



BANK OF ENGLAND
PRUDENTIAL REGULATION
AUTHORITY

Consultation Paper | CP29/16

Residential mortgage risk weights

July 2016

Prudential Regulation Authority
20 Moorgate
London EC2R 6DA

Prudential Regulation Authority, registered office: 8 Lothbury, London EC2R 7HH.
Registered in England and Wales No: 07854923



BANK OF ENGLAND
PRUDENTIAL REGULATION
AUTHORITY

Consultation Paper | CP29/16

Residential mortgage risk weights

July 2016

The Bank of England and the Prudential Regulation Authority (PRA) reserve the right to publish any information which it may receive as part of this consultation.

Information provided in response to this consultation, including personal information, may be subject to publication or release to other parties or to disclosure, in accordance with access to information regimes under the Freedom of Information Act 2000 or the Data Protection Act 1998 or otherwise as required by law or in discharge of the PRA's statutory functions.

Please indicate if you regard all, or some of, the information you provide as confidential. If the Bank of England or the PRA receives a request for disclosure of this information, the Bank of England or the PRA will take your indication(s) into account, but cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system on emails will not, of itself, be regarded as binding on the Bank of England and the PRA.

Responses are requested by Monday 31 October 2016.

Please address any comments or enquiries to:

Prudential Regulation Authority
20 Moorgate
London
EC2R 6DA

Email: CP2916@bankofengland.co.uk

Contents

1	Overview	5
2	Proposals	7
3	The PRA's statutory obligations	11
	Appendices	14

1 Overview

1.1 This consultation sets out proposed changes to the Prudential Regulation Authority's (PRA's) Supervisory Statement (SS) on internal ratings based (IRB) approaches to calculating risk-weighted capital requirements for banks and building societies (SS11/13).¹

1.2 In response to a review of the high level of variability identified in the risk weights of residential mortgage portfolios under the IRB approach, the PRA proposes to set out within SS11/13 revised expectations about the way that firms model probability of default (PD) and loss given default (LGD) for these exposures.

1.3 PDs vary over an economic cycle, and the models used to estimate them range across a spectrum between those known as point-in-time (PiT) and those known as through-the cycle (TtC). PiT models' outputs vary in line with changes in the economic cycle while TtC models' outputs remain unchanged.

1.4 In the United Kingdom, firms' models of residential mortgage PDs are typically at one of the ends of the PiT and TtC spectrum. However, in its review of the approaches that firms use, the PRA has identified material deficiencies in risk capture. Mortgage assets are long term and cyclical but the way that the PiT approaches are calibrated uses only very recent experience. For TtC models, the problem lies in the small number of risk drivers and inability to discriminate sufficiently between cyclical and non-cyclical changes in risk. Where the PRA identifies a material deficiency in risk capture in a firm's models, the PRA may consider what further steps may be necessary to rectify these deficiencies or mitigate their consequences on a case by case basis.

1.5 The PRA is therefore proposing to set an expectation that firms' residential mortgage PD models should move away from both these types of models. This would move residential mortgage PD models away from both ends of the spectrum described above.

1.6 Turning to LGD, firms are required to calculate the expected LGD in economic downturn conditions. For residential mortgages, firms use a number of inputs, one of which is the assumed house price fall. The PRA has found that firms' house price fall assumptions vary significantly and the PRA does not believe this to be justified. In light of this, the PRA is proposing that for UK residential mortgage LGD models, firms will be expected to apply a house price fall assumption of at least 25%.

Implementation

1.7 These policies have been designed in the context of the current UK and EU regulatory framework. The PRA proposes that they will come into effect by 31 March 2019. The PRA will keep them under review to assess what changes would be required due to intervening changes in the UK regulatory framework, including as a result of the referendum on 23 June 2016.

1.8 The PRA proposes to allow firms until 31 May 2018 to submit for approval adjusted residential mortgage models meeting these expectations. In the case of immaterial closed books, where the PRA considers it to be unduly burdensome for the changes to be implemented by 31 March 2019, the PRA may on a case by case basis allow a longer period for firms to meet these expectations. In the case of applications received before 31 May 2018 for new IRB permissions and for material model changes, the PRA proposes to consider it

¹ SS11/13 available here: www.bankofengland.co.uk/pr/Pages/publications/ss/2015/ss1113update.aspx.

acceptable for firms to have based those applications on the unamended version of SS11/13, provided that they have a credible plan to implement these changes by 31 March 2019.

1.9 This consultation is relevant to PRA-authorised firms that have either obtained or may seek to obtain permission to use the IRB approach to calculate risk-weighted assets for their residential mortgage portfolios.

Background

1.10 In December 2014, the Financial Policy Committee (FPC) raised concerns about excessive procyclicality and lack of comparability of UK banks' residential mortgage risk weights in the 2014 UK stress test.¹ The FPC mentioned in December 2015² that work was underway to try to investigate these issues, stating that in *"the United Kingdom, the FPC and PRA Board are also considering ways of reducing the sensitivity of UK mortgage risk weights to economic conditions. The 2014 stress test demonstrated that the risk weights on some banks' residential mortgage portfolios can increase significantly in stressed conditions"*.

1.11 A procyclical capital framework, where capital requirements are high in a downturn and low in an upturn, can encourage credit exuberance in a boom and deleveraging in a downturn. With major UK firms holding around £1 trillion of UK residential mortgage exposure, this is an asset class where excessive variability of capital requirements can be detrimental to financial stability.

