Chapter 4

Credit risk

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4.6 Internal ratings based approach: probability of default

Rating system philosophy

4.6.1 G '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. To explain these concepts:

(1) PiT: a *firm* seeks to explicitly 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 *own funds requirement*. Where data are sufficient, grade level default rates tend to be stable and relatively close to the PD estimates; and

(2) TTC: a *firm* seeks 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.

4.6.2 G Most rating systems sit between these two extremes. Rating philosophy is determined by the cyclicality 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

4.6.3 G A *firm* should understand where its rating systems lie on the PiT/TTC spectrum to enable it to estimate how changes in economic conditions will affect its IRB *own funds requirements* and it should 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 its PD estimate.

Use of variable scalar approaches

4.6.4 G The term "variable scalar" is used 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 its segments.

4.6.5 G Article 169(3) of the *UK CRR* allows the use of direct estimates of PDs, although such a measure could be assessed over a variety of different time horizons which the *EU CRR* does not specify. Accordingly, the *FCA* considers that 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 the following conditions are met. Meeting these conditions requires a *firm* using the variable scalar approach to have a deep understanding of how and why its default rates vary over time:

(1) a *firm* meets 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 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 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* must use a data series of appropriate length in order to provide a reasonable estimate of the long-run default rate in ■ IFPRU 4.4.13 G (Calculation of long averages PD, LGD and EAD); and

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

(2) stress testing includes a stress test covering the downturn scenario outlined in IFPRU 2.2 (Internal capital adequacy assessment process)] 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 *own funds requirements* calculation (ie, the portfolio level average long-run default rates); and

(3) a *firm* is able to understand and articulate upfront how the scaling factor would vary over time in order to achieve the intended effect.

4.6.6 G The *FCA* will not permit a *firm* using a variable scalar approach to revert to using a PiT approach during more benign economic conditions.

4.6.7 G Principle 1 (in ■ IFPRU 4.6.5 G) 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.

4.6.8 G Accordingly, the *FCA* expects a *firm* using a variable scalar approach should 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 the *FCA* would expect the long-run default rate to change (see article 180(1)(a), (b) and (2)(a) of the *UK CRR*).

Variable scalar considerations for retail portfolios

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4.6.9 G The *FCA* 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, the rest of this section applies to residential mortgage portfolios.

4.6.10 G 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 portfolio of *exposures* to small and medium-sized entities (SMEs in the retail *exposure* class).

4.6.11 G The *FCA* considers that one variable scalar approach, potentially compliant with the four principles in ■ IFPRU 4.6.5 G, could involve:

(1) segmenting a portfolio by its underlying drivers of default risk; and

(2) estimating separate long-run default rates for each of these segmented pools.

Segmentation

4.6.12 G A *firm* that applied the segmentation approach properly could satisfy both Principle 1 and Principle 4 (■ IFPRU 4.6.5 G). 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.

4.6.13 G Segmentation should 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. The *FCA* expects a *firm* to:

(1) incorporate an appropriate number of drivers of risk within the segmentation to maximise the accuracy of the system;

(2) provide detailed explanations supporting its choices of drivers, including an explanation of the drivers it has considered and chosen not to use; and

(3) ensure that the drivers reflect its risk processes and lending policy, and is therefore not chosen using only statistical criteria (ie a judgemental assessment of the drivers chosen must be applied).

[**Note**: article 179(1)(d) of the *UK CRR*]

4.6.14 G 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, the *FCA* would expect a *firm* to 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. The *FCA* expects conservatism applied for this reason not to be removed as the cycle changes.

Long-run default rate

4.6.15 G The *FCA* expects a *firm* 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 *FCA* expects a *firm* to consider the extent to which:

(1) realised default rates are changing due to cyclical factors and the scaling factors needs to be changed;

(2) new information suggests that both the PiT PDs and the long run PDs should be changed; and

(3) new information suggests that the basis of segmentation should be amended.

4.6.16 G The *FCA* 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. A *firm* should apply conservatism in this area and this is something on which the *FCA* is likely to focus on in model reviews.

Governance

4.6.17 G A *firm* should put in place a governance process to provide a judgemental overlay to assess its choices of segments, PD estimates and scalars, both initially and on a continuing basis. Moreover, where the basis of its estimation is a formulaic approach, the *FCA* considers that the act of either accepting or adjusting the estimate suggested by the formula would represent the exercise of judgement.

4.6.18 G A *firm* should consider what use it can make of industry information. However, the *firm* should be seeking to measure the absolute level of, and changes to, its own default risk, rather than changes in default risk relative to the industry. Given the potential for conditions to change across in the

market as a whole, 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 it to meet Principle 1 in ■ IFPRU 4.6.5 G.

