



BANK OF ENGLAND
PRUDENTIAL REGULATION
AUTHORITY

Consultation Paper | CP4/13

Credit risk: internal ratings based approaches

March 2013



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Adoption of legacy FSA material

Along with a number of other pieces of legacy FSA material relevant to its objectives, it is intended that the material in this consultation paper will be adopted by the Prudential Regulation Authority (PRA) as a Supervisory Statement. This paper restates material which was originally communicated to firms in various forms by the FSA but does not represent a substantive change of policy. The PRA expects to review the content of this publication in due course. In particular, we will revisit the contents in the light of the forthcoming implementation of the Capital Requirements Regulation (part of the CRD IV package) in the EEA to determine whether any changes are necessary.

Loss given default (LGD) floor for retail mortgages

In addition to material previously communicated by the FSA this consultation proposes that firms should maintain a 10% exposure weighted average residential mortgage LGD floor. This floor was initially set out in Section 264 of the Basel Accord to apply on a transitional basis for three years from implementation. In December 2009 the Basel Committee on Banking Supervision agreed to extend the floor indefinitely in the light of the volatility of some mortgage portfolios during the financial crisis.⁽¹⁾

Within EU law the floor was mandated by Article 154(4) of the Banking Consolidation Directive (2006/48/EC) until 31 December 2010 and this end date was subsequently extended until December 2012 by Directive (2010/76/EU). The floor and its extension were transposed in the United Kingdom through BIPRU TP 11.6. Article 160 of the Commission's Proposal for the Capital Requirements Regulation (CRR) requires the floor to be applied. It is expected that the floor will be in force on a permanent basis following implementation of the CRR.

There are currently nine firms that use the IRB approach for retail mortgages and consequently use mortgage LGD models to calculate capital requirements in the United Kingdom. Mortgage LGD models aim to predict losses in the event of a default in an economic downturn. Model uncertainty can arise from issues such as the price of properties being difficult to evaluate accurately in advance, or the possibility of a sudden unexpected change in the weighted average mortgage LGD of a firm, eg from a crash in the housing market. Therefore we consider that firms should continue to apply the LGD floor in advance of the implementation of the CRR as this would mitigate this risk of insufficient capital being held due to over-reliance on banks' internal models, and hence mitigate risks to the PRA's safety and soundness objective.

(1) www.bis.org/publ/bcbs_n14.htm.

Equality and diversity issues

The PRA has considered equality and diversity issues but has not identified any impacts arising from these proposals. Accordingly, the PRA has concluded that these proposals do not give rise to any equality and diversity issues.

Consultation questions

The PRA welcomes responses to the following questions:

1. Do you consider that the draft Supervisory Statement is presented in an appropriately clear manner?
2. Do you have any further comments on the consolidation of legacy FSA material into a PRA Supervisory Statement?

Please send any comments to benny.spooner@bankofengland.co.uk by 29 April 2013.

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The Prudential Regulation Authority (PRA) has adopted various legacy FSA policy material relevant to the advancement of its objectives. This document, which contains material originally communicated in various forms by the FSA, is being issued by the PRA as a Supervisory Statement as part of this process. Like all other PRA policy materials, this statement may be reviewed at a later stage.

1 Introduction

1. The PRA stated in *The PRA's approach to banking supervision* that 'if a firm is to use an internal model in calculating its regulatory capital requirements, the PRA will expect the model to be appropriately conservative'.

2. The purpose of this Supervisory Statement is to supplement the BIPRU 4 rules and guidance set out in the *PRA Handbook* by setting out more detailed expectations of firms that have permission to use Internal Ratings Based (IRB) approaches to ensure that their internal models are appropriately conservative.

3. This Supervisory Statement is not intended to be an exhaustive list of measures that firms will need to take. Responsibility for ensuring that internal models are appropriately conservative rests with firms themselves.

4. The PRA recognises that its approach may differ in some respects from that taken by other EEA competent authorities. Where appropriate the PRA will follow the Article 129 process to agree an accommodating and consensual application of BIPRU consistent with the principles of home-host regulatory co-operation.

5. The PRA expects that this document will be updated on a periodic basis. This first iteration restates material which was originally communicated in various forms by the FSA, and its content will be reviewed by the PRA in due course. In particular, the PRA is intending to consider whether it will be desirable to relocate any guidance currently contained in BIPRU to this Supervisory Statement. It will also revisit the contents of the Supervisory Statement in the light of the forthcoming implementation of the Capital Requirements Regulation (part of the CRD IV package) in the EEA to determine whether any changes are necessary.

2 Definition of default

2.1 Definition of default: material credit obligations

6. BIPRU 4.3.56(2) requires a default to be considered to have taken place when the obligor is past due more than 90 days on any material credit obligation to the firm.

7. The PRA has not prescribed a threshold for materiality; however in order for materiality thresholds defined by firms to be acceptable they should be expressed in relation to total exposures, and not in relation to overdue amounts.

2.2 Definition of default in retail portfolios: non-compliance on the grounds of immateriality

8. The PRA will make use of the non-compliance on the grounds of immateriality provisions of BIPRU 4.1.25 and 4.1.27 to accommodate non-compliance by a firm with the full definition of default set out in the Banking Consolidation Directive (Directive 2006/48/EC) (BCD), provided a firm can demonstrate that the aggregate effect of all areas of non-compliance with BIPRU are immaterial.

9. In respect of retail portfolios other than mortgage exposures caught by the LGD floor, restriction of the definition of default to days past due rather than the full definition may be automatically considered immaterial as a standalone issue, and will not therefore prevent firms from using the IRB approach. This is because we expect the capital requirements to be higher than if the full definition of default was being used.

10. In respect of residential mortgage exposures caught by the LGD floor, a firm will need to be able to specifically demonstrate that the effect of excluding elements of the full definition of default is immaterial, in accordance with BIPRU 4.1.25 and 4.1.27. This is because we expect the capital requirements to be lower than if the full definition of default was being used.

3 Probability of default in IRB approaches

3.1 Rating system philosophy

11. Regulators have coined the term 'rating philosophy' to describe where a rating system sits on the spectrum between the stylised extremes of:

- a. Point in Time (PiT): in which firms seek to explicitly estimate default risk over a fixed period, typically one year. A consequence of the use of such an approach is that 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 IRB capital requirement; and
- b. Through The Cycle (TTC): in which firms seek to take cyclical volatility out of the estimation of default risk, by assessing a borrower's performance across the business cycle. Such ratings do not therefore react to changes in the cycle when it occurs, so there is no consequent volatility in capital requirements.

12. The PRA does not prescribe a particular ratings philosophy, however the consequence of firms' decisions should be reflected in their model validation and stress-testing processes.

