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Low Default Portfolios

(Joint Industry Working Group Discussion Paper)

This Discussion Paper looks to summarise some of the key characteristics of credit risk models currently being used to cover Low Default Portfolios. The aim of the paper is to inform discussions between regulators and firms seeking to move to an internal ratings based approach to calculating minimum regulatory capital requirements under Basel II.

The industry believes that the substantial assets in LDPs should not be excluded from the IRB approach due to the absence of statistical data to establish and validate PD, LGD and EAD estimates. In an IRB approval process, the premise should therefore be, not that all portfolios meet the requirements, but that no portfolios are ruled out. Where possible we have tried to align the contents of the paper to the Basel II minimum requirements and in so doing provide a useful starting point for the dialogue between firms and regulators.

The Basel II approach to the management of credit risk puts a great deal of emphasis on data and relies heavily on the use of statistical techniques to evaluate risk. There are, however, a significant number of businesses for which sufficient default data is not available. This issue affects all three components of expected loss i.e. PD, LGD, and EAD. We believe LDPs form a significant and material proportion of assets at major financial institutions. It seems inconsistent with the spirit of the New Accord, to exclude these portfolios from the IRB treatment on the grounds that they have suffered so few defaults.

Once again, the industry would be happy to discuss further, and answer any questions you may have, please contact Ed Duncan (at ISDA, on 0207 330 3574), John Phipps (at the BBA, on 0207 216 8862) or Katherine Seal (on 0207 367 5504).

Contents

A. Identifying Low Default Portfolios (LDPs)

- 1.1 Definition
- 1.2 LDPs across different exposure types

B. IRB Review Framework and LDP Model Development Stages

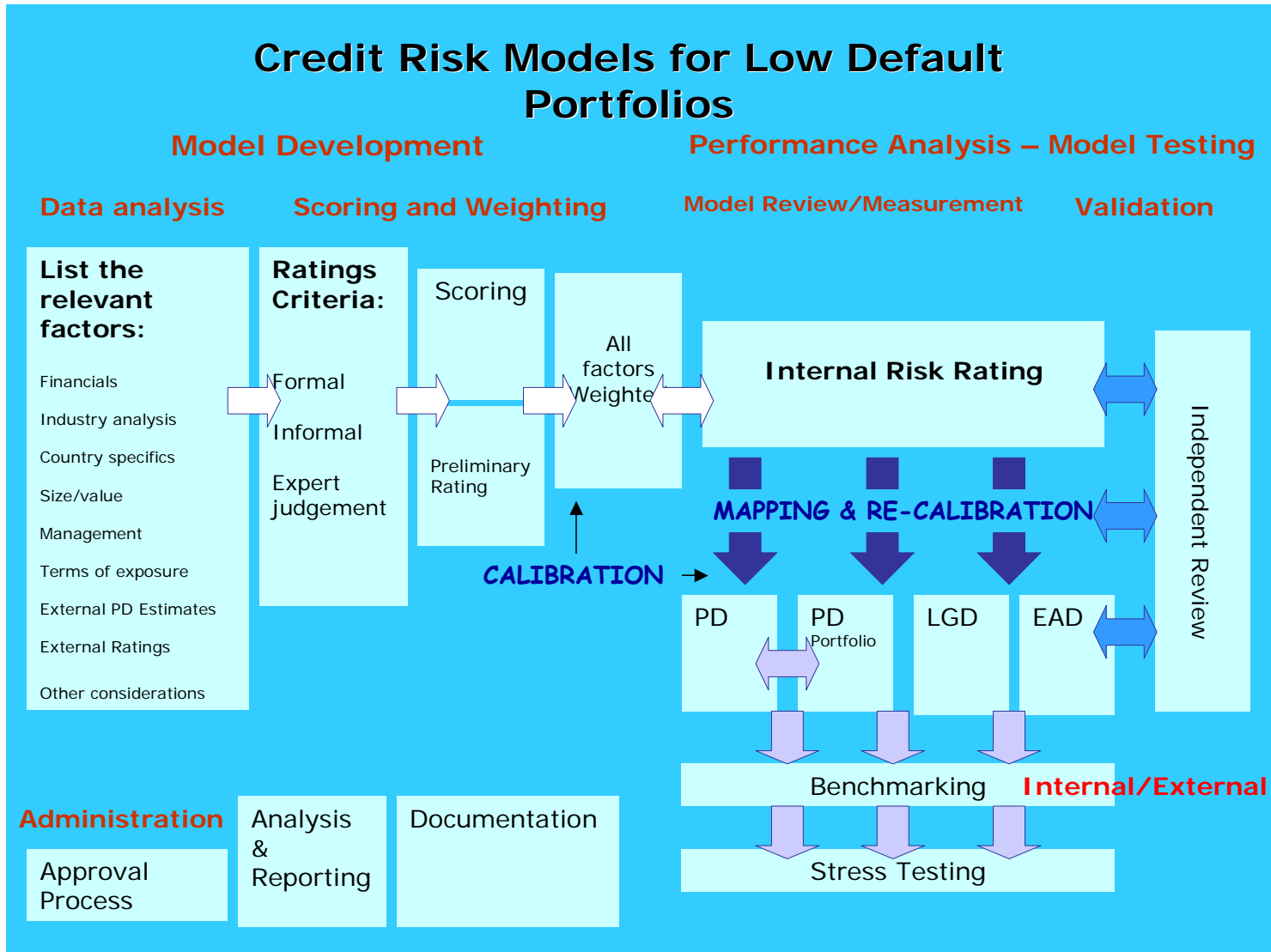
- 2.1 Overview of LDP model
- 2.2 Model Development
 - 2.2.1 Risk Drivers (or risk indicators) – Data Assessment
 - 2.2.2 Scoring – points allocation
 - 2.2.3 Weighting and calibration – preliminary rating
 - 2.2.4 Assigning a rating
 - 2.2.5 Probability of Default – allocating PDs
 - 2.2.6 Model Testing
 - 2.2.7 Feedback and Model Development
- 2.3 Model Validation
 - 2.3.1 Model Review and Measurement
 - 2.3.2 Model Output Validation
- 2.4 Performance Analysis
 - 2.4.1 Benchmarking
 - 2.4.2 Reverse Mapping
 - 2.4.3 Expert Judgement
 - 2.4.4 Statistical Techniques
 - 2.4.5 Ratings Migration
- 2.5 Independent Review

