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August 2004

## The IRB Approach for Low Default Portfolios (LDPs) – Recommendations of the Joint BBA, LIBA, ISDA Industry Working Group

### 1. Introduction

The "International Convergence of Capital Measurement and Capital Standards", published in June 2004, sets out the need under Basel 2 for firms who adopt the IRB credit risk approach to attribute Probability of Default (PD), Loss Given Default (LGD) and Exposure at Default (EAD) estimates, as appropriate, to loan grades and ratings as part of their risk management process.

The standards set out relatively clear expectations in respect of high or average default portfolios where statistical tests will be possible and meaningful. However there is no articulated alternative for the treatment of low default portfolios where, for example, ratings may be based upon expert judgement models and statistical tests will neither be possible nor meaningful. This lack of a positive alternative is at the base of industry concern.

Low default portfolios can arise in any of the following circumstances: -

- a) Globally low default rates for counterparty types e.g. banks, sovereigns, corporates and private banking.
- b) A low number of counterparties e.g. train operating companies.
- c) Small markets of the counterparty and exposure type e.g. niche markets and players.
- d) Lack of historical data e.g. caused by being a new entrant into a market or operating in an emerging market.
- e) Lack of recent defaults e.g. UK residential mortgage market.

Going back in time for some portfolios may increase the number of defaults in the dataset, but often, the dynamics of the portfolio and the business environment have altered so dramatically as to render the additional observations irrelevant. No matter how much historical data is used for a portfolio of bank counterparties the number of defaults within a homogeneous sector will always be too small for statistical validation. In many portfolios the future will not provide the data to solve the problem, with the possible exception of the new entrant example.

Qualification under the IRB approach must be attainable for all portfolios for the following reasons:

- low default portfolios, by their very nature, are of low risk and it would be inappropriate, within a risk sensitive capital regime to treat them under a standardised approach.

- the scale of the issue is significant with most firms signalling that at least 50% of the wholesale assets and a material proportion of their retail portfolios (by asset size) would be affected as per attached table. Over half of all exposures at members' firms across the globe may otherwise be prevented, permanently, from moving to the advanced approaches.
- the importance of rewarding good risk management: to provide an incentive to develop better risk management techniques.

It would be perverse to exclude portfolios from an IRB approach solely on the grounds that they are low risk, high quality, and/or that they have been well managed. If such portfolios are excluded the following unintended consequences could follow:

1. Firms fail to qualify for IRB approaches overall, because they have too many low default portfolios to meet the partial use thresholds;
2. Exclusion of entire asset classes (e.g. banks, sovereigns, corporates and private banking) from an IRB approach;
3. A capital penalty for good risk management.

In this paper, the joint-industry working group sets out an appropriate framework for the assessment and IRB approval of LDPs. We recommend that this framework be used for further discussion between the industry and regulators, with a view to setting out the appropriate level of detail to be articulated for LDPs in the global implementation of the new capital regime.

## 2. The IRB Approval Process for Low Default Portfolios

In discussions in respect of the 'validation' aspects of the Accord/European Directives, and the challenges for low default portfolios in particular, four distinct elements have been identified as being required under the risk management process, i.e.

- **Model Development** involves identifying the factors which influence credit risk for a particular borrower or borrower type and weighting them to produce a rank ordering of counterparties;
- **Model Validation** is aimed at demonstrating (or otherwise) that the model is intuitively and directionally correct – i.e. it looks like it should and does work. The process involves, inter alia, reviewing the model development methodology and assessing its outputs
- **Estimation, Calibration, and Recalibration** is the process of attributing a quantified meaning to the models outputs. This covers assigning PD, LGD, or EAD values to the ratings or scores output from the model.
- **Model Usage, Governance, and Control** is the process of the implementation and use of the grading system and the policies, processes and governance surrounding them.

The generic process involved in these four elements is common to all rating systems, and includes, for example: -

- across model types – PD, LGD, and EAD
- statistical, judgmental, and hybrid models

- low and high data portfolios.

n.b. we define hybrid models as models that combine elements of expert judgement and statistical models other than through the application of a judgemental overlay. For example, this would include rating systems that take into account a number of financial ratios, some qualitative factors and – if applicable – the output from a vendor model such as KMV Credit Monitor and assign a rating based on a combination of these elements in a predetermined way. Judgemental overlay could again be applied to modify the final rating.