3.2 Variable scalar approaches

3.2.1 Use of variable scalar approaches

13. As a generalisation variable scalar approaches transform the outputs of relatively Point in Time PD models to produce final estimates for IRB purposes that are based on portfolio level long run average default rates, with the consequence that they reduce/eliminate the cyclicity of the regulatory capital requirements as far as the PD parameter is concerned.

14. The PRA considers that it is acceptable in principle for UK firms to use methodologies of this type in lieu of direct estimation of long-run averages for the grade/pool/score of the underlying rating system provided that the following conditions are met:

- a. Firms meet the following four principles which address the considerable conceptual and technical challenges which need 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 must 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 must be able to accurately 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 must use a data series of appropriate length in order to establish the long-run default risk.

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

- b. Firms stress testing includes a 'once in 25 years' stress test 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).
- c. Firms are able to understand and articulate upfront how the scaling factor would vary over time in order to achieve the intended effect.

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

3.2.2 Long-run default rates for variable scalar approaches

16. Meeting Principle 1 requires a firm to be able to distinguish movements not related to the economic cycle (eg customer mix) from changes purely related to the economic cycle, and not to average these away. For example, scalar calculations will have to account for changes in the non-cyclical risk of the portfolio (eg portfolio mix) and changes in the structure of the market in which it is operating (eg greater propensity to enter bankruptcy).

17. Accordingly, firms using a variable scalar approach should adopt a long-run default rate 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.

3.2.3 Variable scalar approaches for non-mortgage retail portfolios

18. We consider 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 remains low.

19. 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 etc) but does not include retail SME portfolios.

3.2.4 Variable scalar approaches based on segmentation for retail portfolios

20. We consider that one potentially compliant variable scalar approach 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.

21. We consider that if a firm applied such an approach properly it would satisfy both Principle 1 and Principle 4, however firms are reminded that applying each element of such an approach is a challenging task and that the choice of the basis of segmentation and the calibration of the estimated long-run default rate for the segments will be of critical importance.

22. Firms should ensure that segmentation is 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 debt to income.

23. Firms should incorporate an appropriate number of drivers of risk within the segmentation to maximise the accuracy of the system. Firms should be able to provide detailed explanations supporting their choices of drivers, including an explanation of the drivers they have considered and chosen not to use. Firms should also ensure that the drivers reflect their risk processes and lending policy, and therefore not be chosen using only statistical criteria (ie a judgemental assessment of the drivers chosen must be applied).

24. To the extent that the basis of segmentation is itself insufficient completely to explain movements in non-cyclical default risk, then 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 firms should make a conservative compensating adjustment to the calibration of the long-run average PD for the affected segments and 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, however it is emphasised that conservatism applied for this reason should not be removed as the cycle changes.

25. We expect that in time the actual default rates incurred in each segment will form the basis of the PD estimate 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. Firms should apply conservatism in this area and this is something on which we are likely to focus in particular in PRA model reviews.

26. Firms should also note that the approach does require them to have some measure of the historic performance of either their own portfolio, or the industry performance of that asset class. To enable a meaningful extrapolation the performance measure must contain data from a representative mix of good and bad economic periods.

27. Firms using the variable scalar approach should have a deep understanding of how and why its default rates vary over time. Firms will need 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 firms will need to consider the extent to which:

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

28. The following is an illustrative example of how a firm should determine an appropriate scaling factor:

- a. A segment is expected in benign conditions to incur an average default rate of 0.5% per annum. A '4 times' scalar is applied which results in a long-run PD estimate of 2% for that segment. Actual experience over a recent period shows the actual default rate to be 1.5%. The firm must complete a review which assesses whether the increase in the default rate is a result of cyclical factors, temporary non-cyclical factors or permanent non-cyclical factors.
- b. If the review shows that the economic conditions remain benign, that the cause of the increase in default rates was the consequence of a non-cyclic factor, eg widespread flooding, and that the probability of flooding has increased on a permanent basis, then the firms must review its PD estimates, for example deciding that the permanently increased possibility of flooding indicates an increase in the long-run PD from 2% to 2.5%. The firm must also make the requisite adjustments to its underlying scorecard.
- c. If the firm's review had instead determined that the increase in flooding was not permanent and that its PD estimates already took sufficient account of the flooding risk then no adjustments would be needed.

29. Firms should 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.

30. Firms should consider what use they can make of industry information, however firms should be seeking to measure the absolute level of and changes to their own default risk, rather than how their default risk has changed relative to the industry as a whole. The distinction between cyclical and non-cyclical changes is not the same as the distinction between systematic and idiosyncratic factors. For example, we would expect a variable scalar approach (or indeed any through the cycle rating system) to average out movement in default rates due to changes in the economy, but not movement in default rates due to changes in the market structure or due to a factor such as greater take-up of Individual Voluntary Arrangements (IVAs). Accordingly a firm should not draw comfort from the observation that its default risk is changing in the same way as the industry as a whole.

31. Firms should be able to demonstrate that they have adequate information and processes in order to make the decisions outlined in the preceding paragraphs, and that this is reflected in the reports and information being used to support

the variable scalar governance process. Given that, for retail business, these decisions are likely to affect only the regulatory capital requirements of the firm and not the day-to-day running of its business the use test will be more challenging to satisfy. Accordingly we will be looking for a high level of reassurance and commitment from firms' senior management to maintain an adequate governance process in this regard.

3.2.5 Variable scalar data considerations for UK residential mortgages

32. Firms should 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.

33. Firms that are including mortgage arrears data as a proxy for default data should:

- a. carry out sensitivity analysis which identifies the circumstances in which the assumption that arrears may be used as a proxy for default will produce inaccuracy in its 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 will not result in any significant inaccuracy in its particular case;
- c. institute a process for assessing the ongoing potential for inaccuracy, including trigger points beyond which the level of inaccuracy may no longer be insignificant; and
- d. consider the use of conservative adjustments to address the potential inaccuracy.

34. When using historical mortgage data as a key input into variable scalar models firms should:

- a. carry out sensitivity analysis which identifies 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.

3.3 Multi-country mid-market corporate PD models

35. Firms should normally develop country specific mid-market PD models. Where firms develop multi-country mid-market PD models, they must 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.

36. Firms should 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.

37. Firms should 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).

38. 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.

3.4 Use of external ratings agency grades

39. Firms using a rating agency grades as the primary driver in their IRB models should 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 to continuously collect and analyse all relevant information, and the 'other relevant information' considered by the firm in accordance with BIPRU 4.3.48 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 firm should be able to demonstrate what information was used and why, and, how it was included. If no additional information is included, the firm is able to document what information was discarded and why.
- d. The development of final grades consists of the following steps at a minimum:
 - 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.