C. Governance and Control

D. Concluding Remarks

Appendix 1 - Low Default Portfolios by Asset Type

Appendix 2 – 1st Discussion Paper, August 2004



A. Identifying Low Default Portfolios

1.1 There are a large number of high credit-quality business lines for which extensive default data is not available. It is therefore very difficult to design a statistically significant model validation process for such business lines.

These Low Default Portfolios (LDPs) can be defined as portfolios where the firm has no or a very low level of defaults and is therefore unable to validate PD, LGD or EAD estimates on the basis of a proven statistical significance.

The absence of any significant default data affects all three components of expected loss i.e. PD, LGD, and EAD. In some cases there may be a sufficient level of defaults to enable a statistics based calibration and validation process for PD, however, actual losses are likely to be insufficient for calibration and validation of both LGD and EAD.

Where no, or very few, defaults have been observed over time, implying very low levels of PD, it can be assumed that firms' estimates of PD are likely to be inherently conservative.

1.2 LDPs exist across a number of business types, ranging from relatively new businesses, to mature portfolios where the firm has wide experience but very few, if any, default observations. Examples of LDPs cover a whole range of exposure types, including typically:

- Sovereign debt;
- Banks, particularly in developed countries;
- Large corporates;
- Repo style business;
- Specialised lending (incl. Object finance)
- Niche counterparties such as train operating companies, housing associations, NHS Trust hospitals, UK local authorities etc;
- Private banking exposures;
- Residential mortgage portfolios.

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

- a) Globally low default rates for counterparty types e.g. banks, sovereigns, corporate and private banking.
- b) Small markets of the counterparty and exposure type e.g. niche markets and players, such as train operating companies.
- c) Lack of historical data e.g. caused by being a new entrant into a market or operating in an emerging market.
- d) 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.