1.12 The PRA carried out a review of the causes of variability of residential mortgage risk weights for firms with permission to use the IRB approach to calculate credit risk capital requirements. This review identified the following factors:

- (i) Firms' approaches to modelling PD vary. The majority of firms either use a highly point-in-time (PiT) approach or a highly through-the-cycle (TtC) approach. In both cases a deficiency in risk capture was identified.
- (ii) Firms' house price fall assumptions for UK residential mortgage LGD models vary widely.

1.13 In response to this review, the PRA proposes to amend SS11/13 such that firms would be expected to adopt PD modelling approaches that avoid the deficiency in risk capture identified in the PiT and TtC models currently used by firms, and calibrate their models using a consistent and appropriate assumption for the level of model cyclicity.

1.14 The PRA also proposes to expect firms not to apply a house price fall assumption of less than 25% in their UK residential mortgage LGD models.

Purpose

1.15 The purpose of these proposed changes to SS11/13 is to address the material deficiencies in risk capture identified in respect of residential mortgage models. In doing this, the proposals seek to address the financial stability concerns identified by the FPC.

1 Bank of England, Financial Stability Report, December 2014:
www.bankofengland.co.uk/publications/Pages/fsr/2014/fsr36.aspx.

2 Bank of England, Supplement to the December 2015 Financial Stability Report:
www.bankofengland.co.uk/publications/Documents/fsr/2015/fsrsupp.pdf.

1.16 Similar deficiencies in risk capture may exist in respect of other asset classes for which firms use models with similar characteristics to calculate risk weights. These assets fall outside the scope of the review carried out and, both on an individual and aggregated basis, are less material than residential mortgages. However when firms develop and review models for non-residential mortgages, they should consider carefully whether any of the deficiencies in risk capture may also apply in respect of the approaches adopted for these asset classes. The PRA may in future review the appropriateness of these models, but no conclusion should be drawn from these current proposals as to what the outcome of such a review might be.

Responses and next steps

1.17 This consultation closes on 31 October 2016. The PRA invites feedback on the proposals set out in this consultation. Please address any comments or enquiries to CP2916@bankofengland.co.uk.

2 Proposals

2.1 Banks and building societies that use the IRB approach to calculate credit risk capital requirements for residential mortgages are required to use models to calculate PD and LGD. PD and LGD are inputs that firms use to calculate risk weights, from which capital requirements arise.

2.2 As a result of having identified material deficiencies in risk capture referred to in paragraph 1.4 above, the PRA proposes that for residential mortgage PD models, firms should be expected to move away from the PiT and TtC approaches currently used, and instead apply a modelling methodology falling between the two ends of the spectrum. The PRA proposes to set expectations around the level of cyclicity that firms should assume when calibrating their PD models. The PRA believes that this would ensure that both consistency and prudence are maintained when modelling these assets.

2.3 In addition, the PRA proposes to expect firms not to apply a house price fall assumption of less than 25% in their UK residential mortgage LGD models.

2.4 These proposals will be set out as amendments to SS11/13, the Supervisory Statement on internal ratings based approaches (Appendix 1), and firms will have until 31 May 2018 to submit models for approval that meet these revised expectations which would come into effect by 31 March 2019.

PiT residential mortgage PD models

2.5 In implementing PiT models in the United Kingdom, firms' residential mortgage models estimate a PD for the next year based upon the previous year's default rate. This means that PDs are based only on very recent experience.

2.6 The PRA believes that for residential mortgages, this approach leads to capital requirements that are excessively procyclical. This is because under this approach mortgage assets, which are long term and cyclical, are calibrated based only on short term experience. This can lead to Pillar I capital requirements which are too low in an upturn and too high in a downturn, because a short term change in default rates leads directly to a change in the capital requirement for what is a long term asset. In turn this means that capital ratios may also appear too good in an upturn and too bad in a downturn.

2.7 Paragraph 12.7 of the proposed revised SS11/13 therefore sets out the PRA's expectation that firms should not use such an approach and instead should use models that better capture the risks arising from the long-term nature of residential mortgages.

Variable scalar residential mortgage PD models

2.8 TtC models, as implemented by UK firms, adopt a static approach whereby the PD does not vary with changes in the general economy. These models tend to use a relatively limited number of inputs, that do not change with time, to estimate average default rates for each borrower over an economic cycle. The borrower's PD does not therefore change with economic conditions, and capital requirements vary much less than with PiT models.

2.9 In the UK firms use a form of TtC approach known as 'variable scalar' that use as inputs the PDs derived from relatively PiT models. Variable scalars then transform the average PiT PD for a portfolio into a static TtC PD, by using a multiplier, or scalar, that varies through time.

2.10 The PRA has found that, for residential mortgage portfolios, firms using TtC approaches, including variable scalar approaches, are unable to distinguish sufficiently between movements in default rates that result from cyclical factors (for example, factors that impact the economy in general) and those that result from non-cyclical reasons (for example, the specific performance of one borrower). These approaches only take account of a small number of risk drivers that do not change with time, and the PRA has found that this results in risks not being sufficiently captured. For example, if a particular portfolio deteriorates due to poor underwriting (rather than due to a downturn), then capital requirements calculated using variable scalar approaches may not increase as they should.

2.11 Paragraph 12.10 has been added to SS11/13 to outline the PRA's expectation that firms should no longer use variable scalar approaches for residential mortgage portfolios, and instead should use approaches which calculate long-run average PDs, without seeking to smooth out the impact on capital requirements.

Expectations for residential mortgage PD models

2.12 The PRA expects, in general, that these changes will result in firms having to recalibrate existing models rather than develop new ones. To assist firms in calibrating residential mortgage PD models that will meet the PRA's expectations, the PRA proposes to make a number of amendments to SS11/13.