- iii. The firm has a system and processes in place that allows it to continuously collect and analyse final rating overrides.
 - e. The grades that 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.
 - 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 to materially and consistently add to the internal rating grade, that they have incorporated this information as an additional driver. This work must be analytical (rather than entirely subjective) and could form part of the annual independent review of the model.
40. If a firm does not have any additional information to add to the external ratings for the significant part of its portfolio then it will not be meeting the requirements for using an IRB approach.

4 Loss given default in IRB approaches

4.1 LGD — sovereigns floor

41. Firms should apply a 45% LGD floor to each sovereign exposure.

4.2 LGD — retail mortgages floor

42. Firms should apply a 10% floor to the exposure weighted average LGD for retail exposures secured by residential properties and not benefiting from guarantees from central governments.

4.3 LGD — retail mortgages property sales reference point

43. We believe 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 mortgage portfolios. This reduction captures both a fall in the value of the property due to house price deflation as well as a distressed forced sale discount.

44. 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. All firms wishing to apply such an approach must seek the consent of the PRA and 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 must be formulaic, not judgemental).
- b. 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).
- c. A minimum 5% market value decline applies at all times in the LGD model.
- d. 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%, then a level of market value decline where this assumption will be reassessed must be set.

4.4 LGD — wholesale

45. Firms using AIRB approaches should have done the following in respect of wholesale LGD estimates:

- a. Applied LGD estimates at transaction level.
- b. Ensured that all LGD estimates (both downturn and non-downturn) are cautious, conservative and justifiable, given the paucity of observations. Estimates must be derived using both historical experience and empirical evidence, and must not be based purely on judgemental consideration. The justification as to why the firm thinks the estimates are conservative must be documented.
- c. Identified and explained 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 has been used to produce the estimate.
- d. Clearly documented the process for how estimates were arrived at and reviewed, and who was involved in this process in cases where expert judgement has been used.
- e. Demonstrated an understanding of the impact of the economic cycle on collateral values and be able to use that understanding in deriving their downturn LGD estimates.
- f. Demonstrated sufficient understanding of any external benchmarks used and identified the extent of their relevance and suitability to the extent that the firm can satisfy itself that they are fit for purpose.
- g. Evidenced that they are aware of any weaknesses in their estimation process and have defined standards, for example

related to accuracy, that their estimates are designed to meet.

- h. Be able to demonstrate that it has 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. Ensured, 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 then the firm must be able to demonstrate why they are not relevant.
- j. Have an ongoing data collection framework in place to collect all relevant internal loss and exposure data required for estimating LGD and a framework to start using these data as soon as any meaningful information becomes available.
- k. Be able to articulate what data the firm intends to use from any industry-wide data collection exercises that they are participating in, and how the data will be used.

46. The PRA has developed a framework for assessing the conservatism of firms' wholesale LGD models for which there are a low number of defaults. This framework is set out in Appendix B and does not apply to sovereign LGD estimates which are floored at 45%. The PRA is in the process of using this framework to assess the calibration of firms' material LGD models for low-default portfolios.

47. In the following cases, firms should determine the effect of applying the framework set out in Appendix B to models which include LGD values that are based on fewer than 20 'relevant' data points (as defined in Appendix B):

- a. the model is identified for review by the PRA; or
- b. the firm submits a request for approval for a material change to its LGD model.

In such cases firms should contact their supervisor to obtain the relevant data templates that should be populated and submitted to the PRA.

4.5 Unexpected loss on defaulted assets

48. As set out in the answer to CRD transposition group question 655 two approaches for calculating UL in respect of defaulted assets are:

- a. The independent calculation approach.
- b. Subtracting the best estimate of expected loss from post-default LGD.⁽¹⁾

49. We consider that both of the approaches set out in the CRD transposition group answer are acceptable in principle.

50. Where an independent calculation approach⁽²⁾ is adopted for the calculation of unexpected loss on defaulted assets firms should ensure that estimates will be at least equal, at a portfolio level, to a 100% risk weight/8% capital requirement on the amount outstanding net of provisions.

4.6 Treatment of cures

51. Where firms wish to include cures in their downturn LGD estimates, they should do this on a cautious basis with reference to both their current experience and how this is expected to change in downturn conditions. In particular, firms are expected to be able to clearly articulate 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, firms need 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, cure assumptions in a downturn are expected to be supported by relevant historical data.
- b. Firms need to be aware of and 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.

4.7 Low LGDs

52. Firms should recognise the impact of collateral volatility on low LGD estimates by defining a non-zero LGD floor which is not solely related only to administration costs.

53. Firms should justify any low LGD estimates using analysis on collateral valuation volatility. This should recognise 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.

4.8 Unsecured LGDs where the borrowers' assets are substantially collateralised

54. The extent to which a borrower's assets are already given as collateral will clearly affect the recoveries available to unsecured creditors. Ideally this is something which will always be taken into account, but certainly this does need to

(1) <http://ec.europa.eu/yqol/index.cfm?fuseaction=question.show&questionId=655>.

(2) Independent calculation approaches are an alternative to measuring the unexpected loss on defaulted assets as being the difference between downturn LGD and best estimate LGD. See link in footnote above for further information.

be the case where the degree to which assets are pledged is substantial — in BIRPU terms the giving of collateral is a material driver.

55. In principle this effect can be present in any transaction and this requires knowledge by the firm in particular cases. However one can readily identify situations where 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, and SME/mid-market lending can be considered such cases, and there are possibly growing issues in this regard in the banking sector, to the extent that reliance on covered bonds and the like increases.

56. When estimating unsecured LGDs for borrowers whose assets are substantially used as collateral for other obligations, firms should take this effect into account. Firms are expected to not use unadjusted data sets that ignore this impact, and are reminded that it is an estimate for downturn conditions that is normally required. In the absence of relevant data to estimate this effect, conservative LGDs — quite possibly 100% — are expected to be used.

5 Exposure at default in IRB approaches

5.1 Exposure at default — general expectations of IRB firms

57. Firms are reminded that the exposure at default (EAD) required for IRB purposes is the exposure(s) expected to be outstanding under a borrower's current facilities should it go into default in the next year, but assuming that economic downturn conditions occur in the next year; and assuming also that, other than any changes resulting from the economic downturn conditions, a firm's policies and practices for controlling exposures remain unchanged from what they are at present. As with other aspects of the IRB framework, the EAD estimates to be used for capital purposes are based on the realised EADs in the reference data set of exposures that have gone into default in the past. The basic historic data needs to be adjusted to take account of, *inter alia*, changes in policies and practices and to produce an orientation towards an economic downturn. In line with BIPRU 4.4.45 and 4.4.46 EAD cannot be less than current drawings.

