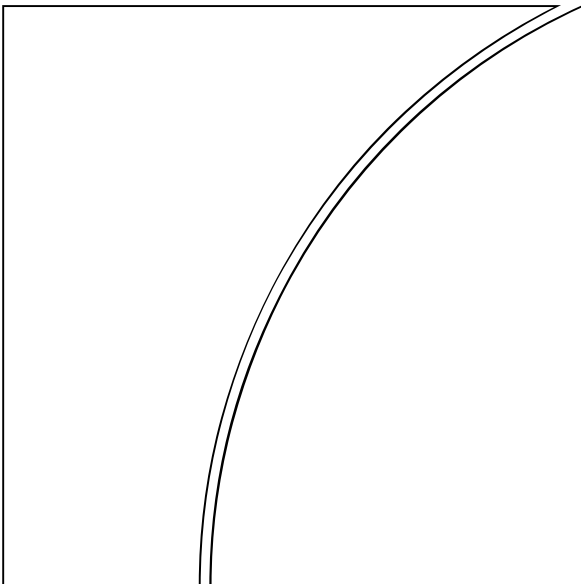# Basel Committee
on Banking Supervision

Consultative Document

The Internal
Ratings-Based Approach

Supporting Document
to the New Basel Capital Accord

Issued for comment by 31 May 2001

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BANK FOR INTERNATIONAL SETTLEMENTS

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The Internal Ratings-Based Approach

Chapter 1: Overview and Orientation of IRB Approach

I.   Introduction

1.   In this section of the consultative package, the Committee sets out its proposals for an internal ratings based approach (the IRB approach) to capital requirements for credit risk. The Committee believes that such an approach, which relies heavily upon a bank's internal assessment of its counterparties and exposures, can secure two key objectives consistent with those which support the wider review of The New Basel Capital Accord. The first is additional *risk sensitivity*, in that a capital requirement based on internal ratings can prove to be more sensitive to the drivers of credit risk and economic loss in a bank's portfolio. The second is *incentive compatibility*, in that an appropriately structured IRB approach can provide a framework which encourages banks to continue to improve their internal risk management practices. In meeting these objectives, the Committee is mindful that the IRB approach should continue to promote and enhance competitive equality across countries. The Committee is also mindful to ensure that the IRB approach should continue to promote safety and soundness in the financial system and, consistent with providing incentive compatibility, that the structure and requirements of the IRB approach do not impinge upon or undermine banks' well-established lending and credit risk management practices.

2.   The idea of an IRB approach to capital requirements was discussed briefly in the first Consultative Paper issued in June 1999. The Committee has undertaken significant work since that time to develop its proposals. An integral part of this work has been consultation with industry associations and individual banks in the form of surveys, requests for data and presentations. Feedback from these efforts has helped shape the proposals, and the Committee wishes to express its gratitude to those who participated in these exercises.

3.   In taking forward this work on an IRB approach, the Committee has sought to develop a framework which is credible, is prudentially sound and that reflects sound credit risk management practices in the industry. In addition to providing incentives for individual banks, the Committee hopes that, at the same time, the approach will accommodate and provide incentives for the ongoing improvement in risk management practices at an industry-wide level.

4.   The Committee believes that the best way of securing these objectives is through the adoption of an *evolutionary approach* to the IRB framework, which mirrors the ongoing evolution of credit risk management itself. Banks have made use of internal rating systems for a very long time as a means of categorising their exposures into broad, qualitatively differentiated layers of risk. Many banks have in recent years made considerable progress in enhancing these traditional, qualitatively-oriented internal assessments of credit risk by expanding their capabilities for quantifying the credit risk associated with their exposures.

5.   Building upon that capability, for each exposure class (e.g. corporate, retail, sovereign), the IRB approach will provide for a single framework by which a given set of risk components or "inputs" are translated into minimum capital requirements. However, in respect of some of these risk components, two methodologies for the estimation are presented. In its surveys of bank practice and discussions with the industry, the Committee has discovered that many banks, including some best-practice banks, currently face difficulties in establishing credible and reliable estimates of some risk factors, which can be

adequately validated by both the bank and its supervisor. Nonetheless, many of these banks can and do provide meaningful and quantifiable estimates of one of the most fundamental drivers of credit risk – the risk of default of the obligor. Thus, for these banks, for some exposure classes the Committee proposes a *foundation* methodology in which banks input their own assessment of the risk of default of the obligor, but estimates of additional risk factors are derived through the application of standardised supervisory rules. The foundation methodology will be available to those banks which can demonstrate to supervisors that they meet specified minimum requirements in terms of their internal rating systems, risk management processes, and ability to estimate the requisite risk components.