2.13 In setting out these expectations, the PRA has been mindful that residential mortgage PD models will now be expected to fall within a spectrum between the cyclical PiT and non-cyclical TtC approaches. Where in this spectrum they fall will depend on the extent to which the model inputs pick up changes in the economic cycle (and are hence closer to the PiT approach) as opposed to changes only to specific assets (and are therefore closer to a TtC approach).

2.14 The PRA does not propose to prescribe what those model inputs should be. However, the PRA does propose to set an expectation in relation to how the models are calibrated.

2.15 In order to calibrate PD models firms need to calculate long-run average default rates through an economic cycle using a representative mix of good and bad years. In the United Kingdom, the PRA considers this to include the recession in the early 1990s. Because firms do not have detailed granular data for their models going back to this period, firms need to infer default rates for years where sufficient internal data are not available.

2.16 The PRA understands that firms make this inference using industry-wide arrears rates as an input. In order to calibrate a particular model using industry-wide rates as a starting point, one necessary input is how PDs in the particular model vary with the economic cycle.

2.17 For example, for a model towards the TtC end of the spectrum, PDs would be expected at all times to be close to the average over the cycle, and models would tend to be calibrated close to the historical average. On the other hand, for a model towards the PiT end of the spectrum, then PDs would vary as the industry-wide rate varies. In good times, the model could be calibrated significantly below the historical average.

2.18 The PRA has identified a risk that, if a model is believed to be closer to the PiT end of the spectrum than it really is, it will consequently be under-calibrated. This could have the result that, during an economic downturn, default rates could increase in a manner under-predicted by the model.

2.19 Consequently, the PRA proposes to expect that there should be a cap on the level of cyclicalities (that is, how close a model is to the PiT end of the spectrum) that firms assume when calculating the long-run average default rates of residential mortgage PD models.

2.20 That cap however will be removed in situations where a model has been calibrated on observed default rates taken from a downturn period, in order to avoid the converse risk of a model over-predicting the cycle.

2.21 The detailed changes to SS11/13 are set out in appendix 1, of which the material elements are:

- (i) Paragraph 12.3 would be amended to include definitions of cyclicalities to ensure that the limit is applied consistently;
- (ii) Paragraph 12.4 would set an expectation that when firms calibrate their PD models by uplifting internal data to a long-run average they should do this using an assumption that model cyclicalities does not exceed 30%. This 30% level is based upon the PRA's view of an appropriately prudent assumption for model cyclicalities in light of recent experience;
- (iii) Paragraphs 12.5 and 12.6 would explain that the expectation outlined in paragraph 12.4 will not apply when firms are either using observed default rates taken from a downturn period to calibrate their models (paragraph 12.5) or when a firm's own approach is sufficiently robust to justify a different outcome (paragraph 12.6);
- (iv) When calculating how risk weights would change in credit risk stress tests (paragraph 16.2), firms would be expected to consider the possibility that the model proves more cyclical than anticipated. This is to avoid the risk that a model is inadequately stressed as a result of its non-cyclicalities being over-stated and therefore in carrying out a credit risk stress test, firms should not necessarily rely on the level of cyclicalities assumed in the calculation of the long-run average PD;
- (v) Paragraph 10.21 would set out the expectation that recalibrations should be rare and symptomatic of failures of model assumptions rather than a natural part of the model design;

- (vi) Paragraph 10.14 would make explicit that the economic cycle used for calibrating long-run averages would be expected to include economic conditions equivalent to that experienced in the early 1990s in the United Kingdom;
- (vii) Paragraph 17.4 would set out the PRA's expectations that in order to meet the requirements of CRR Article 185, a firm should be able to demonstrate that its monitoring includes at least an assessment of (a) long-run average PDs, (b) the cyclicity of the model and (c) the underlying rank ordering mechanism;
- (viii) For some residential mortgages, such as buy-to-let, self-certification and sub-prime, the absence of external data over a representative economic cycle represents an additional challenge. For such portfolios, firms would be expected to model how book level default rates would have performed under the economic conditions experienced in a representative economic cycle (paragraph 10.15). This modelling would be expected to include a level of conservatism and the PRA would then, as part of its review of these models, assess whether the degree by which long-run average PDs of these assets exceeds prime long-run average PDs is sufficient (paragraph 10.16);
- (ix) Paragraph 10.17 would set out the PRA's expectations for non-UK residential mortgages and the applicability of the proposed approach to be outlined in paragraphs 10.15-10.16 of SS11/13 to rating systems that combine both prime and low historical data mortgages;
- (x) Paragraph 10.18 would set out the PRA's expectation that low historical data and prime portfolios would not normally be combined in the same rating system, unless a firm was able to demonstrate that the approach met the proposed expectations to be contained within paragraphs 10.15-10.17 of SS11/13; and
- (xi) Paragraph 10.19 would confirm that firms will, unless there are exceptional circumstances, be expected to apply these expectations in respect of all IRB mortgage portfolios, including those closed to new business and in run-off. The exceptional circumstances mentioned in this paragraph would include where a firm can demonstrate that implementing the proposed changes would be unduly burdensome.

UK residential mortgage LGD models

2.22 Firms are required¹ to model the LGD that is expected in downturn conditions. The 2014 stress test identified LGD, in particular firms' own house price fall assumptions within the LGD calculations, as one of the key sources of risk weight variability. The higher the house price fall assumption, the higher the LGD and therefore the higher the capital requirements. Inadequate assumptions around house price falls could result in insufficient capital when conditions during a downturn exceed those assumptions.