58. In particular, firms using AIRB approaches should have done the following in respect of EAD estimates:

- a. Produced EAD estimates at the level of the individual facility.
- b. Ensured that all EAD estimates are cautious, conservative and justifiable, given the paucity of observations. Estimates must be derived using both historical experience and empirical evidence, and must not be based purely on

judgemental consideration. The justification as to why the firm thinks the estimates are conservative must be documented.

- c. Identified and explained 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. Ensured that where expert judgement has been used, the process for how the estimates were arrived at and reviewed, and who was involved in this process is clearly documented.
- e. Understood the impact of the economic cycle on exposure values and be able to use that understanding in deriving downturn EAD estimates.
- f. Demonstrated sufficient understanding of any external benchmarks used and identified the extent of their relevance and suitability to the extent that the firm can satisfy itself that they are fit for purpose.
- g. Have evidenced that they are aware of any weaknesses in their estimation process and have set standards that their estimates are designed to meet (eg related to accuracy).
- h. Ensured, in most cases, that estimates incorporate effective discrimination on the basis of at least product features and consumer type. If these drivers are not incorporated into EAD estimates then the firm must be able to demonstrate why they are not relevant.
- i. Have put in place a data collection framework to collect all relevant internal loss and exposure data required for estimating EAD and a framework to start using this data as soon as any meaningful information becomes available.
- j. Made use of the data they are collecting to identify all relevant drivers of EAD and to understand how these drivers will be affected by a downturn.
- k. Identified dependencies between default rates and conversion factors 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.

59. The PRA has developed a framework for assessing the conservatism of firms' wholesale EAD models for which there are a low number of defaults. This framework is set out in Appendix B. The PRA is in the process of using this framework to assess the calibration of firms' material EAD models for low-default portfolios.

60. In the following cases, firms should determine the effect of applying the framework set out in Appendix B to models which include EAD values that are based on fewer than 20 'relevant' data points (as defined in Appendix B):

- a. the model is identified for review by the PRA; or
- b. the firm submits a request for approval for a material change to its EAD model.

In such cases firms should contact their supervisor to obtain the relevant data templates that should be populated and submitted to the PRA.

5.2 Time horizon

61. Firms should use a time horizon of one year for EAD estimates, unless they can demonstrate that another period would be more conservative.

62. EAD estimates can be undertaken on the basis that default occurs at any time during the time horizon (the 'cohort approach'), or at the end of the time horizon (the 'fixed-horizon approach'). We consider that either approach is acceptable in principle.

63. Firms should not use a six-month 'fixed-horizon approach' on the basis that this is the effective time horizon of the 'cohort approach'.

64. Where own estimates are used the time horizon for additional drawings should be the same as the time horizon for defaults. In effect this means that EAD estimation need cover only additional drawings that might take place in the next year, such that:

- a. no capital requirement need be held against facilities, or proportions of facilities that cannot be drawn down within the next year; and
- b. where facilities can be drawn down within the next year, firms may in principle reduce their estimates to the extent that they can demonstrate that they are able and willing, based on a combination of empirical evidence, current policies, and documentary protection to prevent further drawings.

5.3 Direct estimates of EAD

65. Although this Supervisory Statement refers to estimates of exposure at default, the regime set out in the BCD is one in which EAD is formulated as the sum of current drawings and additional drawdowns made under the limit applied to a facility. Hence what a firm is actually required to estimate is the percentage of the currently undrawn limit that will be drawn down at the time of default, ie the conversion factor.

66. We consider that it is acceptable in principle to estimate conversion factors directly or to estimate them indirectly via the direct estimation of EAD.

67. There are a range of approaches that focus on the total amount that will be drawn down at the time of default and directly estimate EAD. Typically, but not in all cases, these will estimate EAD as a percentage of Total Limit. These approaches can be described collectively as 'momentum' approaches.

68. A 'momentum' approach can be used either:

- a. by using the drawings/limit percentage to formulaically derive a conversion factor on the undrawn portion of the limit; or
- b. by using the higher of percentage of the limit and the current balance as the EAD.

69. We consider that the use of momentum approaches in both of the ways outlined above is acceptable in principle.

5.4 Estimates of conversion factors

70. In cases where firms estimate conversion factors (CFs) directly using a reference data set that includes a significant number of high CFs as a result of very low undrawn limits at the observation date, the firms should:

- a. investigate the distribution of realised CFs in the reference data set;
- 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
- c. while the median of the distribution might be a starting point, firms should not assume without analysis that the median represents a reasonable unbiased estimate. Firms should consider whether the pattern of distribution in realised CFs means that some further segmentation is needed (eg treating facilities that are close to full utilisations differently).

5.5 Identification of exposures for which an EAD must be estimated

71. An EAD/CF is required on a facility from the time that a borrower is advised by the firm that it has agreed the facility is to be made available. The possibility that a facility will not eventually be taken up by the borrower, or that the formalities necessary to allow drawings to take place are not completed, subsequent to advice of the facility to the borrower, is expected to be reflected in the EAD/CF applied to that facility.

72. Where the facility is of the type that it is customary not to advise the borrower of its availability, an EAD/CF is required

from the time that the existence of the facility is recorded on the firm's systems in a way that would allow the borrower to make a drawing.

73. If the availability of a facility is subject to a further credit assessment by the firm, this may remove the requirement to apply an EAD/CF. However this should be the case only if the subsequent credit assessment was of substantially equivalent rigour to that of the initial credit approval, and if this includes a re-rating or a confirmation of the rating of the borrower.

74. Internal indications of willingness to provide facilities in the future, such as by means of expression of a risk appetite for a customer, which have not been advised to the customer and the provision of which will be subject to the process described in the previous paragraph, do not require an EAD/CF.

75. Firms are not expected to include in their EAD/CF estimates the probability of increases in limits between observation and default date. If the reference data set includes the impact of such increases, firms may adjust their estimates accordingly with the aim of assessing what the exposure would have been at default if the limit had not been increased.

76. Firms should investigate the incidence of exposures existing at default that arise from products or relationships that are not intended to result in a credit exposure and, consequently, have no credit limit established against them and are not reflected in their estimates of EAD. Unless these are immaterial, firms are expected to estimate a Pillar 1 capital charge on a portfolio basis to be applied against such exposures.

77. Firms should investigate how their EAD estimates are impacted by exposures that are in excess of limits at either the observation date (if in the reference data set) or at the current reporting date (for the existing book to which estimates need to be applied). Unless a momentum approach is being used exposures in excess of limit should be excluded from the reference data set (as the undrawn limit is negative and nonsensical answers would result from their inclusion). Unless current exposures in excess of limit are immaterial, firms should estimate a Pillar 1 capital charge on a portfolio basis to be applied against possible future increases in such exposures.