Given these four activities and the defining characteristics of LDPs, we believe, that where there are a low number of defaults, more importance needs to be placed on the model development, model validation, and governance and control activities than is the case for data-rich portfolios (for which the calibration exercise increases in reliability and hence, importance).

**We believe regulators should look for evidence of firms undertaking these activities, using a combination of the techniques detailed below, in order to satisfy the IRB approval process.**

The aspects and potential approaches for each of the four activities are outlined below.

#### Model Development

In the model development stage firms will either be looking to improve on an existing model, perhaps in the light of on going experience and/or advances in risk management techniques, or firms will be looking to start from scratch. In the case of portfolios with a statistically valid default population this will normally consist of comparing a sample of "goods" and "bads" and seeking to identify the drivers of risk in order to produce a rank ordering. With LDPs, the approach is likely to be based more on criteria set out using expert judgement and utilising the extensive internal and/or external experience of that particular type of business. Provided there is enough experience available, such expert judgement models can be as effective in rank ordering risk as statistically -based approaches.

#### Model Validation

There are two aspects of the Model Validation Process 1) Model Review and 2) Model Output Validation.

##### 1) Model Review

Model review is a key aspect of all model validation exercises. The US Federal Reserve in its "Draft Supervisory Guidance on Internal Ratings-Based Systems for Corporate Credit" provides a good description of the objective of the model review, "...intended to answer the question, Could the rating system be expected to work reasonably if it is implemented as designed?"

The review is likely to consider the following:

- i. The development methodology used, including decisions regarding the use (or otherwise) of data, the people involved in the development process (e.g. selection of expert panel), and the development steps taken.
- ii. The content of the model, including the risk drivers and their weightings.
- iii. The model documentation, covering the development process and implementation guidance.

- iv. Where sufficient data exists, the distribution of scores or ratings. Many portfolios (banks and sovereigns being obvious possible exceptions) could be expected to reveal a good spread of scores, although for any type of borrower there may be circumstances where this will not be the case, for example where the lender has made a policy decision to deal only with a limited range of counterparties (e.g. corporates rated A or better).

For a lot of corporate models, expert judgement is used to test how the models rank credit quality, rather than focusing purely on the default prediction. This is seen as being a key element of control in the absence of extensive default histories.

For statistically developed models, the review process will also consider issues particular to such methodologies, such as over fitting, treatment of biases in the data set (e.g. assessment of rejects) and the confidence levels used.

## 2) Model Output Validation

The second aspect of the overall model validation process is concerned with assessing the rank ordering or discriminatory power of the model. There are numerous methods that are employed in this process. For statistical models much of the focus is on testing the model on the development and hold-out (validation) samples. Measures used include Kolmogorov-Smirnoff tests of separation and power co-efficients, like the Gini-coefficient. It is important to note that these statistical tests do not provide estimates of the probability of default for each score or score range, but can provide an indication of the power of the models. It should also be recognised that even these techniques have their limitations.

The same level of statistical analysis is clearly not possible in the validation of models to be used on LDPs. Therefore, it is usual (and advisable) for firms to use a variety of quantitative and qualitative analyses to provide confidence in, and an indication of, the discriminatory strength of the models. Depending on the level of data and, in particular, defaults available, the following techniques can be used:

- Internal benchmarking – this typically involves comparing the output of the model with the views of account managers or expert credit officers within the business. Although it is nigh on impossible for this process to provide a quantification of the meaning of the model outputs, a test that shows strong correlation between expert assessment and the model provides the firm with confidence that the model is a good assessor of credit quality.
- Comparison with other ratings and models – this process compares the outputs of the model being validated with the output of other models or ratings on the same set of observations (e.g. exposures or counterparties). For example, this may mean using an existing model (either an internal or external one) on a subset of the portfolio in question and comparing the rank ordering on that subset with the order output from the new model. Alternatively, this could include comparing external ratings with the output of the model, or comparing the outputs with external models (such as KMV and/or RiskCalc). In neither case will a quantification of the meaning of the model's outputs be possible (not least as the portfolio size is likely to be too small) however it should (if the model is good) provide further support as to the discriminatory merits of the model.