Many of the niche counterparties included above contain implicit governmental support and even statutory protection, which together help to preserve the no-to-low default nature of the portfolio. In order to maintain and promote this kind of lending activity it is important to impose a level of capital that not only reflects the high quality of credit risk, but also to ensure competitive pricing. It is therefore in the interests of both the firms and the supervisory authorities to ensure that these portfolios also qualify for an IRB approach.

The summary below is based on a range of models recently developed and in current use, covering a variety of LDPs that exist in each of the exposure types listed above.

This summary considers the model and parameters simultaneously. The model assessment incorporates a review of the rank ordering of counterparties, the discriminatory powers of the inputs, and the correlation between the various inputs. An assessment of the parameters involves a performance analysis of the components of the IRB risk weights over a period of time and is explored in more detail below.

B. IRB Review Framework

According to the "Revised Framework" (International Convergence of Capital Measurement and Capital Standards), the Basel II approach requires firms to "regularly compare realised default rates with estimated PDs for each grade and be able to demonstrate that the realised default rates are within the expected range for that grade." (P.501, also covered in the EU Directive, CRD Annex VII, Part 4, P.109-113). These minimum requirements also refer to estimates for LGD and EAD, however in this summary, for simplicity sake, we start by focussing largely on the estimates for PD. Where possible we have referenced the relevant Basel II minimum requirement paragraph in brackets.

2.1 LDP IRB models typically employ expert judgement and extensive business experience throughout the rating process. The models often appear complex and mechanical, but at the core of each model the same basic fundamental process is used in arriving at a rating.

The firm is required to consider both the risk of the borrower and the characteristics of the transaction, with the rating of the borrower driving the assessment of PD and the rating of the transaction driving the assessment of LGD and EAD (P.396-398).

In the assessment, all available, material, and relevant quantitative and qualitative information is to be compiled (P.448). It is likely that much of the data will come from external sources (audited financial reports, equity market data, government statistics etc). A firm may consider the external ratings themselves as the primary factor in determining an internal rating assignment. Where this is the case, other relevant information will need to be considered (P.411). The less data a firm starts off with the more conservative the final rating will need to be (P.411, P.451, and P.462).

The data is then used to identify a list of risk drivers (or indicators of risk) considered as potential inputs for a model.

Many models then group the drivers into related categories and each is given a score. The categories or drivers are then weighted according to their predictive powers using expert judgement and extensive business experience. The score is then calibrated to arrive at an internal rating.

Where an external rating is used as the primary factor for internal ratings, a firm will need to fully understand the assumptions and limitations of the methodology

used to derive the external rating. They would then be expected to use a combination of other available relevant information and/or expert judgement to consider whether an adjustment to the external rating is required before arriving at an internal rating (P.462, *use of external or pooled data sources*).

Some rating models are less formulaic in determining internal ratings albeit showing the same consideration of the appropriate risk factors as the scorecard based approaches.

The result is a rating scale that ranks exposures in order of credit risk, differentiating low risk from those considered high-risk exposures (P.388 "*the focus is on the bank's abilities to rank order and quantify risk in a consistent, reliable and valid fashion*" and P.389 "*rating and risk estimation systems and processes provide for a meaningful differentiation of risk*").

The following section outlines in more detail each stage the firm goes through to arrive at an internal rating for an LDP.

2.2 Model Development

Model Development involves identifying the factors that influence credit risk for a particular borrower or borrower type and weighting them to produce a rank ordering of counterparties. The process of rank ordering LDP exposure types is a critical stage in the model development, and is crucial to the outcome of the final rating (P.417 "*Use of models*").

2.2.1 Risk Drivers (or risk indicators) – Data Assessment

The approach by the majority of firms is likely to be based on a list of key risk drivers broken down into a list of potential model/rating inputs.

The risk drivers describe the important characteristics of the exposure type, typically covering quantitative and qualitative data drawn from such things as the financial reports, the structure of the transaction, the funding arrangements, the quality of management, ownership, governance, the experience of the counterparty, and the risk culture of the business. Note these characteristics are likely to be based on internal data, external data, and/or pooled internal/external data (P.429 "*Data Maintenance*" and P.461-462 "*PD estimation.. Corporate, sovereign, and bank exposures*").

