

data are related to default frequencies.<sup>4</sup> The relevant characteristics that help to determine the likelihood of default are referred to as “drivers of default”. Drivers might include variables such as financial ratios, management expertise, industry, and geography.

S. Estimates of default rates must be empirically based and must represent a long-run average.

Estimates must capture average default experience over a reasonable mix of high-default and low-default years of the economic cycle. The average is labeled “long-run” because a long observation period would span both peaks and valleys of the economic cycle. The emphasis should not be on time-span; the long-run average concept captures the breadth, not the length, of experience.

If the reference data are characterized by internal or external rating grades, one estimation approach is to calculate the mean of one-year realized default rates for each grade, giving equal weight to each year’s realized default rate. PD estimates generally should be calculated in this manner.

Another approach is to pool obligors in a given grade over a number of years and then calculate the mean default rate. In this case, each year’s default rate is weighted by the number of obligors. This approach may underestimate default rates. For example, if lending declines in recessions so that obligors are fewer in those years than in others, weighting by number of obligors would dilute the effect of the recession year on the overall mean. The obligor-weighted calculation, or another approach, will be allowed only if the bank can demonstrate that this approach provides a better estimate of the long-run average PD. At a minimum, this would involve comparing the results of both methods.

Statistical default prediction models may also play a role in PD estimation. For example, the characteristics of the reference data might include financial ratios or a distance-to-default measure, as defined by a specific implementation of a Merton-style structural model.

For a model-based approach to meet the requirement that ultimate grade PD estimates be long-run averages, the reference data used in the default model must meet the long-run requirement.

For example, a model can be used to relate financial ratios to likelihood of default based on the outcome for the firms—default or non-default. Such a model must be calibrated to capture the default experience over a reasonable mix of good and bad years of the economic cycle. The same requirement would hold for a structural model; distance to default must be calibrated to default frequency using long-run experience. This applies to both internal and vendor models, and a bank must verify that this requirement is met.

*Example 1.* A bank uses external data from a rating agency to estimate PD. The PD estimate for each agency grade is calculated as the mean of yearly realized default rates over a time period (1980 through 2001) that includes several recessions and high-default years. The bank provides support that this time period adequately represents long-run experience. This illustrates an estimation method that is consistent with the standard.

*Example 2a.* Like the institution in example 1, a bank maps internal ratings to agency grades. The estimates for the agency grades are set indirectly, using the default probabilities from a default prediction model. The bank does so because although it links internal and agency grades, the bank views the default model’s results as more predictive than the historical agency default experience. For each agency grade, the bank calculates a PD estimate as the mean of the model-based default probabilities for the agency-rated obligors. In order to meet the long-run requirement, the bank calculates the estimates over the seven years from 1995 through 2001. The bank demonstrates that this time period includes a reasonable mix of high-default and low-default experience. This estimation method is consistent with the standard.

*Example 2b.* In a variant of example 2a, a bank uses the mean default frequency per agency rating grade for a single year, such as 2001. Empirical evidence shows that the mean default frequency for agency grades varies substantially from year to year. A single year thus does not reflect the full range of experience, because a long-run average should be relatively stable year to year. Such instability makes this estimation method unacceptable.

*Example 2c.* Another bank calculates the agency grade PD estimates as the median default probability of companies in that grade. The bank does so without demonstrating that the median is a better statistical estimator than the mean. This estimation method is not consistent with the standard. A median gives less weight to obligors with high estimated default probabilities than a simple mean does. The difference between mean and median can be material because distributions of credits within grades often are substantially skewed toward higher default probabilities: the riskier obligors within a grade tend to have individual default probabilities that are substantially worse than the median, while the least risky have default probabilities only somewhat better than the median.

S. Judgmental adjustments may play an appropriate role in PD estimation, but must not be biased toward lower estimates.

The following examples illustrate how supervisors will evaluate adjustments:

*Example 1.* A bank uses the last five years of internal default history to estimate grade PDs. However, they recognize that the internal experience does not include any high-default years. In order to remedy this and still take advantage of its experience, the bank uses external agency data to adjust the estimates upward. Using the agency data, the bank calculates the ratio between the long-run average and the mean default rate per grade over the last five years. The bank assumes that the relationship observed in the agency data applies to its portfolio, and adjusts the estimates for the internal data accordingly. This practice is consistent with the standard.

*Example 2.* A bank uses internal default experience to estimate grade PDs. However, the bank has historically failed to recognize defaults when the loss on the default obligation was avoided by seizing collateral. The bank makes no adjustment for such missing defaults. The realized default rate using the more inclusive definition would be higher than that observed by the bank (and loss severity rates would be correspondingly lower). This practice would not be consistent with the standard, unless the bank demonstrates that the necessary adjustment is immaterial.

## Mapping

Mapping is the process of establishing a correspondence between the bank’s current obligors and the reference obligor data used in the default model. Hence, mapping involves identifying how default-related characteristics of the current portfolio correspond to the characteristics of reference obligors. Such characteristics might include financial and nonfinancial variables, and assigned ratings or grades.

Mapping can be thought of as taking each obligor in the bank’s portfolio and characterizing it as if it were part of the reference data. There are two broad approaches to the mapping process:

*Obligor mapping:* Each portfolio obligor is mapped to the reference data based on its individual characteristics. For example, if a bank applies a default model, a default probability will be generated for each obligor. That individual default probability is then used to assign each obligor to a particular internal grade, based on the bank’s established criteria. To obtain a final estimate of the grade PD in the subsequent application stage, the bank averages the default probabilities of individual obligors within each grade.

*Grade mapping:* Characteristics of the obligors within an internal grade are

<sup>4</sup> The New Basel Capital Accord produced by the Basel Committee on Banking Supervision discusses three techniques for PD estimation. IRB banks are not constrained to select from among these three techniques; they have broad flexibility to implement appropriate approaches to quantification. The three Basel techniques are best regarded not as a complete taxonomy of the possible approaches to PD estimation, but rather as illustrations of a few of the many possible approaches.