6.   The Committee's work has further revealed that some banks are able (or are likely soon to be able) to provide reliable and consistent estimates of additional risk components. These additional components are the likely loss to be incurred should a borrower default, the likely level of exposure to that borrower at the time of default, and the effect of guarantes and credit derivatives on the risk of the exposure. Thus, sitting alongside the foundation methodology are a set of *advanced* methodologies which allow banks to use their own internal assessments of these components. The Committee feels that the wider use of such assessments is an important part of a dynamic and risk-sensitive IRB approach, in that it can recognise and differentiate those banks which can provide sufficiently robust and quantifiable estimates of risk. Furthermore, the use of an advanced methodology more closely aligns capital requirements to banks' internal risk measurement and management practices, and is consistent with the philosophy of providing incentives for banks to improve these practices. Banks seeking to use one of the advanced methodologies will be required to meet the minimum requirements for the foundation methodology and an additional set of specified requirements specific to the risk component being estimated.

7.   The 'evolutionary' aspect to the IRB approach can be seen in a number of ways. First, over time and at the industry level, the Committee hopes to see more banks moving from the standardised approach to the IRB approach, and expects that they will do so when they have the requisite systems. Secondly, within the IRB approach, the Committee would expect banks to migrate over time from use of the foundation to the more advanced methodologies, in line with improvements in their risk management practices. Lastly, the Committee envisages that the IRB approach itself will evolve over time. As currently configured, the IRB approach allows banks to use many of their own internal risk assessments in the derivation of regulatory capital requirements. It stops short, however, of permitting banks to calculate their capital requirements on the basis of their own or vendor portfolio credit risk models. The Committee explored the use and application of such models in its report titled *Credit Risk Modelling: Current Practices and Applications*, published in April 1999. It concluded at that stage that it was too early to use the output of such models as a basis for setting minimum capital requirements. The Committee continues to believe this to be the case.[1] Even the advanced IRB methodology will not allow for bank-specific adjustments to measures of credit risk to reflect risk correlation between different borrowers (in effect, this is the complexity boundary beyond which the IRB approach as currently configured will not pass). However, in setting out a framework which contemplates and provides appropriate incentives for developments in risk management practices, the

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[1]   The main deficiencies identified by the Committee in using credit risk models as a basis for minimum regulatory capital requirements were the quality of data and ability of banks and supervisors to validate model outputs. Internal rating systems are a key input into many credit risk models and in this respect these issues – data quality and validation – are as important for the IRB approach as they are for credit risk modelling. However, in requiring banks to meet rigorous sound practice requirements in terms of the inputs to and outputs of a bank's internal rating system, and importantly ruling out at this stage own assessments of portfolio effects such as concentration and diversification, the Committee believes that these deficiencies can be overcome in the context of an IRB approach.

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Committee believes that an approach based on internal ratings could ultimately pave the way for a transition towards full portfolio credit risk modelling in the future.

8.   In taking forward the development of an IRB approach, the Committee took as its starting point an approach for corporate, sovereign, and inter-bank exposures. The Committee has also developed proposals for retail exposures. The Committee proposes to extend the IRB approach to other types of exposures, namely project finance and equity. The Committee will continue to develop IRB treatments for these types of exposures over the coming months.

9.   The Committee requires that, once a bank uses the IRB approach for one part of its total loan book, it must take steps to implement the IRB approach across all significant portfolios and business lines, subject to being able to meet the requisite standards. The Committee recognises that for large, diversified internationally active banks, with loan books and business units located in many different countries, this requirement may prove to be particularly challenging. The Committee, however, views this requirement as being of particular importance – both to ensure that minimum capital requirements continue to provide prudential coverage and to prevent so-called "cherry-picking" opportunities during the transition from partial coverage to full implementation of the IRB approach across group companies

10.   As such, the Committee proposes that a banking group that has met the requisite minimum requirements and is utilising the IRB approach for some of its exposures must adopt the IRB approach across all exposures and significant business units (groups, subsidiaries, and branches) within a reasonably short period of time. Banks must agree to an aggressive, articulated rollout plan with the home supervisor. Some exposures in non-significant business units that are immaterial in terms of size and perceived risk profile may be exempt from the above rule, subject to national discretion (see Chapter 9).

II.   Orientation of the IRB Approach

11.   One of the Committee's goals in setting forward an IRB approach is to align more accurately capital requirements with the intrinsic amount of credit risk to which a bank is exposed. The orientation of the IRB approach is consistent with the framework currently being used by many banks with well-developed risk management systems to assess internally both their credit risk profile and their capital adequacy.