5.6 Accrued interest

78. Firms should treat accrued interest in the following manner:

a. accrued interest to date should be included in current exposure for performing exposures;

b. firms may choose whether estimated increases in accrued interest up to the time of default should be included in LGD or EAD;

c. in the estimation of EAD increases in accrued interest may be offset against reductions in other outstandings;

d. estimation of changes in accrued interest needs to take account of changes in the contractual interest rate over the time horizon up to default, and in a way consistent with the scenario envisaged in the calculation of the downturn/default weighted average;

e. inclusion of estimates of future post-default interest is not necessary in either EAD or LGD; and

f. firms' accounting policies will determine the extent to which interest accrued to date is reflected in current exposure as opposed to LGD for defaulted exposures.

5.7 Netting

79. As regards current balances, netting may be applied in those cases where a firm meets the general conditions for on balance sheet netting set out in BIPRU 5.3.3.

80. As regards the CF on undrawn limits, this may be applied on the basis of the net limit provided the conditions in BIPRU 5.3.3 are met. However firms are reminded that the purpose of the measure is to estimate the amount that would be outstanding in the event of a default. This implies that their ability in practice to constrain the drawdown of credit balances will be particularly tested. Moreover the appropriate conversion factor should be higher as a percentage of a net limit than of a gross limit.

81. The lower the net limit as a percentage of gross limits or exposures, the greater will be the obligation 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 application of a zero net limit is acceptable in principle, but there is a consequently a very high obligation on the firm to ensure that breaches of this are not tolerated.

5.8 Underwriting commitments

82. Estimation of CFs on underwritten facilities in the course of primary market syndication may take account of anticipated sell down to other parties.

83. Firms are reminded that since the basis of EAD estimation is that default by the borrower is expected to take place in a one-year time horizon, and quite possibly in downturn conditions, any reduction in their CF in anticipation of syndication will need to take account of this scenario.

5.9 Use test

84. As with other parameters firms are not required to use exactly the same EAD measures for regulatory and internal purposes, but should be able to demonstrate the reasonableness of any differences as set out in BIPRU 4.2.6.

85. In general differences are expected to be confined to those arising from conceptual distinctions between internal measures and BCD compliant estimates of EAD. As examples:

- a. As with LGD, a firm may use EAD estimates in its internal risk management processes that differs from downturn EADs used in the calculation of risk-weighted assets; and
- b. the starting date at which a CF must be recognised against an undrawn exposure for IRB purposes need not be the same as that at which an internal limit is recorded, where the firm has a different approach to the BCD regarding the balance in EAD measurement between exposures to individual counterparties or facilities and exposures of the book as a whole.

6 Income-producing real estate portfolios

6.1 BIPRU compliance

86. We consider that income-producing real estate (IPRE) is a particularly difficult asset class for which to build effective rating systems that are compliant with the requirements of the internal ratings based (IRB) approach.

87. As with all asset classes, firms should assess whether their IPRE model is BIPRU compliant and not whether it is the nearest they can get to compliance given the constraints imposed on their model development (eg lack of data or resource constraints).

88. Where material non-compliance is identified and cannot be remediated in a timely fashion firms should adopt a compliant approach for calculating regulatory capital. In most cases this is likely to be the slotting approach.

6.2 Drivers of risk

89. Firms should be able to demonstrate that the model drivers selected offer sufficient discriminatory power and to justify why other potential data sources are not expected to materially improve the discriminatory power and accuracy of estimates.

90. We expect that an IPRE rating system will only be compliant if a firm is able to demonstrate the following in respect of its treatment of cash flows (except where the firm can demonstrate that this is not an appropriate risk driver):

- a. the difference in deal ratings when tenant ratings are altered is intuitive;

- b. the transformation of ratings into non-rent payment probability is intuitive. Even where tenants are rated by the firm the PD will not usually represent a direct read across to probability of non-payment due to, for example, model philosophy issues. Addressing this is likely to be a key area since many firms struggle with defining what divergence is expected between observed default rate and PD in different economic conditions in the mid corporate space;
- c. selection of parameter values and/or distributions, and their impact on deal ratings, is well supported and intuitive;
- d. impact on the deal rating is intuitive for such features as: type of building, geographical location and building quality; and
- e. where data are missing or unavailable the treatment is conservative.

91. We expect that an IPRE rating system will only be compliant if a firm is able to demonstrate the following in respect of its treatment of interest rate risk (IRR):

- a. IRR is included as a relevant risk driver (unless the portfolio is exclusively hedged);
- b. the way in which interest rate risk is included in the deal rating is intuitive with respect to model philosophy. For example a 'point in time' rating should consider the current interest rate and likely change over a one-year time horizon, whereas a 'through the cycle' model needs to consider the interest rate risk averaged over an economic cycle; and
- c. the model rates deals where IRR is hedged by the firm differently from deals where IRR is unhedged and the magnitude of the difference in these ratings is intuitive.

92. We expect that an IPRE rating system will only be compliant if a firm is able to demonstrate the following in respect of its treatment of refinance risk:

- a. refinance risk is included as a relevant risk driver (unless the portfolio contains only amortising loans). This conforms to a BIPRU compliant definition of default which is based on whether an independent third party would provide finance on materially similar conditions;
- b. the firm should be able to demonstrate that the model rates interest only and amortising deals differently in the final year and that the magnitude of the difference in these ratings is intuitive;
- c. given the time horizon associated with IRB estimates (ie twelve months) the refinance risk could have a zero weight until the deal enters its final year for point in time

models. In these cases the risk should be captured in stress testing and Pillar 2; and

- d. the firm is able to report by borrowers that have previously had a distressed restructuring unlikelihood to pay indicator (even if they are now performing) by number, EAD and RWA.

6.3 Calibration

93. We expect that firms will not be compliant with the calibration requirements relating to use of a long-run default rate unless it can demonstrate that:

- a. the internal data series is the longest relevant and accurate data, on a BIPRU compliant definition of default, available;
- b. the determination of long-run default rate includes reference to an appropriate source of downturn data. This may require the use of external data;
- c. the relevance of any external data used is analysed, and the relationship between internal default data and the external data used is considered over a multi-year period; and
- d. where uncertainty is introduced due to, for example, the quality of internal data or shortcomings in the relevance of external data a conservative adjustment to the estimates should be made.

94. We expect that a firm will only be compliant with the calibration requirements relating to model philosophy if it can demonstrate that:

- a. model philosophy is clearly articulated and justified. Justification should include analysis of the performance of assets, and the corresponding ratings assigned, over a change in economic conditions (ie as long as period as possible); and
- b. in addition to encapsulating this information in a coherent way in the calibration, the impact of capturing risks such as IRR and refinance risk is clearly documented.

6.4 Low default portfolios

95. Where the rating system is classed as a low default portfolio under BIPRU 4.3.95 firms should be able to demonstrate that the framework applied adequately considers:

- a. economic environment of data used;
- b. changes in portfolio composition over time;
- c. parameter choices; and
- d. model philosophy.