2.23 The PRA does not believe that widely varying assumptions are justified on the basis of historical experience. Although portfolios will vary, the PRA does not consider that firms' data and portfolios can justify making substantially different assumptions relative to national averages. However, the PRA will continue to expect firms to make higher house price fall assumptions if concentrations in their portfolios mean that it is appropriate.

1 CRR article 181(1)(b)

2.24 SS11/13 includes an existing expectation that firms assume at least a 40% reduction in property sale prices from the peak. The total property price fall is a combination of forced sale discount and house price decline, which need to be sufficient to ensure that risk weights are robust for downturn conditions. If the house price fall assumption proves insufficient, risk weights will rise in a downturn, leading to greater cyclicalities. To address this issue, the PRA proposes to amend paragraph 13.8 of SS11/13 to include the expectation for UK mortgage LGD models that, in addition to the existing expectation that the model includes at least a 40% reduction in property sale prices from the peak, firms will also be expected to apply an assumption for the fall in the value of a property due to house price deflation of at least 25%.

3 The PRA's statutory obligations

3.1 The PRA has a statutory duty to consult when introducing new rules and a public law duty to consult widely on any other measures that significantly affect firms. In discharging its general functions the PRA must, as far as it is reasonably possible, act in a way that advances its general objective and its insurance objective.

3.2 The PRA has assessed the impact of its proposals on mutuals. It does not expect the effect of these proposals on mutuals to be significantly different to the effect on other firms.

3.3 The PRA is also required by the Equalities Act 2010¹ to have due regard to the need to eliminate discrimination and to promote equality of opportunity in carrying out its policies, services and functions. The PRA has performed an assessment of the policy proposals and does not consider that the proposals give rise to equality and diversity implications.

Cost benefit analysis

3.4 The PRA is also required to perform an economic assessment of the impact of its policy proposals. In doing so, the PRA has considered the impact both on existing IRB firms that will need to change the modelling approach they currently use for residential mortgages, and the impact of the additional expectations contained within the supervisory statement on firms applying for IRB permissions.

3.5 Although all large UK firms have IRB permissions for their residential mortgage portfolios, a number of smaller firms also have such permissions. There is no particular pattern between the size of a firm and the modelling approach adopted. Therefore, the PRA does not believe that these changes will adversely impact smaller firms relative to larger ones.

3.6 Firms that need to move away from a PiT approach will typically see an increase in their Pillar 1 capital requirements. For firms using TtC approaches, the opposite will be the case. Overall the PRA estimates that for IRB firms needing to change their residential mortgage models, there will be a neutral outcome in terms of Pillar 1 capital. Stress capital requirements will depend on the stress tests carried out at the time. However on the basis of the 2014 stress tests, which specifically examined residential mortgage exposure, we estimate that across all impacted firms there would have been some increase in total capital requirements as a result of the increase for existing TtC firms exceeding the reduction for existing PiT firms. The size of this estimated increase is a function of the stage in the cycle at which the change is being implemented, and therefore this outcome is not necessarily predictive of future stress tests.

¹ Section 149.

3.7 The cost to firms of recalibrating their residential mortgage models with an approach that will meet the PRA's expectations is a justifiable measure to address an identified lack of risk capture that will have the additional benefit of ensuring greater comparability across IRB residential mortgage models.

3.8 For firms applying for IRB permissions, the changes proposed to the supervisory statement should assist in providing a better understanding of the PRA's expectations when granting such permissions. The expectation that the PiT and TtC approaches should no longer be used for modelling residential mortgage portfolios should not impact the building of residential mortgage models, as the change is a matter of calibration. However, PiT models, as currently implemented, are frequently recalibrated, and more careful monitoring is required of models where this is not the case. To this extent the level of understanding and monitoring of the model may need to be higher than might have been needed for PiT. But this is in line with the existing expectation in SS11/13 that firms 'should understand where their rating systems lie on the PiT/TtC spectrum to enable them to estimate how changes in economic conditions will affect their IRB capital requirements'.

3.9 Firms moving away from the PiT approach require sufficient data in order to establish a long-run average calibration to meet the requirements in the CRR. In the United Kingdom, residential mortgage arrears data are available from external sources. In addition, even if firms are using only recent data to calibrate PD, they still require long-run data to calibrate the probability of possession for LGD models.

3.10 For portfolios where there is a lack of sufficient external default data, the proposals involve modelling these assets using synthetic cycles, which can be done with reference to prime mortgage data, and as such this does not impose any additional data requirements.

3.11 The proposed change to UK residential mortgage LGD models will only impact those IRB firms that currently use house price fall assumptions of under 25%. For those firms, the additional Pillar 1 capital requirement is likely to be offset by a reduced stress capital requirement.

Compatibility with the PRA's objectives

3.12 In discharging its general functions of making rules, and determining the general policy and principles by reference to which it performs particular functions, the PRA must, so far as reasonably possible, act in a way that advances its general objective to promote the safety and soundness of the firms it regulates. These proposals advance the PRA's general objective by ensuring a reduction in excessive risk weight variability as well as addressing identified areas of material deficiencies in risk capture.

3.13 When discharging its general function in a way that advances its primary objectives, the PRA has, as a secondary objective, a duty to facilitate effective competition. These proposals will help advance that objective through increasing the comparability of residential mortgage risk weights across IRB firms and thereby reducing the variability in risk weights. The provision of greater clarity in the supervisory statement on the PRA's expectations for firms seeking new IRB permissions will also facilitate effective competition.