12.   Banks' internal measures of credit risk are based on assessments of the risk characteristics of both the borrower and the specific type of transaction. Most banks orient their borrower rating methodologies and risk management practices to the risk of borrower default. The probability of default (PD) of a borrower or group of borrowers is the central measurable concept on which the IRB approach is built. The PD of a borrower does not, however, provide the complete picture of the potential credit loss. Banks also seek to measure how much they will lose should a borrower default on an obligation. This is contingent upon two elements. First, the magnitude of likely loss on the exposure: this is termed the Loss Given Default (LGD), and is expressed as a percentage of the exposure. Secondly, the loss is contingent upon the amount to which the bank was exposed to the borrower at the time of default, commonly expressed as Exposure at Default (EAD). These three components (PD, LGD, EAD) combine to provide a measure of expected intrinsic, or economic, loss.

13.   The IRB approach also takes into account the maturity (M) of exposures. Thus, the derivation of risk weights is dependent on estimates of the PD, LGD and, in some cases, M,

that are attached to an exposure. Where there is no explicit adjustment for maturity, a standard supervisory approach is presented for linking effective contractual maturity to capital requirements.

14.   These components (PD, LGD, EAD, M) form the basic inputs to the IRB approach, and consequently the capital requirements derived from it. As such, most aspects of the IRB framework are designed to provide confidence that these elements are separately identifiable, measurable and capable of being verified by both banks and supervisors.

15.   For certain types of exposure - retail in particular - bank practice suggests that the assessment of the risk of the borrower and the transaction is not based primarily on a rating grade structure. For this exposure class, banks seek to measure and manage credit risk by identifying "segments" of borrowers or transactions with similar risk characteristics, and assessing the risk of each segment of exposures. The number and characteristics of a bank's retail segments are thus far more fluid than the borrower (and facility) grades it may use for its corporate exposures. Although not necessarily based on a discrete rating of each borrower and assessment of each facility, such segmentation techniques are consistent with the broad orientation of the IRB framework outlined above.

16.   In addition to the increased reliance on banks' internal assessments of risk, the Committee is proposing to make another important departure form the 1988 Accord. Following the precedent set in the Market Risk Amendment, the minimum capital required for an exposure will not only depend on the risk or characteristics of that exposure, but also on the relationship with a bank's other exposures. Thus, a bank's capital requirements for credit risk will also depend on the concentration of a bank's exposures to single borrowers, or groups of closely related borrowers. Granularity (G), or rather a lack of it, is shown to be a material driver of credit risk. The Committee proposes to incorporate this adjustment into the IRB approach by means of a standard supervisory capital adjustment applied to all non-retail exposures under IRB treatment.

III.   Simple Schematic of IRB Approach

17.   This section provides an overview of how the supervisory IRB approach works in practice. There are five key elements.

- A classification of exposures by broad exposure type;

- For each exposure class, certain *risk components* which a bank must provide, using standardised parameters or its internal estimates;

- A *risk-weight function* which provides risk weights (and hence capital requirements) for given sets of these components;

- A set of *minimum requirements* that a bank must meet in order to be eligible for IRB treatment for that exposure, and

- Across all exposure classes, supervisory review of compliance with the minimum requirements.

18.   Each of these elements is examined below.

A.   Categorisation of exposures

19.   Banks typically manage their credit-related business in broad business lines or portfolios, each of which may encompass a variety of specific borrower and exposure types. Although the specific business line and portfolio delineation used by individual banks can vary greatly, the key common bonds that define a business line or portfolio may be related to the nature of the customer (e.g. governmental, corporate, household), the nature of the transaction, or a combination of the two.

20.   The design and features of internal rating systems and internal default-loss estimation processes, as key risk management tools, also reflect this broad management approach. At the same time, there can be significant differences across business lines or portfolios in the key risk factors and rating criteria, on the one hand, and the historical loss characteristics or relationships on the other. For example, while political factors are key criteria in the assessment of a sovereign, this is hardly the case when considering the ability of an individual to repay a credit card obligation. Similarly, the likely pattern of portfolio losses for a retail portfolio – typically made up of many unrelated borrowers – is very different from that of a portfolio of a much smaller number of corporate exposures, because defaults by individuals tend to be driven more heavily by factors idiosyncratic to the borrower. These differences translate into key differences in the distribution of credit loss events for the different portfolios, and thus different relationships between risk characteristics and unexpected loss or required capital. Banks' internal assessments of economic capital reflect these differences, and to be appropriately risk sensitive, the IRB approach also needs to consider them in the construction of capital treatments.