- One technique used by firms to validate external vendor models is to look at the default probability predicted by the external vendor model, and then compare this to their internal empirical data for the same rating category, or to data from external rating agencies if the customers have an external rating. The validation then judges the "power" of the external tool by answering two questions: 1. Do we agree with the relative ranking provided by the external tool and 2? Do we agree with the absolute PD number predicted by the tool? Often, the answer to the first question is yes, but that to the second question is no, i.e. while the relative ranking of the tool is considered to be adequate, the absolute PD number is out of line with the internal or external reference data used for validation. This explains why many firms do not use the PD output of vendor models directly in their rating systems but rather use a vendor model as an additional source of information, along with other techniques.
- Comparison with other external information – in the same way as other ratings can be compared to the model outputs; it is possible to gain confidence in the 'sense' of the model by comparing the outputs with other indicators. For example, for large corporates there is often significant amounts of market data that can be used as a proxy for credit quality, and which, therefore, can be correlated to the model outputs, such data could include bond spreads, credit default derivative prices, etc.
- Statistical analysis using internal and external data – although there is unlikely to be sufficient data internally to robustly validate the model, there may be enough data to perform some basic analysis that provides weight to the model's claim to be discriminatory. Alternatively, externally pooled data may be available. This may lead to a sufficient amount of data to enable more robust and rigorous testing. However, although this will, again, provide more weight to the model's discriminatory claims, it is only in the very rare cases that the external data is suitable to be treated as if it were internal data (and hence taken at face value and used in the calibration exercise). The shortcomings of external data have been discussed at length elsewhere, but include inconsistency of meaning across organisations, and differing processes and policies that reduce comparability.
- Ratings Migration - the analysis of ratings and their migrations over time. Where defaults are scarce, analysis of migration from 'good' grades to 'less good' grades within a rating system may provide indicators of the movement of credit quality in a portfolio that can be used as a proxy for defaults. Whilst this technique could be used to enhance data sets, it should be noted that the increased data set so created couldn't be ascribed the same level of confidence as 'true' internal default data.
- Back testing - comparison of model estimates with actual defaults over time. The extent to which this is practicable may be limited for LDPs but, provided there are some defaults, it should be possible to draw out some conclusions on the power of a model using ongoing experience. In LDPs, the impact of outliers can be greater than for statistically derived models and care is needed to ensure that one or two "rogue" exposures do not undermine the entire methodology.

While it may be possible to obtain a reasonable estimate for the grades covering external ratings from A+ to A-, it is less likely that enough data exists to validate each of the sub-grades of the A-range individually. The lack of actual defaults is likely to present an even more serious problem with respect to the validation of LGD/EAD estimates in these portfolios.

Most firms will use a variety of these techniques in the validation process. Each positive test will provide further weight to the confidence the firm has in the model (gained from the model review process).

#### Estimation, Calibration and Recalibration

This third activity aims to assign estimates of PD, LGD and EAD to the relevant models both for use within internal risk processes, e.g. pricing and provisioning, and for input into the Basel 2 framework risk weightings calculations, although the actual values may differ slightly between the two uses.

However for LDPs the commonly used techniques of back testing cannot be applied. Given the inability to use standard statistical techniques for these portfolios a number of alternative techniques are used by firms in the calibration process. Again, as for the validation process, firms will often use a combination of these techniques to arrive at their final estimates. These techniques include:

- Benchmarking against the output of other models (e.g. internal models, KMV) or external ratings (where these are associated with PD, LGD & EAD estimates). This is similar to technique 2 in the Model Output Validation section above, except that an attempt is made to quantify the meaning rather than simply comparing the rank ordering. In itself, this is unlikely to provide a robust answer as there are often differences between samples and model use that make direct comparisons difficult, or in some cases there are insufficient defaults even for the model/rating vendor and hence their calibration faces the same difficulties as individual institutions face and is as equally open to challenge.
- Applying a distribution curve. In this process a mean default rate (for PD models) is assigned to the portfolio through analysis of historic portfolio losses, comparison to industry performance or through expert judgement (or a combination thereof). A loss distribution is then applied around this mean loss rate using the rank ordering of the model. The sophistication of the loss distribution application will depend on the model structure and its outputs (e.g. extreme scores may warrant very high/very low default estimates) and the indications provided by the other techniques highlighted within this section.
- Comparison with external data, in particular market prices. It is possible to try to calibrate using market prices for the portfolios for which market data is likely to be available (e.g. large corporates and banks).
- Internal ratings migration – analysis of ratings and their migrations over time can be a useful method of calibrating models. Where defaults are scarce, analysis of migration from 'good' grades to 'less good' grades within a rating system may provide indicators of the movement of credit quality in a portfolio that can be used as a proxy for defaults. Whilst this technique could be used to enhance data sets, it should be noted that the increased data set so created couldn't be ascribed the same level of confidence as 'true' internal default data. Again, this technique can provide a useful insight into potential values, but by itself is unlikely to be sufficient.
- Developing causal models. Although few, if any, firms have developed such models, it may be possible to build models that are causal in nature (rather than empirical) and hence may require less (if any) data to calibrate. These models could include cash flow modelling, econometric models, and Merton-type models. However, as with all models, significant assumptions would be required that can lead to doubts with the model

(that can only be allayed through empirical testing). Nonetheless, there may be some value in these models in the calibration process.

