that establish whether its rating systems meet those standards;
- (b) standards of accuracy of calibration (ie whether outcomes are consistent with estimates) and discriminative power (ie the ability to rank-order risk) that it designs its rating systems to meet, and processes that establish whether its rating systems meet those standards;
- (c) policies and standards that specify the actions to be taken when a rating system fails to meet its specified standards of accuracy and discriminative power;
- (d) a mix of developmental evidence, benchmarking and process verification, and policies on how this mixture varies between different rating systems;
- (e) use of both quantitative and qualitative techniques;

- (f) policies on how validation procedures are expected to vary over time; and
- (g) independent input into and review of rating systems.

21.9 In paragraph 21.8:

- (a) developmental evidence means evidence that substantiates whether the logic and quality of a rating system (including the quantification process) adequately discriminates between different levels of, and delivers accurate estimates of, PD, LGD, EL, and EAD or CF (as applicable); and
- (b) process verification means the process of establishing whether the methods used in a rating system to discriminate between different levels of risk and to quantify PD, LGD, EL, and EAD or CF (as applicable) are being used, monitored and updated in the way intended in the design of the rating system.

21.10 The PRA expects firms to be able to explain the performance of their rating systems against their chosen measure (or measures) of discriminative power. In making this comparison, firms should rely primarily on actual historic default experience where this is available. In particular, the PRA expects firms to be able to explain the extent of any potential inaccuracy in these measures, caused in particular by small sample size and the potential for divergence in the future, whether caused by changing economic conditions or other factors. Firms' assessment of discriminative power should include appropriate use of external benchmarks where available.

21.11 The PRA expects that for residential mortgage rating systems, firms should be able to demonstrate that their monitoring includes at least the following:

- (a) an assessment of whether each long-run average PD remains appropriate to the population it is applied to, including whether movements in default rate are due to external factors or changes in underlying credit quality. The PRA expects firms to give consideration to historical internal data, industry data and economic data when assessing this;
- (b) an assessment of the rating system's cyclical; and
- (c) an assessment of the performance of any underlying rank-ordering or segmentation mechanism.

21.12 The PRA expects firms applying for a permission to implement a new residential mortgage PD rating system, or to make a material change to an existing residential mortgage PD rating system in accordance with Article 143 of the Credit Risk: Internal Ratings Based Approach (CRR) Part, to submit a completed monitoring management information pack in support of their application.

21.13 The PRA expects firms to take into account the sophistication of the measure of discrimination chosen when assessing the adequacy of a rating system's performance.

21.14 The PRA expects that, for the purpose of validating model performance, where a portfolio contains insufficient default experience to provide any confidence in statistical measures of discriminative power, firms should apply alternative validation methods. These could include, for example, analysis of whether the rating system and an external measurement approach such as external ratings rank common obligors in broadly similar ways.

21.15 Where firms apply alternative validation methods as referred to in paragraph 21.14, the PRA expects that firms should not systematically adjust individual ratings with the objective of making them closer to external rating as this would be counter to the philosophy of an approach based on internal ratings. The PRA expects firms to be able to explain the methodology they used and the rationale for its use.

Near-final

Appendix

SS4/24 was first published in near-final form in September 2024.

2025

October 2025

Following PS19/25 – Restatement of CRR requirements – 2027 implementation – near final, the PRA has amended paragraphs 2.8 to 2.11.

This amendment is effective from 1 January 2027.

Near-final