21.   The above motivates the requirement that under the IRB approach, banks must assign banking-book exposures into one of six broad classes of exposures with different underlying credit risk characteristics: corporates, sovereigns, banks, retail, project finance, and equity. Definitions for each exposure class are contained within the relevant section of this Supporting Document. As noted in these sections, the Committee is continuing to work on refining the boundaries between these different classes and, in some cases, on the definition of the exposure classes themselves. Generally, all exposures that do not specifically meet one of the definitions for exposure classes set out in this document (e.g. corporate, retail, sovereign) will be categorised as corporate exposures for purposes of the IRB approach. The objective of this proposal is to avoid the potential for regulatory capital arbitrage which may occur through an artificial characterisation of an exposure by a bank for the purpose of reducing regulatory capital requirements.

22.   The classification of exposures in this way is broadly consistent with established bank practice. However, some banks may use different definitions in their internal risk management and measurement systems. While it is not the intention of the Committee to require banks to change the way in which they manage their business and risk, banks will be required to apply the appropriate treatment to each exposure for the purposes of IRB analysis, tabulation, and reporting.

B.   Risk components

23.   The capital charge for exposures within each of the six exposure classes discussed above will then depend on a specific set of risk components, or inputs. In the IRB framework for corporate, sovereign, and bank exposures classes, these inputs are provided either through the application of standardised supervisory rules (foundation methodology) or internal assessments (advanced methodology), subject to supervisory minimum requirements. For purposes of simplicity, the exposition below focuses on the inputs required

for the IRB approach to corporate, sovereign, and bank exposures, though its orientation is applicable to other exposure types with some modification.

(i)   Probability of Default

24.   All banks, whether using the foundation or advanced methodologies, must provide supervisors with an internal estimate of the PD associated with borrowers in each borrower grade. Each estimate of PD must represent a conservative view of a long-run average PD for the grade in question, and thus must be grounded in historical experience and empirical evidence. Preparation of the estimates, and the risk management processes and rating assignments that lay behind them, must reflect full compliance with supervisory minimum requirements (including internal use and disclosure requirements associated with the estimates) to qualify for IRB recognition.

(ii)   Loss Given Default

25.   While the PD associated with a given borrower does not depend on the features of the specific transaction, LGD is facility-specific because such losses are generally understood to be influenced by key transaction characteristics such as the presence of collateral and the degree of subordination.

26.   LGD is determined in one of two ways. Under the foundation methodology, LGD is estimated through the application of standard supervisory rules, which differentiate the level of LGD based upon the characteristics of the underlying transaction, including the presence and type of collateral. The supervisory rules and treatments were chosen to be conservative. The starting point proposed by the Committee is use of a 50% LGD value for most unsecured transactions, with a higher LGD (75%) applied to subordinated exposures. For transactions with qualifying financial collateral, the LGD is scaled to the degree to which the transaction is secured, using a haircut methodology adapted from that described for the standardised approach. For transactions with qualifying commercial or residential real estate collateral, a separate set of supervisory LGD values and recognition rules are applied. All other transactions are viewed as unsecured for this regulatory purpose.

27.   In the advanced methodology, the bank itself determines the appropriate LGD to be applied to each exposure, on the basis of robust data and analysis which is capable of being validated both internally and by supervisors. Thus, a bank using internal LGD estimates for capital purposes might be able to differentiate LGD values on the basis of a wider set of transaction characteristics (e.g. product type, wider range of collateral types) as well as borrower characteristics. As with PD estimates, these values would be expected to represent a conservative view of long-run averages, although banks would be free to use more conservative estimates. A bank wishing to use its own estimates of LGD will need to demonstrate to its supervisor that it can meet additional minimum requirements pertinent to the integrity and reliability of these estimates.

(iii)   Exposure at Default (EAD)

28.   As with LGD, EAD is also facility specific. In most cases EAD will equal the nominal amount of the facility, but for certain facilities (e.g. those with undrawn commitments) it will include an estimate of future lending prior to default. Again as with LGD, under the foundation methodology EAD is estimated through the use of standard supervisory rules.

29.   In the advanced methodology, the bank itself determines the appropriate EAD to be applied to each exposure, on the basis of robust data and analysis which is capable of being validated both internally and by supervisors. Thus a bank using internal EAD estimates for capital purposes might be able to differentiate EAD values on the basis of a wider set of transaction characteristics (e.g. product type) as well as borrower characteristics. As with PD and LGD estimates, these values would be expected to represent a conservative view of long-run averages, although banks would be free to use more conservative estimates. A bank wishing to use its own estimates of EAD will need to demonstrate to its supervisor that it can meet additional minimum requirements pertinent to the integrity and reliability of these estimates.