6.5 Constructed theoretically

96. Although elements of the BIPRU text suggest a supposition that models will be constructed on data, some models, such as Monte-Carlo cash-flow simulation models, are built from a theoretical basis and produce PD estimates without reference to any empirical default data.

97. If used for regulatory capital calculation purposes these estimates should still meet the usual requirements — eg the parameter reflects a one-year PD estimate with a well-understood model philosophy. Importantly even if empirical data were not used to determine the PD estimate it should, where available, be used to back-test the estimates.

98. We believe most models of this type will be able to produce one-year estimates of PD that correspond closely to 'point in time' estimates. This allows for robust back-testing as such estimates can be meaningfully compared with realised default rates.

99. We would consider that performing robust back-testing of this nature and demonstrating that the results meet pre-defined and stringent standards must be a requirement for model approval, both internally and by us where default data has not been used directly in the model calibration process.

100. Where estimates are determined from a theoretical basis the assumptions undertaken in the model build process are likely to materially impact the resulting PDs. For example, there is likely to be an element of judgement applied when selecting the value or distribution associated with particular parameters.

101. As with all the material assumptions, we would expect these choices to be clearly justified in the model documentation and to have been subject to independent review. The justification for all assumptions should be supported by analysis covering the sensitivity of the model outputs to changes in the assumptions (BIPRU 4.4.25R).

102. Where the firm has less than 20 defaults in their internal data set, the requirement to perform a statistical low default portfolio calibration as discussed in the previous section still holds.

6.6 Validation

103. We expect that a firm will not be compliant with the validation requirements relating to discrimination unless it can demonstrate that:

- a. appropriate minimum standards that the rating system is expected to reach are defined together with reasoning behind the adoption of such standards and that the factors considered when determining the tests are clearly documented;

- b. an objective rank ordering metric, measured using an appropriate time horizon (eg using ratings one year prior to default) or cohort approach), such as Gini or Accuracy Ratio of 50% is achieved over time;
- c. where there are sufficient defaults from different time periods the discriminatory power is shown to have reached the appropriate minimum standard over an extended time period (ie longest period possible including most recent data); and
- d. any concentrations in ratings from the model are demonstrated to be appropriate.

104. We expect that a firm will not be compliant with the validation requirements relating to the accuracy of calibration unless it can demonstrate that:

- a. observed default rate versus PD is considered at grade level and across a range of economic environments (ie as long as period as possible);
- b. where the PD does not relate to a pure point in time estimate either the PD or the observed default rate is transformed such that comparison between the two is meaningful. This transformation should be consistent with the model philosophy and calibration technique applied; and
- c. pre-defined tolerances for the degree of divergence, and the associated actions for what should happen when they are not met, are set.

105. We expect that firms will not be compliant with certain other validation requirements unless it can demonstrate that:

- a. appropriate stability metrics should be considered across a range of economic environments (ie longest period possible including most recent data);
- b. the tolerances for the degree of divergence, and associated actions for what should happen when they are not met, is pre-defined; and
- c. subsections of portfolios by characteristics affecting risk profile, and therefore potentially model performance, are investigated. Such subsections could include:
 - i. loan type (amortising/interest only);
 - ii. degree of hedging;
 - iii. building type; and
 - iv. other factors such as non-SPV lending in a predominately SPV lending book or *vice versa*.

6.7 Other requirements

106. We expect that a firm will not be compliant with certain other requirements unless it can demonstrate that:

- a. Where more than one model is used the rationale, and the associated boundary issues, is clearly articulated and justified. The criteria for assigning an asset to a rating model are objective and clear.
- b. The firm has a process in place to ensure valuations of the property are appropriate and up to date.
- c. Where relevant the firm makes reference to information available from the Investment Property Databank. Where this data is utilised at a broad level when more granular data is available this is fully justified with appropriate analysis.
- d. The rating histories demonstrate that deals are re-rated every time material information becomes available, for example where the deal enters its final year (and refinance risk becomes relevant) or a tenant defaults, is replaced or has their rating changed.
- e. The relationship between the IRB estimates and those used to run the business is demonstrated and justified. Note that the IRB estimates should be one-year estimates which may not be well aligned to managing the business (eg the potential for refinance risk or significant interest rate risk over the lifetime of the deal may not be captured).
- f. Management information covering all aspects required by BIPRU is produced and reviewed regularly by senior management.
- g. The tolerances for the degree of divergence, and associated actions for what should happen when they are not met, are pre-defined.
- h. Impact on PDs and RWAs is consistent with model philosophy (although ratings should be affected by events such as tenant defaults even if they are TTC).
- i. Impairment projections are justified with reference to past internal data.
- j. All the relevant above points are documented in a comprehensive and clear way.
- k. Any changes as a result of independent challenge or review work are clearly documented.

7 Unrated exposures

7.1 Criteria for use of common ratings

107. This section deals with situations in which a firm, for reasons of cost and/or practicability, does not apply its usual IRB rating system to certain exposures but nevertheless wishes to treat them as being on IRB as opposed to leaving them on standardised (using the partial use provisions, where available). In such cases a firm typically gives a common rating to all such obligors which it argues is more conservative than individual ratings.

108. Such an approach cannot in itself be BIPRU compliant as it does not meet one of the overriding requirements for the IRB approach — to provide a meaningful differentiation of obligor risk (BIPRU 4.2.2(1)). On the other hand, the provisions of BIPRU 4.1.25 and 4.1.27 mean that 100% compliance is not essential provided all the incidences of non-compliance, when taken together, are immaterial.

109. In accordance with the immateriality provisions firms should only use common ratings as outlined above under the following conditions:

- a. the firm is able to justify this approach within the context of BIPRU 4.1.27;
- b. the firm is able to demonstrate why a slimmed-down rating system is not a practicable alternative for some or all of the exposures in question;
- c. the firm's policy for excluding such exposures from its usual ratings systems is clear and transparent — both internally and externally as relevant;
- d. the firm is able to demonstrate that the common rating approach produces more conservative outcomes than rating the obligors individually;
- e. the total obligors subject to this approach are subject to caps, including one based on the proportion of total RWAs due to the exposures in question;
- f. the appropriateness of and compliance with the caps, as well as the conservatism of the approach, are monitored on a regular basis — at least yearly. Firms may expect us to discuss these issues as part of our regular monitoring; and
- g. the major elements of the approach cannot be varied without the PRA's consent.

8 Notification and approval of changes to approved models

8.1 Changes to approved models

110. This section sets out our expectations in respect of the notifications and changes to approved models. For clarification, the term 'approved model' refers to all aspects of the IRB rating system that were in place at the time that the model was approved and implemented. This would include any judgemental overlays or conservatism that were put in place or processes for manually overriding the model outputs, updating house price indices or ongoing recalibrations for Point-in-Time PD models.