Regulatory Principles

3.14 In proposing to amend the supervisory statement, the PRA has had regard to the regulatory principles as set out in the Financial Services and Markets Act 2000 (FSMA). Three of the principles are of particular relevance.

3.15 The principle that a burden or restriction which is imposed on a person, or on the carrying on of an activity, should be proportionate to the benefits, considered in general terms, which are expected to result from the imposition of that burden or restriction. The PRA has followed this principle when developing the proposals outlined in this CP and considers that the task of amending existing residential mortgage models to meet the proposed revised expectations of SS11/13 is proportionate relative to the benefits of addressing risk weight variability in such a significant asset class.

3.16 The principle that the desirability where appropriate of each regulator exercising its functions in a way that recognises differences in the nature of, and objectives of, businesses carried on by different persons (including different kinds of persons such as mutual societies and other kinds of business organisation) subject to requirements by or under the Act has been recognised through considering the impact of the proposals both on existing IRB firms and those which might at some stage in the future seek an IRB permission.

3.17 The principle that the regulators should exercise their functions as transparently as possible has been addressed through the additions to SS11/13 which are designed to provide greater clarity of the PRA's expectations when assessing residential mortgage models.

Appendices

- 1 Draft amendments to Supervisory Statement 11/13 'Internal Ratings Based approaches'**

Appendix 1 : Draft amendments to Supervisory Statement 11/13 'Internal Ratings Based approaches'

This appendix outlines proposed amendments to SS11/13 'Internal Ratings Based (IRB) approaches'

Underlining indicates new text and striking through indicates deleted text. Paragraphs following the inserted text in Chapters 10, 12 and 17 have been renumbered. Chapters 10 and 12 have been included in their entirety in order to assist the reader.

...

10 Overall requirements for estimation

High-level expectations for estimation

10.1 In order to be able to determine that the requirements in CRR Article 144(1) have been met, the PRA would typically have the high level expectations set out in this subsection.

10.2 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).

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

- (a) a report and accounts reconciliation, including whether every exposure has a Probability of Default (PD), Loss Given Default (LGD) and, if applicable, conversion factor (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.

10.4 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 in the capital requirement, either immediately or subsequently.

10.5 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 (for example expected loss (EL) and accounting provisions).

10.6 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.

(CRR Article 144(1)(a))

Ratings systems: policies

10.7 In order for the PRA to be satisfied that a firm documents its ratings systems appropriately in accordance with CRR Article 144(1)(e) 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 its not being sensitive to movements in fundamental risk drivers or for any other reason;
- (b) the 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 pools or grades;
- (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.

(CRR Article 144(1)(a) and 144(1)(e))

Collection of data

10.8 In order to be satisfied that the requirements in CRR Article 179(1) are met, the PRA expects a firm to collect data on what it considers to be the main drivers of the risk parameters of PD, LGD, CF and EL, 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.

10.9 In its processes for identifying the main drivers of risk parameters, the PRA expects that a firm should set out its 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 materially to 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.

(CRR Article 179(1)(a), 179(1)(d) and CRR Article 179(1)(e))

Data quality

10.10 In order to demonstrate that rating systems provide for meaningful assessment, the PRA expects that a firm's documentation relating to data include clear identification of responsibility for data quality. The PRA expects a firm to set standards for data quality, aim to improve them over time and measure its performance against those standards. Furthermore, the PRA expects a firm to ensure that its data are of sufficiently high quality to support the firm's risk management processes and the calculation of its capital requirements.

(CRR Article 144(1)(a))

Use of models and mechanical methods to produce estimates of parameters

10.11 Further detail of standards that the PRA would expect firms to meet when it assesses compliance with CRR Article 174 are set out in the sections on PD, LGD and Exposure at Default (EAD).

10.12 In assessing whether the external data used by a firm to build models are representative of its actual obligors or exposures, the PRA expects a firm to consider whether the data are appropriate to its own experience and whether adjustments are necessary.

(CRR Article 174 and 174(c))

Calculation of long-run averages of PD, LGD and EAD

10.13 In order to estimate PDs that are long-run averages of one year default rates for obligor grades or pools, the PRA expects firms to estimate expected default rates for the grade/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 that a long-run estimate would be changed when there is reason to believe that the existing long-run estimate is no longer accurate, but that it would not be automatically updated to incorporate the experience of additional years, as these may not be representative of the long-run average.

10.14 In order to calibrate a long-run average PD for UK residential mortgages, the PRA expects that in defining a representative mix of good and bad economic periods (as referred to in paragraph 10.13 above) firms would need to incorporate economic conditions equivalent to those observed in the United Kingdom during the early 1990s. The PRA is setting this expectation in light of recent economic experience and may revise it in the future as appropriate.

10.15 CRR Article 180(1)(a) 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') 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.

10.16 The PRA expects rating systems referred to in paragraph 10.15 above to result in long-run average PDs that are appropriately conservative. For each low historical data mortgage portfolio the PRA will undertake an assessment of whether the degree of uplift in PDs relative to comparable mortgages in a firm's prime portfolio is sufficient.

10.17 The PRA recognises 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 10.15. For each portfolio of non-prime non-UK mortgages, where the approach in paragraph 10.15 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.

10.18 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 then the PRA expects the low historical data sub-set of the rating system to meet the expectations contained within paragraphs 10.15-10.17.

10.19 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 10.15 should be applied.

(CRR Article 180)

10.20 In order to be able to demonstrate compliance with CRR Article 144(1), 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.