(iv)   Maturity

30.   Where maturity is treated as an explicit risk component, banks will be expected to provide supervisors with the effective contractual maturity of their exposures.

C.   Risk weights

31.   The estimates of PD, LGD and in some cases maturity (M) associated with an exposure combine to map into a schedule of regulatory capital risk weights. In the standardised approach, borrowers are assigned to one of five risk weights (0%, 20%, 50%, 100%, 150%) on the basis of supervisory standard treatments or assessments provided by external credit assessment institutions. The IRB approach provides for a finer differentiation of risk, in that estimates of PD, LGD and M are developed separately and then used as inputs to produce corresponding risk weights. Given this additional sensitivity, the risk weights reflect the full spectrum of credit quality through use of a continuous function of risk weights in the place of the five discrete risk buckets of the standardised approach. Thus, under the IRB framework, different sets of risk inputs will generally produce a different risk weight. In this way, exposures to borrowers where PD, LGD and in some cases M combine to produce a very low level of risk will tend to have risk weights which are below their equivalents in the standardised approach. By the same token, exposures to counterparties where PD, LGD and maturity combine to produce a significant degree of risk will tend to attract risk weights which are higher than those contemplated in the standardised approach.

32.   To calculate risk-weighted assets, the bank will multiply the risk weights by a measure of exposure, here the estimate of EAD, and add the resulting amounts across the portfolio. Finally, an adjustment factor, in the form of a standard supervisory index, is then applied to the total risk weighted assets to reflect the granularity of the bank's non-retail portfolio (see Chapter 8).

D.   Minimum requirements

33.   A bank becomes eligible to use the IRB approach when it can demonstrate to the satisfaction of its supervisor that it meets all the requisite minimum requirements. These attest, inter alia, to both the assessment and quantification of the inputs provided and to the robustness of the banks' internal rating system and overall credit risk management process.

(i)   Adherence to minimum requirements

34.   In establishing a framework for credit risk capital requirements which relies on a bank's internal assessment of risk, the Committee recognises that this will pose a challenge

for both banks and supervisors, particularly in respect of seeking to ensure that estimates of risk are meaningful and robust. This issue may prove particularly challenging given the differing approaches to assigning ratings and to estimating loss characteristics per grade evident in the industry, and the degree of imprecision inherent in measuring these characteristics. In this regard, bank and supervisory practices for validation are critical to the successful implementation of the IRB approach. The Committee also notes that market discipline will play a key role in this respect. As such, disclosure requirements are attached to the use of the IRB approach – these are set out in the Supporting Document *Pillar 3: Market Discipline*. These requirements will allow market participants to assess key pieces of information on the capital, risk exposures, assessment and management processes, and capital adequacy of banks under the IRB approach.

Chapter 2: IRB Framework for Corporate Exposures

I.   Definition of Corporate Exposures

35.   For IRB purposes, a corporate exposure is generally defined as a debt obligation of a corporation, partnership, or proprietorship (with possible exceptions for some small businesses, as is discussed in Chapter 3). Exposures to corporates are characterised by the fact that the source of repayment is primarily based on the ongoing operations of the borrower, rather than the cash flow from a project or property. The definition thus includes large multinational corporations, medium sized enterprises and potentially small businesses. This definition would also include those Public Sector Entities (PSEs) that do not meet the characteristics of a sovereign, as defined in Chapter 5.

36.   In common with the IRB approach taken for other portfolios, there are three main elements to the IRB approach for corporate exposures: *risk components* which a bank must provide, using either its own estimates or standardised parameters, a *risk-weight function* which provides risk weights (and hence capital requirements) for given sets of these components and a set of *minimum requirements* a bank must meet in order to be eligible for IRB treatment.

II.   Range of Practice

37.   In January 2000, the Committee issued a paper titled *Range of Practice in Banks' Internal Ratings Systems* (hereafter referred to as the Range of Practice paper or survey). This paper summarised the key findings from its empirical studies and surveys in respect of the rating systems used in best-practice banks. This focused heavily on banks' rating systems for corporate exposure. While this is a free-standing document, it is useful at this stage to revisit some of its key findings, given that these have guided the Committee in its design of the IRB approach for corporate exposures and its thoughts on the minimum requirements which accompany it.

38.   The structure of an individual bank's internal rating system is influenced by a broad range of factors, including the uses to which the rating information is put, and the bank's policy towards the treatment of impaired assets. It is, however, possible, to identify the key elements of such a structure, as discussed below.