Data considerations

4.6.19 G The *FCA* expects a *firm* to consider the following issues when seeking to apply a variable scalar approach for UK mortgages:

(1) in respect of Principle 2 (■ IFPRU 4.6.5 G), 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

(2) in respect of Principle 3 (■ IFPRU 4.6.5 G), the historical data time period chosen for use in the calculations will vary the long-run PDs, and thus *own funds requirements*, when there is no change in the underlying risk.

4.6.20 G The *FCA* expects a *firm* that is including mortgage arrears data as a proxy for default data to:

(1) 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;

(2) 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;

(3) establish a process for assessing the ongoing potential for inaccuracy, including thresholds beyond which the level of inaccuracy may no longer be insignificant; and

(4) consider the use of conservative adjustments to address the potential inaccuracy.

4.6.21 G When using historical mortgage data as a key input into variable scalar models, the *FCA* expects a *firm* to:

(1) carry out sensitivity analysis identifying the implications of using different cut-off dates for the start of the reference data set; and

(2) justify the appropriateness of its choice of cut-off date.

Retail exposures: obligor level definition of default

4.6.22 G Where a *firm* has not chosen to apply the definition of default at the level of an individual credit facility in accordance with article 178(1) of the *UK CRR*, the *FCA* expects it to ensure that the PD associated with unsecured *exposures* is not understated as a result of the presence of any collateralised *exposures*.

4.6.23 G The *FCA* expects the PD of a residential mortgage would typically be lower than the PD of an unsecured loan to the same borrower (see article 178(1) of the *UK CRR*).

Retail exposures: facility level definition of default

4.6.24 G Where a *firm* chooses to apply the definition of default at the level of an individual credit facility, in accordance with article 178(1) of the *UK CRR*, 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 *FCA* expects a *firm* to take this into account in its estimates of PD (see article 178(1) of the *UK CRR*).

Multi-country mid-market corporate PD models

4.6.25 G To ensure that a rating system provides a meaningful differentiation of risk and accurate and consistent quantitative estimates of risk, the *FCA* expects a *firm* to develop country-specific mid-market PD models. Where a *firm* develops multi-country mid-market PD models, the *FCA* expects the *firm* 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 *own funds requirements* calculation.

4.6.26 G The *FCA* expects a *firm* 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.

4.6.27 G The *FCA* expects a *firm* 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).

4.6.28 G In the *FCA's* 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 rating agency grades

4.6.29 G The *FCA* expects a *firm* using a rating agency grades as the primary driver in its IRB models to be able to demonstrate (and document) compliance with the following criteria:

(1) the *firm* has its own internal rating scale;

(2) 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 article 171(2) of the *UK CRR* reflects the information collected and analysed by the *firm* when extending credit to new or existing obligors;

(3) 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 *FCA* expects the *firm* to be able to demonstrate what

information was used and why, how it was included and, if no additional information is included, to be able to document what information was discarded and why;

(4) the development of final grades includes the following steps:

(a) the *firm* takes into account all available information (eg,external agency grades and any 'other relevant information') prior to allocating obligors to internal grades and does not automatically assign obligors to grades based on the rating agency grade;

(b) any overrides are applied to these grades; and

(c) the *firm* has a system and processes in place that allows it to continuously collect and analyse final rating overrides;

(5) 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;

(6) the *firm* 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 internal rating grade, that they have incorporated this information as an additional driver. The *FCA* expects this work to be analytical (rather than entirely subjective) and could form part of the annual independent review of the model.

4.6.30 G In the *FCA'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 it will not be meeting the requirements for using an IRB approach.

Low default portfolios

4.6.31 G The *FCA* expects a *firm* to estimate PD for a rating system in line with this section where the *firm's* internal experience of defaults for that rating system was 20 defaults 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 the rating system, the *FCA* expects the *firm* to:

(1) 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* to produce conservative estimates of PDs in accordance with article 179(f) of the *UK CRR*;

(2) use a statistical techniques to derive the distribution of default which takes account, as a minimum, of the following modelling issues:

(a) the number of defaults and number of obligor years in the sample;

(b) the number of years from which the sample was drawn;

(c) the interdependence between default events for individual obligors;

(d) the interdependence between default rates for different years; and

(e) the choice of the statistical estimators and the associated distributions and confidence intervals;

(3) further adjust the statistical PD to the extent necessary to take account of the following:

(a) 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 article 180(1)(a) and (2)(a) of the *UK CRR*; and

(b) 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.

4.6.32 G The *FCA* expects a *firm* to take into account only defaults that occurred during periods that are relevant to the validation under the *UK 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

4.6.33 G The *FCA* expects a *firm* to assign *exposures* to the risk weight category for specialised lending *exposures* based on the criteria set out in the tables in ■ IFPRU 4 Annex 1G(Slotting criteria).