10.21 The PRA expects recalibrations of rating systems applying the cyclicity assumptions set out in paragraph 12.4 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 cyclicity of the rating system;

- (b) a robust assessment and explanation of the cause for 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.

(CRR Article 144(1))

10.22 The PRA expects that a firm that is not able to produce a long-run estimate, as described above, to consider what action it would be appropriate for it to take to comply with CRR Article 180(1)(a). In some circumstances, it may be appropriate for firms to amend their rating system so that the PD used as an input into the IRB capital requirement is an appropriately conservative estimate of the actual default rate expected over the next year. However, such an approach is not likely to be appropriate where default rates are dependent on the performance of volatile collateral.

(CRR Article 179(1)(f) and 180(1)(a))

10.23 In accordance with CRR Article 181(1)(b) and CRR Article 182(1)(b), where the estimates appropriate for an economic downturn are more conservative than the long-run average, we would expect the estimate for each of these parameters to represent the LGD or CF expected, weighted by the number of defaults, over the downturn period. Where this was not the case we would expect the estimate to be used to be the expected LGD or CF, weighted by the number of defaults, over a representative mix of good and bad economic periods.

(CRR Article 179, 181 and 182)

Assignment to grades or pools

10.24 In order to demonstrate that a rating system provided for a meaningful differentiation of risk and accurate and consistent quantitative estimates of risk the PRA expects that a firm would have regard to the sensitivity of the rating to movements in fundamental risk drivers, in assigning exposures to grades or pools within a rating system.

(CRR Article 171)

12 Probability of default in IRB approaches

Rating philosophy

12.1 '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.

12.2 Most rating systems sit between these two extremes. Rating philosophy is determined by the cyclicity of the drivers/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.

12.3 Firms should understand where their rating systems lie on the PiT/TTC spectrum to enable them to estimate how changes in economic conditions will affect their IRB capital requirements. The PRA also expects firms to be able to compare the actual default rates incurred against the default rate expected over the same period given the economic conditions pertaining, as implied by their PD estimate. The cyclicity of the rating system is a measure of where a system lies on the PiT/TtC spectrum. 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 would define cyclicity for a rating system as follows:

$$\text{cyclicity}\% = \left(\frac{PD_t - CT}{DR_t - CT} \right) * 100$$

or:

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

Where:

- PD_t means the long-run average PD at time t
- CT means the central tendency, or portfolio average default rate over a cycle
- DR_t means the observed default rate at time t

12.4 In the PRA's experience, firms often have difficulty in practice in understanding the cyclical nature of their residential mortgage rating systems. To mitigate the risk of under-calibration of these rating systems due to inaccurate estimation of their cyclical nature, 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 cyclical nature of each rating system is no more than 30% in those years where grade level internal observed default rates are not available. This level reflects the PRA's current view of an appropriately conservative assumption for rating system cyclical nature 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.

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

12.6 As an alternative to the expectations on risk mitigation methodology in paragraph 12.4, 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 nature;
- (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.

12.7 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 PiT approach achieved through dynamic recalibration of the score to PD relationship in their application and behavioural scorecards for residential mortgage models.

Variable scalar approaches

Use of variable scalar approaches

12.8 We use the term 'variable scalar' to describe approaches in which the outputs of an underlying, relatively PiT, rating system are transformed to produce final PD estimates used for regulatory capital requirements that are relatively non-cyclical. Typically this involves basing the resulting requirement on the long-run default rate of the portfolio or segments thereof.

12.9 CRR Article 169(3) allows the use of direct estimates of PDs, though such a measure could be assessed over a variety of different time horizons which CRR does not specify. Accordingly,

the PRA considers it acceptable in principle to use methodologies of this type in lieu of estimation of long-run averages for the grade/pool/score of the underlying rating system where conditions set out below are met. Meeting these conditions would require firms using the variable scalar approach to have a deep understanding of how and why their default rates varied over time.

- (a) firms meet the following four principles which address the considerable conceptual and technical challenges to be overcome in order to carry out variable scalar adjustments in an appropriate way:

Principle 1: both the initial calculations of and subsequent changes to the scalar should be able to take account of changes in default risk that are not purely related to the changes in the cycle;

Principle 2: a firm should be able accurately to measure the long-run default risk of its portfolio; this must include an assumption that there are no changes in the business written;

Principle 3: a firm should use a data series of appropriate length in order to provide a reasonable estimate of the long-run default rate referred to in paragraph 10.13; and

Principle 4: a firm should be able to demonstrate the appropriateness of the scaling factor being used across a portfolio.

- (b) stress testing includes a stress test covering the downturn scenarios outlined by the PRA, based on the PDs of the underlying PiT rating system, in addition to the stress test based on the parameters used in the Pillar 1 capital calculation (ie the portfolio level average long-run default rates); and
- (c) firms are able to understand and articulate upfront how the scaling factor would vary over time in order to achieve the intended effect.

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

12.11 The PRA will not permit firms using a variable scalar approach to revert to using a PiT approach during more benign economic conditions.

12.12 Principle 1 is the most important and challenging to achieve as it requires an ability to be able to distinguish movements not related to the economic cycle, from changes purely related to the economic cycle, and not to average these away. This is because a variable scalar approach removes the ability of a rating system to take account automatically of changes in risk through migration between its grades.

12.13 Accordingly, the PRA expects firms using a variable scalar approach to adopt a PD that is the long-run default rate expected over a representative mix of good and bad economic periods, assuming that the current lending conditions including borrower mix and attitudes and the firm's lending policies remain unchanged. If the relevant lending conditions or policies change, then we would expect the long-run default rate to change.