A.   The number of grades both for performing and non-performing loans

39.   Rating systems differentiate between good quality assets and exposures that show potential weaknesses (however defined). Both categories are usually sub-divided according to the quality of the borrower or facility on the one hand, and the degree of risk of actually losing money on the other. The Range of Practice paper indicated that, across the banks surveyed, the number of grades for performing loans was on average 10, the number for impaired loans was about 3, although it has to be noted that in both cases there was wide diversity across banks.

B.   The decision whether to focus the rating on the borrower or the facility

40.   The Range of Practice paper revealed that the rating systems in place at most banks include an explicit *obligor dimension*, that is, they assign a rating that is meant to reflect primarily the risk that the borrower will default on any of its obligations. Many banks also utilise a *two-dimensional* rating system that includes both an obligor and a *facility* grade. Under such an architecture, facility grades for different loans to the same obligor could differ based, for example, on differences in the collateral requirements, seniority, or other structural attributes of these loans. In some cases, facility grades were based on the relevant obligor grade, adjusted explicitly or implicitly by "notching" the grade higher or lower to reflect the attributes of the transaction in question. Only a small number of banks operate rating systems with only a facility grade, and only a small minority of the banks surveyed take no consideration of facility characteristics in their grading processes.

41.   Among those banks with two-dimensional rating systems, a small number appear to assign an obligor rating and a *second "LGD" rating grade* that explicitly and separately evaluates likely recovery rates for each transaction in the event that a default were to occur.

C.   The means by which ratings are assigned

42.   The survey identified a continuum of practice bounded by full reliance on quantitative techniques (such as scoring models), on the one hand, and full reliance on the personal experience and expertise of loan and credit officers, on the other. In general terms, three categories of rating systems can be identified:

- statistical-based processes;

- constrained expert-judgement based processes; and

- full expert-judgement reliant processes.

43.   The distinctions between these three categories may be less precise in practice. Even in the first case, personal experience and subjective judgement plays a role, at least in developing and implementing the statistical models, and in constructing their inputs. In practice, banks also often use a different mix of these techniques, for example, in different market segments. For example, the survey revealed that each of the banks surveyed use all of these practices in the large, medium and small corporate lending market, although to very different degrees.

44.   External ratings are also considered in assigning internal grades, to the extent that such an external rating is available for the borrower in question. Especially in the case of judgementally-based systems, external ratings play a major role when a bank is assigning an internal rating. In these cases, the external rating may simply serve as the starting point or may even dominate the internal rating.

45.   In some banks a default probability model or other quantitative tool is essentially the sole basis for determining a rating for certain portfolios. Such models may be developed internally or by vendors, and typically include both quantitative (e.g. financial ratios) and some qualitative but standardised (e.g. industry, payment history/credit report) factors. The modelling technique can be described as discriminant, logit-based, or based on classic credit scoring techniques. In general, it appears that these statistically-based approaches have a more prominent role in small corporate lending than for middle market or large corporates.

46.   In contrast to a purely mechanical process, sometimes the ratings are based primarily on statistical default/credit scoring models or specified objective financial analysis,

but with the possibility for those assigning a rating to adjust that rating to an explicitly limited degree based on their expertise (so-called constrained expert judgement-based processes). In one variant, a scorecard determines the grade but raters may adjust the final grade up or down by no more than one or two gradations based on their judgement. In another variant, quantitative and judgmental factors are explicitly assigned a maximum number of "points", thereby effectively limiting the influence of judgmental considerations on the final rating. Usually the constraints on judgement are more severe when such judgement calls for an upgrade to the rating rather than a downgrade.

47.   Mostly ratings are assigned using considerable judgmental elements, where the relative importance given to such elements is not formally constrained. The survey revealed that at times, the statistical models provided a "baseline" rating that can be overridden by raters. Other times these tools are only one consideration among many in assigning grades. In all cases based on unconstrained expert judgement, however, the rater has discretion to significantly deviate from statistical model indications in assigning a grade. Mostly, these systems do not need to specify the factors to be considered as fully as model-based systems, although raters may be required to address certain core issues or risk factors. In some cases, peculiar circumstances surrounding an individual borrower may come to dominate a risk assessment yet would be excluded from consideration (other than through human intervention) in a model-oriented process.

D.   The risk factors considered in the rating assignment process

48.   Essential in the process of assigning a rating of a *borrower* are balance sheet, income statement, and cash flow performance. When using statistical default models, specific types of financial data are required in a pre-specified format (e.g. specific ratios that describe leverage, debt service coverage, and the like), while a more judgmental analysis may leave much discretion to the rater in respect of which economic data are used and how they are analysed. Sometimes this discretion is supported by some standardisation via inclusion of explicit guidance ratios in the documentation of the formal rating criteria.