The number of risk drivers or model inputs can vary depending on borrower or transaction type. Some models can have as few as five or six inputs (e.g. as seen for some specialised lending models), while others can have as many as thirty or forty different inputs (e.g. models covering sovereign type exposures where there is a rich source of publicly available data).

The criteria are often set out using expert judgement and the utilisation of extensive internal and/or external business experience. Provided there is enough experience available, such expert judgement models can be just as suitable for rank ordering risk as statistically based approaches, especially where insufficient data exists to validate statistically based models.

In general the models will include all available relevant and material quantitative and qualitative data, with firms expected to document the reasons for any information considered in development, but ultimately excluded from the model (P.411, P.417 "*accuracy, completeness and appropriateness of the data*" and P.448).

("...[firms] *should investigate parameter estimates' sensitivity to different ways of combining data sets...[firms] must document why it selected the combination techniques it did*")

- US Consultation Paper, IRB Systems for Retail Credit Risk for Regulatory Capital, III Quantification of IRB Systems, P.96, Oct 27 2004)

In evaluating the credit risk associated with LDPs firms are expected to maximise the use of any existing data and where possible to develop and employ statistical techniques to assess the risk. Data pooling may be possible to address the lack of data in certain circumstances and firms would be expected to consider such opportunities to overcome the lack of data. The potential limitations of using data pooling are acknowledged and include the lack of consistency of the ratings criteria used by the participants. (P.462 "*Requirements specific to PD estimation*")

2.2.2 Scoring – points allocation

Where the rating model is based on a scoring technique, each model input or risk factor is given a numerical score. Numerical score ranges are often "normalised" which usually involves setting a minimum and a maximum score that is applied to all inputs (e.g. a minimum of 0 and a maximum of 100 is quite common). This process allows the model developer or reviewer to quickly assess the relative contribution of any particular input to the overall rating process.

Where scores have been normalised, it is then possible, during either the model testing phase of model development (prior to implementation) or during a subsequent validation stage, for the firm to statistically analyse the relationship between normalised total model scores and normalised model input scores. Where there is little or no relationship between the two scores, further analysis is required as to determine whether that particular input is worth including in the model.

For many firms appropriate detailed guidelines accompany the scoring process. This helps to ensure consistency in ratings from one analyst to the next, and from one rating to the next. The guidelines outline a range of possibilities for the analyst to choose from (e.g. goods to bads, simple to highly complex, low to high risk); with example exposure types for each and the relevant score range and/or score given.

Due to the extensive use and importance of scoring in the rating process, a firm or regulatory review framework is likely to concentrate on three key areas: data (see above); consistency; and conservatism.

In order to illustrate that the scoring process is consistent (and hence the application in the development of the model of "expert judgement") an IRB firm will have in place a number of checks and balances to ensure that the same exposure is scored by different analysts the same way. This may be through the use of a Credit Review Team, or by utilising expert judgement from different areas of the firm (see "blind rating" in the section on validation).

Where data is particularly scarce and a firm relies on model inputs that are weak predictors, model outputs/estimates should be more conservative (P.411). For example, leverage and cash flow are generally considered to be reliable predictors of corporate defaults. Borrower size is also considered predictive, but less so. A rating based solely on size is by nature less reliable than one based on leverage, cash flow, and size.

Extensive documentation of the scoring process should also refer to the controls and governance in place to ensure scores/ratings are as accurate and reliable as possible (see also the section on corporate governance).

2.2.3 Weighting and calibration

Typically, experts agree on what weights to assign to critical variables/scores. It will not always be possible for experts to use clear, consistent criteria to select

the weights attached to each score. Often the experts will make a practical choice where there is not enough data to support a statistical analysis.

An equation can then be “modelled”, normally using linear weights, and used as a basis to rate each exposure. Following this stage of model development, the LDP model behaves much like a more conventional statistical model.

The discriminatory power of model inputs and their subsequent weightings can be assessed by reference to the correlation between the model inputs and the overall credit quality of the exposure. Model inputs with little discriminatory power will exhibit low correlations between their values and the overall credit quality.