(CRR Article 180(1)(a), 180(1)(b) and 180(2)(a))

Variable scalar considerations for retail portfolios

12.14 The PRA considers that until more promising account level arrears data is collected, enabling firms to better explain the movement in their arrears rate over time, the likelihood of firms being able to develop a compliant variable scalar approach for non-mortgage retail portfolios is low. This is because of the difficulty that firms have in distinguishing between movements in default rates that result from cyclical factors and those that result from non-cyclical reasons for these portfolios. In practice therefore the rest of this section applies to residential mortgage portfolios.

12.15 For the purposes of this subsection 'non-mortgage retail portfolios' refers to non-mortgage lending to individuals (eg credit cards, unsecured personal loans, auto-finance) but does not include portfolios of exposures to small and medium-sized entities (SMEs in the retail exposure class).

12.16 The PRA considers that one variable scalar approach, potentially compliant with the four principles set out above, could involve:

- (a) segmenting a portfolio by its underlying drivers of default risk; and
- (b) estimating separate long-run default rates for each of these segmented pools.

Segmentation

12.17 A firm that applied a segmentation approach properly could satisfy both Principle 1 and Principle 4. The choice of the basis of segmentation and the calibration of the estimated long-run default rate for the segments would both be of critical importance.

12.18 The PRA expects segmentation to be done on the basis of the main drivers of both willingness and ability to pay. In the context of residential mortgages, an example of the former is the amount of equity in the property and an example of the latter is the ratio of debt to income of the borrower. The PRA expects firms to:

- (a) incorporate an appropriate number of drivers of risk within the segmentation to maximise the accuracy of the system;
- (b) provide detailed explanations supporting their choices of drivers, including an explanation of the drivers they have considered but chosen not to use; and
- (c) ensure that the drivers reflect their risk processes and lending policy, and are not chosen using only statistical criteria (ie a judgemental assessment of the drivers chosen is applied).

(CRR Article 179(1)(d))

12.19 To the extent that the basis of segmentation is not sufficient completely to explain movements in non-cyclical default risk, the long-run default rate for that segment will not be stable (eg a change in the mix of the portfolio within the segment could change the long-run default rate). In such cases, we expect firms to make a conservative compensating adjustment to the calibration of the long-run average PD for the affected segments and to be able to demonstrate that the amount of judgement required to make such adjustments is not excessive. Where judgement is used, considerable conservatism may be required. The PRA expects conservatism applied for this reason not to be removed as the cycle changes.

Long-run default rate

12.20 The PRA expects firms to review and amend as necessary the long-run default rate to be applied to each segment on a regular (at least an annual) basis. When reviewing the long-run default rate to be applied to each segment, the PRA expects firms to consider the extent to which:

- (a) realised default rates are changing due to cyclical factors and the scaling factors need to be changed;
- (b) new information suggests that both the PiT PDs and the long-run PDs should be changed; and
- (c) new information suggests that the basis of segmentation should be amended.

12.21 The PRA expects that over time the actual default rates incurred in each segment would form the basis of PD estimates for the segments. However at the outset the key calibration issue is likely to be the setting of the initial long-run default rate for each segment, as this will underpin the PD of the entire portfolio for some years to come. The PRA expects firms to apply conservatism in this area and this is something on which the PRA is likely to focus on in particular in PRA model reviews.

Governance

12.22 The PRA expects firms to put in place a governance process to provide a judgemental overlay to assess their choices of segments, PD estimates and scalars, both initially and on a continuing basis. Moreover, where the basis of their estimation is a formulaic approach, we would consider that the act of either accepting or adjusting the estimate suggested by the formula would represent the exercise of judgement.

12.23 The PRA expects firms to consider what use they can make of industry information. However, we would expect firms to seek to measure the absolute level of and changes to their own default risk, rather than changes in default risk relative to the industry. Given the potential for conditions to change across the market as a whole, the PRA expects a firm should not draw undue comfort from the observation that its default risk is changing in the same way as the industry as a whole. Doing so would not allow them to meet Principle 1.

12.24 The PRA expects firms to be able to demonstrate that they have adequate information and processes in order to underpin the decisions outlined above on choice of segmentation, source of data, and adequacy of conservatism in the calibration, and that this information is reflected in the reports and information being used to support the variable scalar governance process. Given that, for retail business, these decisions would be likely to affect only the regulatory capital requirements of the firm and not the day-to-day running of its business, we will be looking for a high level of reassurance and commitment from firms' senior management to maintain an adequate governance process.

Data considerations

12.25 The PRA expects firms to consider the following issues when seeking to apply a variable scalar approach for UK mortgages:

- (a) in respect of Principle 2, the commonly used Council for Mortgage Lenders database was based on arrears data and not defaults during a period, and the use of these data without further analysis and adjustment can undermine the accuracy of any calculations; and

- (b) in respect of Principle 3, the historical data time period chosen for use in the calculations will vary the long-run PDs, and thus capital requirements, when there is no change in the underlying risk.

12.26 The PRA expects firms that are including mortgage arrears data as a proxy for default data to:

- (a) carry out sensitivity analysis identifying the circumstances in which the assumption that arrears may be used as a proxy for default would produce inaccuracy in long-run PD estimates;
- (b) set a standard for what might constitute a potentially significant level of inaccuracy, and demonstrate why in practice the use of this proxy would not result in any significant inaccuracy;
- (c) establish a process for assessing the on-going potential for inaccuracy, including thresholds beyond which the level of inaccuracy may no longer be insignificant; and
- (d) consider the use of conservative adjustments to address the potential inaccuracy.