49.   At times, formal industry and peer group analysis plays a significant role in assigning ratings. Such analysis is provided by internal economic analysis units or outside vendors, with the goal that different raters within the same institution would incorporate a common view of an industry's outlook across all relevant borrowers. Management experience and competence are also important considerations especially when raters are allowed to override the results of statistical models. Other considerations are ownership structure, reputation, quality of financial information, the purpose of the loan in question, and in some instances the presence of environmental or other liability claims against the borrower. Country (transfer) risk is almost universally considered for cross-border lending.

50.   All banks take into account *facility* characteristics such as third-party guarantees, collateral, and seniority/subordination of the obligation in making lending decisions and more generally in their credit risk mitigation processes. Moreover, in nearly all cases facility characteristics are (at least to some extent) also explicitly considered in assessing the credit quality of an exposure and/or analysing internal profitability or capital allocations. Mostly, guarantees are allowed to affect the rating by effectively transferring the risk to the guarantor or, alternatively, using the more favourable of the borrower or guarantor rating (although such "notching", as described above, may also result in a grade that falls between that of the borrower and that of the guarantor). Collateral is generally also considered as an input in reducing the severity of the loss and thus in improving facility ratings, although in a few cases it reduces the exposure rather than alter the rating. The survey revealed that banks take account of a wide range of both financial (e.g. marketable securities) and physical (e.g. real estate) forms of security. Banks providing facility grades generally did not consider the

liquidity of the instrument being rated in assigning that grade, although in some cases the liquidity of collateral (and implications for its value) was considered explicitly.

51.   Other risk factors, like the variability of loss, or the correlation of risk factors, are generally not taken into account in assigning ratings. Although maturity is often considered in the process of allocating of economic capital for credit risk, it is not explicitly cited as consideration in the assignment of ratings.

E.   The time horizon over which the rating is considered a valid risk indicator

52.   The "time horizon" over which a rating is expected to be valid (i.e. the forecast horizon of the rating) is mostly described by banks to be one year, although this period was characterised as extending anywhere from 3 to 7 years, or the maturity of the transaction in question. The decision for a one-year horizon is mostly based on annual financial reporting cycles (bank and borrower), frequency of internal review of the rating, and in some cases the uncertainties of projected performance beyond one year. The choice for longer periods referred to relationship ties with the customer and the need to analyse the full period of the transaction. Sometimes raters are allowed to determine the horizon on a case-by-case basis.

53.   Some banks distinguish their rating system on the basis of whether it estimates the probability of a borrower's default on a '"point in time" or "through the cycle" approach. In a "point-in-time" process, an internal rating reflects an assessment of the borrower's current condition and/or most likely future condition over the course of the chosen time horizon. As such, the internal rating changes as the borrower's condition changes over the course of the credit/business cycle. In contrast, a "through-the-cycle" process requires assessment of the borrower's riskiness based on a worst-case, "bottom of the cycle scenario" (i.e. its condition under stress). In this case, a borrower's rating would tend to stay the same over the course of the credit/business cycle.

54.   While rating agencies typically claim to utilise a through-the-cycle process, the Range of Practice survey indicates that bank rating systems generally evaluate the risk of a borrower or facility on a point-in-time basis. That said, longer-term negative prospects are typically taken into account, consistent with sound credit risk management. On the other hand, long-term projections of improvement in a borrower's ability to repay as a basis for assigning a favourable internal rating are seldom taken into account.

F.   Use of internal ratings

55.   Rating systems within banks are not developed and operated for their own sake. The uses to which the rating information is put within a bank are numerous and can be considered to form a spectrum according to the degree of sophistication of the internal risk management and control process. In many banks, internal ratings are an integral part of the management information about the quality structure of the loan portfolio, which allows for a close monitoring of its risk composition, the aggregated exposure for all rating grades and the limits assigned. In addition, management information can encompass borrower-specific information, such as major shifts in rating classes for a single customer or groups of borrower. Secondly, rating information serves as a basis for a bank's policy of building loan loss reserves and provisions and is also used as information for pricing decisions and for profitability analysis. In more sophisticated banks, the results of the rating processes can provide the basis for economic capital allocation systems. Finally, internal rating systems and information are a key component in banks' credit risk models.

III.   Risk Components

A.   Overview

56.   There are four risk components within the IRB approach to corporate, bank, and sovereign exposures, which build off the structure of banks' rating systems. These are:

- Probability of Default (PD) of a borrower;

- Loss Given Default (LGD) of a transaction;

- Exposure at Default (EAD) of a transaction; and

- Maturity (M) of the transaction.