A firm will often give a low weighting, or disregard, any input found to exhibit minimal discriminatory power. This analysis will need to be well documented and proof provided to show that following removal of any data/model inputs the rating profile remains unchanged. It should also be noted that firms might collect data on elements and attribute a zero weight to them, in order to test factors for inclusion.

It is important to recognise that firms under an IRB approach will vary in the particular factors they consider and in the weight they give each factor. This variation should not be discouraged for competitive reasons, to reduce systematic risk and promote innovation.

The individual inputs and their weightings are also reviewed as part of the routine model validation process (see details below in section on validation).

2.2.4 Assigning a rating

The expert judgement that goes into assigning an internal rating is often driven by a complex, sophisticated judgement of both quantitative and qualitative variables.

Ratings assigned by individuals or rating committees are likely to rely on the following tools: a transparent rating process; a comprehensive database containing all the data used by the rater; and documentation of how decisions were made.

A firm is expected to keep detailed guidelines on how scores and ratings are assigned so that, during model testing and validation, other individual reviewers can more easily assess whether a rating has followed firm policy.

The majority of firms will have a policy documented covering situations and procedures for model overrides. In general firms will also perform override analysis to ensure that the override policy, and the grades applied through the override process, is consistent with the standard model grading.

“...banks must clearly articulate the situations in which bank officers may override the outputs of the rating process...and separately track their performance” (P.428 “Overrides”)

Where a firm relies more heavily on expert judgement, the ratings review function will have to be staffed increasingly by experts with the appropriate skills and knowledge about the ratings policy of the firm.

Firms are expected to follow a process whereby other individual reviewers are asked to evaluate whether the rater followed rating policy.

2.2.5 Probability of Default – allocating PDs

Internal ratings compiled from the risk variables or characteristics of the firm’s LDPs need to be mapped to the risk components of default, loss severity, and exposure at default used in the IRB capital charge.

The mapping process is performed in many different ways and at different stages of model development. Both external ratings and/or externally estimated PDs can be used as the primary factor and mapped to internal ratings. Under such circumstances the firm would be expected to undertake an analysis in order to confirm the application of the externally sourced data for internal purposes (P.462).

The process of mapping ratings to the risk components should include any adjustments necessary for the differences between reference data sets and the firm's portfolio.

Where the external rating is employed as the primary factor in the model the mapping process is performed relatively early on in the model development process and is critical to the internal rating.

Where it is not possible to calculate a statistically significant PD, for the purpose of calculating capital, internal ratings may be mapped to external PDs. This is particularly common where there is a high correlation between internally rated counterparts and those rated by public rating agencies (ECAIs), for instance in rating low default interbank and sovereign exposures.

This can result in PDs attributed to each credit exposure within a portfolio, or to each internal grade. Where estimates are applied to individual exposures, under an IRB approach, the firm will also be required to aggregate estimates up to the grade level.

Mapping to each credit exposure - an LDP model may generate a PD for each individual exposure in the portfolio. These PDs can then be used to assign each exposure to an internal rating grade. In order to arrive at a final estimate of PD for each internal rating grade, an average is taken of all the default probabilities in each grade.

Mapping to each grade - a firm may identify a "typical" (or representative) exposure type within each grade, generally by averaging out all the characteristics of each exposure within that grade. A firm may then directly assign this "typical" exposure to a PD, and this will serve as the final estimate of PD for that grade, or the firm may map the exposure to an external rating grade (based on a quantitative and qualitative analysis) and assign the long-run default rate for that rating to the internal grade.

A general principle of the IRB approach is that where adjustments are made, firms must make them conservatively. This is of particular relevance to LDPs, where firms generally face a large degree of both uncertainty and/or potential error (P.462 "*greater margin of conservatism*" and P.485-P.487 "*Adjustment criteria*").

Firms and reviewers may also consider whether any adjustments made as part of the mapping process are biased towards optimistically low estimates of PD, LGD, or EAD.

An IRB firm will need to document an analysis of the impact of any adjustments made on estimates and risk weights and the extent to which they are considered conservative.