12.27 When using historical mortgage data as a key input into variable scalar models the PRA expects firms to:

- (a) carry out sensitivity analysis identifying the implications of using different cut-off dates for the start of the reference data set; and
- (b) justify the appropriateness of their choice of cut-off date.

Retail exposures: obligor level definition of default

12.28 Where a firm has not chosen to apply the definition of default at the level of an individual credit facility in accordance with CRR Article 178(1), 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.

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

(CRR Article 178(1))

Retail exposures: facility level definition of default

12.30 Where a firm chooses to apply the definition of default at the level of an individual credit facility in accordance with CRR Article 178(1) 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.

(CRR Article 178(1))

Multi-country mid-market corporate PD models

12.31 In order to ensure that a rating system provides a meaningful differentiation of risk and accurate and consistent quantitative estimates of risk, the PRA would expect firms to develop country-specific mid-market PD models. Where firms develop multi-country mid-market PD

models, we would expect firms to be able to demonstrate that the model rank orders risk and predicts default rates for each country where it is to be used for regulatory capital calculation.

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

12.33 We would expect 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).

12.34 In our view a model is not likely to be compliant 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.

Use of external ratings agency grades

12.35 We would expect firms using rating agency grades as the primary driver in their IRB models to be able to demonstrate (and document) compliance with the following criteria:

- (a) the firm has its own internal rating scale;
- (b) the firm has a system and processes in place that allow it continuously to collect and analyse all relevant information, and the 'other relevant information' considered by the firm in accordance with CRR Article 171(2) 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. We would expect 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 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 rating agency grade;
 - (ii) any overrides are applied to these grades; and
 - (iii) the firm has a system and processes in place that allows it to continuously collect and analyse final rating overrides.
- (e) the grades to which obligors are assigned is reassessed at least annually. The firm is able to demonstrate how the grades are reassessed on a more frequent than annual basis when new relevant information becomes available; and
- (f) firms can demonstrate that a modelling approach is being applied, both in terms of the choice of the 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 could form part of the annual independent review of the model.

12.36 In the PRA's view, if a firm does not have any additional information to add to the external ratings for the significant part of its portfolio then the PRA expects it will not meet the requirements for using an IRB approach.

Low default portfolios

12.37 The PRA expects a firm to estimate PD for a rating system in accordance with this section where a firm's internal experience of defaults for that rating system was 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 PD estimation for all exposures covered by that 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 CRR Article 179(f);
- (b) use a statistical technique to derive the distribution of default which takes account, as a minimum, of 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 CRR Articles 180(1)(a) and 180(2)(a); 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.

12.38 The PRA expects firms to take into account only defaults that occurred during periods that are relevant to the validation under the CRR of the model or other rating system in question when determining whether there are 20 defaults or fewer.

Supervisory slotting criteria for specialised lending

12.39 The PRA expects firms to assign exposures to the risk-weight category for specialised lending exposures based on the criteria set out in the tables in Appendix A. The planned EBA regulatory technical standards on supervisory slotting will further specify these assignments.

13 Loss Given Default in IRB approaches

.....

LGD — UK retail mortgage property sales reference point

13.8 The PRA believes 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 mortgage portfolios and expects a firm's rating systems to assume a reduction consistent with this. This reduction captures both a fall in the value of the property due to a market value decline ~~house price deflation~~ 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%.

13.9 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) we recognise that 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 seek the consent of the PRA and to be able to demonstrate that the following criteria are met:

- (d) 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);
- (e) the output from the adjusted model has been assessed against the 40% peak-to-trough property sales prices decrease reference point (after inclusion of a forced sale discount);
- (f) a minimum 5% market value decline applies at all times in the LGD model; and
- (g) the firm has set a level for reassessment of the property market price decline from its peak. For example, if a firm had initially assumed a peak-to-trough market decline of ~~15~~ 25%, then it will have set a level of market value decline where this assumption will be reassessed.

.....

16 Stress tests used in assessment of capital adequacy

.....

16.2 The level of cyclicity assumption used in calculating the long-run average PD for residential mortgages referred to in paragraph 12.4 above should not be relied on when

undertaking the credit risk stress test required under CRR Article 177(2) and the PRA expects firms to consider the possibility that the model proves more cyclical than anticipated.

.....

17 Validation

.....

17.4 The PRA expects that a firm establishing compliance with CRR Article 185 for residential mortgage rating systems should be able to demonstrate that its 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 rates are due to external factors or changes in underlying credit quality. The PRA would expect to see consideration given to internal firm historical data, industry data and economic data in assessing this;
- (b) an assessment of the rating system's cyclicity; and
- (c) an assessment of the performance of any underlying rank-ordering or segmentation mechanism.

When applying for permission for either a new residential mortgage PD rating system or a material change to an existing rating system, the PRA expects firms to submit a completed monitoring management information pack in support of their application.

17.5 The PRA will take into consideration the sophistication of the measure of discrimination chosen when assessing the adequacy of a rating system's performance.

17.6 In the case of a portfolio for which there is insufficient default experience to provide any confidence in statistical measures of discriminative power, the PRA expects a firm to use other methods. For example, analysis of whether the firm's rating systems and an external measurement approach, eg external ratings, rank common obligors in broadly similar ways. Where such an approach is used we would expect a firm to ensure it does not systematically adjust its individual ratings with the objective of making them closer to the external ratings as this would be counter to the philosophy of an internal rating approach. The PRA expects a firm to be able to explain the methodology it uses and the rationale for its use.