111. Where a firm intends to make changes to an approved model these must be pre-notified to the PRA if they are significant and post-notified otherwise. Firms may nominate certain models for exclusion from these notification requirements on the grounds of immateriality. In addition, in certain circumstances temporary adjustments may be made to capital requirements outside of this framework. Further details are set out below.

8.2 Pre-notification of significant changes

112. Model changes may necessitate a modification to the IRB approval originally granted. For the avoidance of doubt, any change that requires a revision to the IRB Direction and/or Joint Decision must be pre-notified.

113. In addition, firms must notify the PRA of significant changes to IRB models prior to these changes being implemented. A firm's IRB Direction offers some broad guidelines around factors which constitute significant change.

114. In addition to these broad guidelines, the following are examples of factors which constitute significant change (please note that this is not an exhaustive list):

- a. Rating system development eg changes to the ratings philosophy of a material rating system.
- b. Extension of rating systems or development of new rating systems for new products and where partial use provisions were employed to migrate standardised portfolios to IRB.
- c. Mergers and acquisitions — a firm with IRB model approval may acquire rating systems which are not IRB compliant, or firms may have legacy capital models that they wish to amalgamate.
- d. Upgrades to IRB approaches — for example, from Foundation to Advanced IRB.
- e. A change resulting in a change in credit risk capital requirements for the UK consolidation group that is greater

than 1%. In assessing changes to credit risk capital requirements firms should take into account changes in expected loss and treatment of securitisation positions as well as changes arising from RWAs.

- f. A recalibration that results in a reduction in portfolio level credit risk capital requirements greater than 5%. If a recalibration has an impact below 5% at the portfolio level but above 1% at the group level then such a recalibration would count as a significant reduction by virtue of (e) above. 'Portfolio level' should be interpreted as the portion of the group's overall exposures covered by the ratings system that the firm is proposing to modify. In assessing changes to credit risk capital requirements firms should take into account changes in expected loss and treatment of securitisation positions as well as changes arising from RWAs.
- g. A significant change to the outputs of the ratings system resulting from a series of changes that in isolation may not be significant but cumulatively have a significant effect.

115. In relation to 114(e) and 114(f) above, in the context of an Article 129 joint decision, it should be open for the PRA and other EEA regulators to agree to the parameter for defining a significant change, so that there is consensus on how these cases are dealt with within the Article 129 framework. Where the PRA is the consolidated supervisor, it will attempt to agree the thresholds for significance with other EEA regulators.

116. Firms should implement a formal internal policy which governs the IRB changes that require pre and post-notification, or are *de minimis* and require no notification.

117. An IRB direction may specify that one or more rating systems is to be rolled out within a time window and may specify that the PRA will review the rating system prior to rollout. Where the PRA has not indicated in the Direction that it will review the ratings system prior to rollout firms should nonetheless follow the above approach in determining whether pre-notification of a model change is necessary.

8.3 Process for pre-notifying a change

118. Firms should follow the following process to pre-notify a change:

Step 1. Submit the information set out in the *pro-forma* in Appendix A.

Step 2. The firm should advise its PRA supervisor about future proposed changes as far in advance as possible. Formal pre-notification to the PRA of specific changes in more detail may follow. Such advance notice might take the form of a periodic report setting out the firm's current thinking on future changes, in aggregate across the group.

Advance notice is particularly important in the case of firms with an IRB permission under Article 129(2) of the BCD, where the PRA may need to revise the Joint Decision in consultation with other EEA regulators, or more generally where a proposed change impacts on overseas jurisdictions where it may be appropriate to consult with other regulators. The common decision by the PRA and other regulators must be reached within six months.

Step 3. Conduct a self-assessment of the change against the relevant BIPRU rules, noting any areas of non-compliance with details of how these gaps will be closed.

Step 4. If the change affects a rating system, then, in addition to the information provided in the *pro-forma* in Appendix A, the firm should also comment on the following areas:

- the way in which the rating system complies with the use test;
- what the internal governance arrangements and sign-off procedures were for the rating system;
- what validation work has been performed on the ratings system or is planned; and
- how the firm's Pillar 1 stress-testing practices, including the impact on the quantitative results of stress testing, have been affected by the change.

Step 5. Send the material from Steps 1, 2 and 4 to its PRA supervisor. The material needs to be sent sufficiently far in advance of the proposed change to allow us time to review it prior to implementation. If the PRA chooses to review the change it may ask for additional information and if necessary meetings or on-site visits. We are content for firms to provide internal documentation for this purpose, provided this addresses clearly and sufficiently the process requirements set out above.

8.4 Process for post-notifying a change

119. Where a change to an approved model may be notified to the PRA after it has occurred, firms should prepare and submit the following information:

- the information set out in the *pro-forma* in Appendix A;
- confirmation that the change has been reviewed through the firm's internal governance processes; and
- confirmation that a self-assessment of the change against the relevant BIPRU rules has been completed and has not identified any areas of non-compliance.

120. After the post-notification, we might request additional information to assist in any review that we might undertake.

8.5 Immaterial models

121. We will normally permit firms to nominate a number of models, which in total account for no more than 1% of the credit risk capital requirement of the UK consolidation group, for which neither pre-notification nor post-notification is ordinarily necessary.

8.6 Fees

122. There will be some circumstances where a fee may be applied for example, where a firm is upgrading from FIRB to AIRB or conceivably a special project fee in the case of a merger or acquisition.

8.7 Self-assessment

123. The self-assessment process described above need only be an assessment against BIPRU rules that are relevant to the change in question. While it is the firm's responsibility to decide on the method of conducting the self-assessment, this should be sufficiently rigorous to allow the firm to identify areas of non-compliance.

124. A high-level 'gap analysis' or a process that places reliance on the firm's governance process or on the firm's developmental process to deliver a compliant approach is unlikely to form an adequate self-assessment, at least in the early years of IRB operation.

8.8 Temporary adjustments to approved models

125. Firms should address identified model issues in a timely fashion with suitable model changes, and ensure that such changes are implemented in accordance with the model changes process outlined above. We recognise, however, that there are instances where it is prudent and correct for firms to adjust the capital requirements produced by their models on a temporary basis. We do not expect any such adjustment to be in place for a period longer than six months and firms should take any action required to remove an adjustment (including notifying the PRA of a model change where appropriate) within that period.