Where default data is particularly scarce a firm may use a central tendency (or long run average PD) from a similar comparable model for the LDP. An example of this would be where estimates from a large corporate model are used as a basis for assigning PDs for project finance. A conservative central tendency can be used to assess the distribution of PD estimates across LDP grades. Different measures of central tendency will lead to different results, and these results may

have a material effect on a grade's PD, it is therefore important for firm's to justify their choice of a measure.

A firm should have in place documentation outlining a clear and consistent policy toward the calculation.

All mappings should be reviewed and updated regularly.

However, we note that proving conservatism in LDPs is significantly problematic, given the low level of confidence in the set point of parameters. This is the point at which expert judgement, evidence of independence of the model from the sales process, strong governance of the model development and assessment process and regulatory oversight / benchmarking comes in.

2.2.6 Model Testing

In the development stage, as part of the model testing process, an analysis of the rating assignment seeks to answer the following questions: Are the ratings being assigned as intended? Is the correct data being used in the model?

LDP models, like all other models, should be tested over an extended period, with the firm running parallel testing between test models and existing rating systems. This comparison will often lead to a number of modifications being made to the test model.

2.2.7 Feedback and Model Development

It is important for the firm to learn from the feedback that both the model testing, during the development stage, and on going validation, provides. Even without default observations, time equates to experience, and experience improves knowledge. We would expect a firm to learn both from this experience and developments in the market place. Initiatives like Basel II and the transition to new accounting standards (e.g. the implementation of FRS 17 in the UK improved disclosures around pension assets, and provided valuable new information for corporate credit risk models), along with changes to country law, such as a change to bankruptcy laws, all impact the way credit risk is assessed.

2.3 Model Validation

Model validation can be broken down into two aspects (i) model review and measurement, and (ii) model output validation.

2.3.1 Model Review and Measurement

This stage of review is akin to the model testing that occurs during the model development stage. The review is likely to consider the following:

- the methodology used, including decisions taken regarding data, the people and committees involved in development, and an outline of the steps taken prior to implementation of the model
- the model content, including the risk drivers or model inputs and their weightings
- full documentation of the model including any implementation guidance available
- the distribution of scores and/or ratings (where there is sufficient data and these are statistically derived, the review process may include an analysis of things like model fit, treatment of biases, and confidence levels used).

2.3.2 Model Output Validation

At this stage the firm conducts an assessment of the rank ordering and discriminatory power of the model. There are a number of techniques currently used for LDPs, and a firm will often use a variety of these to build confidence in the model. In general these will consist of a mixture of both quantitative and qualitative performance analysis. Below we outline a number of the techniques particularly relevant to LDPs. This list, providing for a selection of possible methods, is not intended to be exhaustive or prescriptive.

2.4 Performance Analysis

Most firms will use a variety of techniques in the validation process. Each positive test will provide further weight to the confidence the firm and the reviewer builds in the model (gained from the model testing in the development stage).

The analysis generally covers an assessment of the scope, materiality and rating profiles of the LDP model.

Scope refers to where the model is being used, in what business units, what types of exposure covered, and the geographic spread of the exposures.

2.4.1 Benchmarking

Benchmarking is a critical model testing/validation process for all models covering LDPs and refers to a firm's use of a range of alternative tools to assess the appropriateness of a rating. Regulators should expect to see some sort of benchmark analysis from all firms (P.502).

In LDPs, where default observations are rare, benchmarking often replaces back testing (the comparison of predictions with actual outcomes) as the dominant and most important validation technique.

Benchmarking seeks to answer the question of whether another rating method would attach the same rating to a particular exposure. The benchmark does not have to adopt the same rating approach (e.g. for LDP models the benchmark can be judgemental or model-based?), although there should be clearly documented reasons why the bank believes the benchmark to be valid.

The most common form of benchmarking for LDPs is where internal ratings are compared to the results of external agencies or external models (e.g. a low default sovereign model rating dependent largely upon expert judgement may be compared to a Moody's or S&P rating for the same sovereign).

Where these are not available (e.g. project finance and private banking type exposures), a firm will often rely on internal rating reviewers who completely re-rate a sample of credits, or by comparison to another internally developed model (e.g. benchmarking a low default private banking model to a statistically-derived residential mortgage model, where the private banking sample is also secured by residential property). If the model is good this should provide further support as to the discriminatory merits of the model.