#### Model Usage Governance and Control

It is clear that any model can only be as good as its implementation, use and management. This is a requirement as important for statistical models on large portfolios as it is for the LDPs considered within this paper. Rather than attempting to describe this activity in depth, a joint industry group believes that the use test and governance requirements detailed within the various accord documents provide a good explanation of this requirement. Where a model is used within the firms internal processes this should provide a greater confidence in the appropriateness of the rating system, irrespective of whether it has been developed statistically or judgementally and for low or high default portfolios.

Firms rely on an allocation of 'control function' responsibilities (to specific operational units and individuals) as a component of their controls framework that will ultimately enhance the integrity of LDP models in their internal ratings systems.

- 1) Dedicated teams responsible for data input quality (mainly for expert judgement models)
- 2) Central processing areas responsible for monitoring data quality;
- 3) An independent quality assurance function checking quality of data on a sampling basis;
- 4) Confirmation by a credit unit that is independent of case management; and
- 5) Risk Review and Corporate Audit both responsible for auditing different aspects of data integrity within the company.

### 3. Conclusion

The joint industry group believes that the IRB approval process for LDP models must integrate all of the above four activities rather than considering just one of them or insisting on each of them as a minimum requirement independently. In particular Regulators should fall short of insisting on "back-testing" as a minimum requirement for all portfolio types seeking advanced IRB approval, but rather look for evidence of the above mix of risk management techniques. By taking this approach appropriate confidence can be gained in the models even if one of the components has some limitations.

If the model is considered robust and appropriate, and therefore a valuable tool in the firm's risk management process then it is in the interests of all parties (institutions, supervisors and rule-makers) to enable such a model to be used within the advanced credit risk approaches: We recall that the stated aim of the Accord/European Directives is to encourage advances/improvements in risk management practices as well as ensuring the appropriate amount of capital in the system.

The joint industry-working group believes that the substantial assets in Low Default Portfolios should not be excluded from the IRB approach due to the absence of statistical data to establish and validate PD, LGD and EAD estimates. The application of the abovementioned process, with the use of one or more of the aforementioned techniques, will enable firms to apply effective risk management processes to low default portfolios under the IRB approach.

The joint industry-working group would appreciate the opportunity to discuss in more depth this framework as a basis for assessment and approval under the IRB approach for low default portfolios as part of the international regulators' interpretation and implementation of the Accord and European Directives.

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## Appendix 1

### Low Default Portfolios by Asset Type

\* This table is based on responses from seven UK firms having nearly US\$ 3 trillion in total gross assets.

Asset Type	Insufficient default data to give a statistically significant estimate of:		
	*Probability of Default (PD)	*Loss Given Default(LGD)	*Exposure at Default(EAD)
WHOLESALE			
1) Sovereigns	90%	98%	86%
2) Object Finance (SL)	70%	70%	70%
3) Banks	62%	70%	50%
4) Project Finance (Specialised Lending (SL))	50%	83%	83%
5) Corporate, Repo & Securities Lending & ABS	48%	50%	46%
6) Income Producing Real Estate (SL)	45%	45%	45%
7) Equity Exposures	30%	30%	30%
<b>TOTAL WHOLESALE EXPOSURE</b>	<b>57%</b>	<b>62%</b>	<b>53%</b>
RETAIL EXPOSURES			
1) All other Retail Exposure	52%	13%	5%
2) Retail Exposures secured by residential properties	32%	34%	41%
3) SME's (sales below Euro 50 million)	1%	26%	1%
4) Qualifying Revolving Retail	2%	2%	2%
<b>TOTAL RETAIL EXPOSURE</b>	<b>3%</b>	<b>7%</b>	<b>10%</b>
<b>TOTAL GROSS ASSESTS</b>	<b>26%</b>	<b>30%</b>	<b>25%</b>

\* These columns represent the nearest percentage of the particular Asset Class for the seven UK firms consulted where a firm has either no or a very low level of defaults and is therefore unable to validate PD or LGD or EAD on the basis of a proven statistical significance.