126. Firms should meet the following criteria in respect of any temporary adjustments to approved models:

a. The framework must be applied at a portfolio level. For this a 'portfolio' is defined as the group of assets covered by the IRB model the adjustment is being made for. If adjustments are being made to more than one model (eg PD and LGD) which cover overlapping assets (eg a global LGD model and regional PD models), then a portfolio(s) must be defined as the subset of assets covered by the same models (eg in the example above the assets covered by the regional PD model would be classified as a single portfolio).

b. Irrespective of what model component the adjustment is for (eg PD, LGD or EAD) the RWA and EL adjustments are made as a portfolio level add-on to the requirements produced by the approved models (ie the underlying models must not be recalibrated or changed to give the desired capital outcome).

c. Firms' PD, LGD and EAD models remain in place until the correct level of approval has been obtained for any changes. These models continue to be monitored as required by BIPRU.

d. Only adjustments that increase RWA and EL are made and there should be no netting of adjustments across portfolios (eg if there are two data issues, in separate portfolios, one which increases RWA by £200 million and one that decreased RWA by £100 million, only the adjustment increase of £200 million is applied). Where netting of impacts is proposed, this is applied in the relevant portfolio (ie where a model covers a number of portfolios, netting can only be done at a portfolio level).

e. A list of all model adjustments is included in the firm's model monitoring information presented to senior management, containing the following information as a minimum:

- 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 RWA and EL as a result of the adjustment.

f. Firms may make adjustments across model components (eg PD, LGD and EAD), however if the PRA judges that a firm is not applying the netting across components appropriately, or with the correct degree of conservatism, then it will require that netting is permitted only within a model component (eg if the adjustment to PD increases capital and to LGD decreases capital, the firm would only apply the increased capital that results from the PD adjustment).

127. Firms should include any EL and RWA adjustments in their regulatory returns. In respect of the FSA004 return uplifts should be made by adjusting the total figures within the relevant IRB asset classes. In respect of the FSA045 return the total RWA and EL figures for each of the PD grades should be increased proportionally.

9 Appendices

9.1 Appendix A: Model change *pro-forma* required when pre or post-notifying changes to a ratings system

Firm:	
Date notification sent to PRA:	
Pre or post change notification:	
Rating system:	Name: Asset type: PD/LGD/EAD
Brief description of change(s):	
Portfolio information: <i>[Credit risk capital information on the ratings system that the firm is proposing to change — this information should be prior to the application of the proposed change.]</i>	EAD £xxx (date) RWA £xxx (date) EL £xxx (date)
Group information: <i>[Credit risk capital information for UK consolidation group.]</i>	EAD £xxx (date) RWA £xxx (date) EL £xxx (date)
Materiality of change:	RWA impact £xxx RWA % change % EL impact £xxx EL % change %
Reason change is pre/post notified: <i>[Explain here why the change is classed as pre or post notified.]</i>	
Relevant committee approval: <i>[Committee responsible for approval of change.]</i>	Name: Date of approval:
Proposed implementation date: <i>[Date from which changes are intended to affect capital calculations, subject to approval received in the case of material pre-notified changes.]</i>	
Attach supporting documentation here: <i>[Including the following where available: development document(s); validation document(s); materials presented to approval committee; approval committee minutes; other supplementary materials.]</i>	

9.2 Appendix B: Wholesale LGD and EAD framework

128. The following framework should be used to assess wholesale LGD models in the circumstances set out in paragraph 47 of this Supervisory Statement:

- a. For unsecured recoveries if a firm has fewer than 20 relevant default observations of recoveries in a specific country for an individual type of exposure then the maximum recovery a firm can assume must be equivalent to that which would give a 45% LGD for senior unsecured exposures, 75% for subordinated exposures and 11.25% for covered bonds.
- b. If a firm is taking account of non-financial collateral which is not eligible under the foundation approach where they do not have 20 or more relevant data points of recovery values for that type of collateral or do not have a reliable time series of market price data for the collateral in a specific country, then the LGD for the exposure to which the collateral is applied must be floored at 45%.
- c. If a firm is taking account of non-financial collateral which is eligible under the foundation approach where they do not have 20 or more relevant data points of recovery values for that type of collateral or do not have a reliable time series of market price data for that collateral in a specific country, then the LGD for the exposure to which the collateral is applied must be floored at 35%.

129. Firms should note the following when applying the framework to LGD models:

- a. The 20 or more relevant data points can include internal or external data, however firms must ensure that each data point is independent, representative and an accurate record of the recovery for that exposure or collateral type in that specific country.
- b. We would only anticipate firms being able to use market price data within the framework where they have less than 20 defaults in exceptional circumstances. As a minimum, firms would need to demonstrate that the market price data being used is representative of their collateral and that it is over a long enough time period to ensure that an appropriate downturn and forced sale haircut can be estimated.
- c. The framework does not affect the use of financial collateral.
- d. The framework does not affect the use of unfunded credit protection.

- e. Where a model takes account of multiple collateral types, if this only includes collateral that is eligible under the foundation approach then LGDs must be floored at 35%, and if any collateral type is not eligible under the foundation approach then LGDs must be floored at 45%.
- f. The effect of this framework is to floor bank and non-bank financial institution (NBFIs) exposures at foundation values unless sufficient country-specific recovery data is available. This floor should be applied where the exposures are to types of banks and NBFIs that are not sufficiently represented in the available historic data (eg if the historic recovery data only relates to small banks then the floor will affect large banks).
- g. When applying the framework firms should assess whether the 11.25% LGD floor for covered bonds is sufficient given the quality of the underlying assets.

130. Firms should select the most appropriate of the following three options when using the framework to assess wholesale EAD models in the circumstances set out paragraph 60 of this Supervisory Statement:

- a. rank-order the off balance sheet product types (separately for lending and trade finance) according to their drawdown risk. The EAD parameter for a product with 20 or more default observations can then be applied to low-default products with a lower drawdown risk; or
- b. for product types where the firm has the defaults needed to estimate the EAD for committed credit lines (or an estimate derived from the option above) but less than 20 defaults for uncommitted credit lines, use 50% of the committed credit line conversion factor as an estimate of the uncommitted credit line conversion factor; or
- c. apply the foundation parameters.

131. Firms should note the following when applying the framework to EAD models:

- a. Firms may select more than one option when applying the framework providing that they can demonstrate that their chosen combination is appropriate, reflecting their particular mix of products and risks, and is not selected in order to minimise their capital requirements.
- b. As we believe that the EAD experienced by firms is dependent on their own credit management processes we would expect only internal data to be used to estimate EAD. However, where firms can convincingly demonstrate to the PRA's satisfaction that the credit process are consistent across countries then we would accept that data sourced from these countries could be combined to

estimate the EAD for each product (ie the 20 default data points do not have to be country specific for the purposes of estimating EAD).

- c. Firms using the option in 130(a) above should be able to demonstrate that a sufficiently robust approach has been taken to rank-ordering their product types by drawdown risk. This approach must be fully documented and assessed by an independent reviewer.