At a minimum, for an IRB approach, a firm will be expected to establish a process in which a representative sample of internal ratings is compared to third-party ratings of the same or similar credit exposures (P.502).

There is another form of benchmarking of particular importance to many LDP models. This form of benchmarking attempts to answer the broader questions of whether the rating model is doing what it was designed to do – does the model work?

In order to answer this question the firm needs to demonstrate consistency in ranking or consistency in the values of rating characteristics for similarly rated exposures.

This can be achieved by analysing the characteristics of exposures that have the same ratings, by monitoring changes in distribution of ratings over time; or by compiling a transition matrix calculated from changes in internal ratings and comparing it either to internal historical transition matrices or those calculated from external publicly available ratings.

Another acceptable form of benchmarking compares internal ratings with other external information or “proxies”. This analysis helps the firm and the reviewer to gain confidence in the “sense” of the model. For example, for some large corporate models and inter bank exposures there is often a significant amount 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 equity prices, bonds spreads, and credit derivative spreads etc. For example credit spreads can be used to determine the market’s perception of given counterparties and can be rank ordered against internal gradings.

It is important to emphasize that for the majority of LDP models, the results of a back testing exercise will not provide any appropriate evidence to support the IRB approval process (P501 *“Banks must regularly compare realised default rates with estimated PDs for each grade”*, P.504 *“where realised values continue to be higher than expected values, banks must revise estimates upwards”*, and P.417 and P.420 *“Use of Models”*).

Furthermore it is important for a regulatory review framework to distinguish between benchmarking and back testing, where the benchmark is itself, at best, a prediction, and may not be a very good one.

The benchmarking process should therefore include the possibility of feedback through the model development and on going validation process.

The industry also recognises that over time the international regulatory community will be well placed to perform a relative benchmarking of firms’ internal ratings. This process compares the estimates for similar or the same credits between firms in order to identify outliers for further investigation.

Where the results of benchmarking indicate differences between ratings, an IRB firm will have in place procedures to ensure further investigation and an internal ratings model review.

2.4.2 Reverse Mapping

Reverse Mapping is a useful validation technique for LDPs that tests for internal consistency. Using this technique a firm may evaluate sample exposures from an external data set as if they were subject to the firm’s own internal ratings based system.

The firm’s mapping is then applied to these reverse-mapped credit exposures to see whether the mapped characterisation of the external data set is consistent with that of the internal evaluation. For example, if a firm’s grade 4 corresponds to an S&P rating of BBB, applying reverse mapping, the bank would take a sample of BBB-rated counterparts from the S&P data set, run them through the firm’s rating process, and check to see that they receive a grade 4 or worse on the firm’s internal scale.

2.4.3 Expert Judgement

A firm may use expert judgement to assess the limitations and weaknesses of the models. In the absence of any material data or appropriate external benchmarks, the performance of models can be assessed by asking individual experts to make a “blind ranking” of customers and compare these to the final model outputs.

Although this would appear to be a fairly basic validation technique, it allows the firm to determine whether the model is producing an intuitive ranking of customers.

This technique requires the internal and external reviewers to be credit risk professionals with a good knowledge of the underlying business in question, and not ones not involved in the original model development.

2.4.4 Statistical techniques (P.417)

There are numerous statistical methods that are employed in the development of credit risk models. LDPs covering corporate or wholesale type exposures are most likely to employ some of these statistical methods in model validation. This is due, in general, to the availability of a small number of historical defaults for these types of LDP exposures.

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.

2.4.5 Ratings Migration

Ratings Migration refers to 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 provides an indicator of the movement of credit quality in a portfolio and can be used as a proxy for default data.

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 (although there might be a presumption that it is directionally correct).

2.5 Independent Review

The framework of governance in place for LDPs should provide another piece of evidence of the usefulness of the model in Risk management practice.

Many firms have internal groups whose responsibility it is to review the risk management practices in place in the bank – these are commonly called Risk Review or Risk Assurance Teams. Their role is to attest to the business that people (lenders) are using the right processes or models and using the processes or models appropriately.

This role is differentiated from the role of Internal Audit, who is responsible to the Board for assuring that the bank's internal risk management practices are operating effectively. In this instance, Internal Audit would check that Risk Review was operating within their mandate and that they were not overlooking any material risk areas (P.443 "*Internal and external audit*").

C. Governance and Control (P.438)

This refers to the policies, procedures, and controls firms put in place to ensure the integrity of the internal ratings process. It is clear that a model can only be as good as its implementation, use, and management. Good governance and control will not be unique to LDPs, and is an important minimum requirement for all portfolio models. However, where data is scarce and models rely more on expert judgement and external data/ratings, evidence of good governance and control

increases in importance (e.g. where expert judgement is central to the model, the independence of the rating function from the origination function, P.441)

In general, firms allocate 'control function' responsibilities (to specific operational units and individuals) according to a control framework that ultimately enhances the integrity of all 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.

Risk Review and Corporate Audit will both be responsible for auditing different aspects of data integrity within the company.

All critical elements of an internal LDP model and modelling process are likely to be fully and adequately documented (P.536). The documentation covering LDPs would be expected to fully cover compliance with minimum quantitative and qualitative standards.

Firms should document the rationale for the choice of rating methodology, and where the limited availability of default data has affected this choice. Like all models, LDP models must be reviewed on a regular basis to determine whether they remain fully applicable to the current portfolio and to external conditions.

Governance and control requirements likely to be a key focus for LDPs are: the independence of the credit risk control function (P.441); use of internal ratings (P.444, including the role of pricing); monitoring and reporting (P.743, also, see list of tools below); the internal control review (P.744-745, including accuracy and completeness of firms' data inputs); an assessment of the control environment (P.751-752); and the independent review, encompassing the scope of the models, the soundness of conceptual basis of the models, the adequacy of model testing prior to introduction, an assessment of the limitations and weaknesses of the models, and the thoroughness of the documentation covering the models.

The following list of tools can be used to monitor and control internal ratings, and are of particular relevance to LDP ratings systems that rely to a large extent on expert judgement and business experience: -

"Watch Lists" – these are lists generally containing exposures that have recently undergone deterioration in credit quality and may be subject to risk reduction measures.

"Large Exposure Lists" – these are used to report the firm's largest counterparts on a current and potential exposure basis (listed by industry, region, etc)

"Priority Counterparty Lists" – lists subject to intensive review and defined by pre-determined criteria based on exposure level relative to internal rating, where the threshold for intensive review is higher for a rating of 3 than say for a rating of 5.

"High Risk Country Lists" – generally used for periodic distribution around the firm (weekly, monthly etc), compiled by senior industry figures based on subjective expert judgement.

"Traffic Light Lending Sectors" organised by industry sector. "Red Lending Sectors" may contain ratings that are to be automatically downgraded by one

notch. For example a weak sector company rated 5.2 would be automatically re rated 5.3.

D. Concluding Remarks

No single internal rating system is considered best for Low Default Portfolios. Firms' systems are very different, reflecting the very different types of business lines they cover, and the different ways in which internal ratings are used. The joint industry working group believes that the IRB approval process for LDP models must concentrate on a range of possible risk management techniques, some of which are outlined in this paper, in order to build confidence in the model. Regulators should not necessarily exclude models on the basis of possible limitations in one single component of model development.

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 considered within the advanced credit risk approaches (given 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 industry believes that the substantial assets in LDPs should not be excluded from the IRB approach due to the absence of statistical data to establish and validate PD, LGD and EAD estimates. In an IRB approval process, the premise should therefore be, not that all portfolios meet the requirements but that no portfolios are ruled out.

The application of one or more of the techniques referred to in this paper, will enable firms to initiate 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 the key issues 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%
TOTAL WHOLESALE EXPOSURE	57%	62%	53%
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%
TOTAL RETAIL EXPOSURE	3%	7%	10%
TOTAL GROSS ASSETS	26%	30%	25%

* 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.

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.

- 5) Dedicated teams responsible for data input quality (mainly for expert judgement models)
- 6) Central processing areas responsible for monitoring data quality;
- 7) An independent quality assurance function checking quality of data on a sampling basis;
- 8) Confirmation by a credit unit that is independent of case management; and
- 9) 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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