57.   The Range of Practice survey revealed that many banks, through their internal rating systems, are capable of assigning an estimate of PD to borrowers within that grade. As such, and subject to meeting the minimum requirements, all banks using the IRB approach for these exposure classes must provide an estimate of the probability of default associated with the grade to which the exposure is assigned. In terms of LGD and EAD, however, the Range of Practice survey revealed that some banks were more comfortable than others in producing robust and reliable estimates for these risk components. As such, the Committee proposes two options for the estimation of these components – a *foundation approach*, in which banks use standard supervisory figures and methodologies for the estimation of these components, and an *advanced approach*, in which, subject to meeting additional minimum requirements specific to each risk component, banks may use their own methodologies and estimates of LGD, EAD, and/or the treatment of guarantees and credit derivatives.

58.   Credit risk mitigation in the form of collateral, credit derivatives and guarantees and on-balance sheet netting, can have a material impact on a bank's estimation of PD, LGD or EAD. In terms of foundation approach treatments, the Committee believes that, as these rely on standard assumptions applicable across all banks, the standardised approach to credit risk mitigation is the logical starting point for the foundation IRB approach. As such, the Committee proposes that the range of permitted credit risk mitigation techniques, the operating standards and the techniques for recognition outlined in the standardised approach be applied to the foundation IRB approach as well, with certain adaptations that reflect differences in the calculation of risk weights between these two approaches. However, unlike under the standardised approach, where the effect of such risk mitigation is to amend the risk weight of an exposure, the IRB framework can provide for greater risk sensitivity by considering the effects of this mitigation on the separate risk components. In the advanced IRB approach, banks are permitted, subject to meeting specified minimum requirements, to use their own estimates for the effect of credit risk mitigation techniques on their estimates of PD, LGD and EAD. Importantly, banks using the advanced approach will be required to demonstrate to their supervisors the appropriateness of these estimates. As such, these banks will not be limited to using the specific recognition mechanisms being proposed for the standardised or foundation IRB approaches. The Committee feels that its proposals for the recognition of credit risk mitigation provides for broad but sufficient consistency across the range of approaches for addressing credit risk. In terms of specific credit risk mitigation techniques, *collateral* can be seen as reducing the bank's loss should its counterparty to a transaction default, and hence, the LGD of the exposure. For banks using the foundation approach to LGD, the treatment draws heavily upon the rules for recognition of collateral as outlined in the standardised approach. Physical collateral in the form of eligible commercial and residential real estate will, however, also be recognised in the foundation IRB approach. For banks which meet the requirements for the advanced approach to LGD, there is no limit

on the types of collateral that may be recognised, nor is a specific technique for recognition set out. This approach is entirely consistent with bank practice and the greater risk sensitivity provided by the IRB approach.

59.   In terms of *credit derivatives and guarantees*, the Range of Practice survey revealed that many banks consider the effect of such transactions by adjusting or 'notching' the borrower grade to take account of the risk-reducing effect of these products. As such, credit derivatives and guarantees can be seen as amending the PD of the borrower. Consistent with the general approach here, two frameworks are envisaged – a foundation and an advanced approach. The foundation approach makes use of standard, supervisory assumptions for the recognition of such transactions and as such draws heavily upon the rules for recognition of credit derivatives and guarantees outlined in the standardised approach. The advanced approach provides recognition for a treatment based on the internal practice of the bank to 'notch' the grade to take into account the effect of the guarantee. To qualify for this treatment, banks must meet an additional set of minimum requirements.

60.   In terms of *on-balance sheet netting*, this can be seen as reducing the extent to which a bank is exposed to a counterparty upon default. As such, it impacts upon a bank's estimate of EAD. On balance-sheet netting effectively provides for a one-for-one reduction in EAD. As such, the Committee does not propose distinguishing between a foundation and an advanced approach treatment. The operating standards which banks must meet in order to derive the benefits of on-balance sheet netting are the same as those proposed for the standardised approach.

61.   In terms of the advanced treatments outlined above, a bank would initially be allowed to move to the advanced approach for one or more of these risk components. However, once a bank moves to use its own estimates for one risk element, supervisors would expect the bank to move to the advanced approach for the other risk components within a reasonably short period of time, subject to banks being able to demonstrate that they meet the requisite requirements. To support this, the bank would need to agree to an aggressive implementation plan with the supervisor.

62.   The fourth and final risk component for corporate exposures is maturity. Maturity (M) is shown to be a material driver of credit risk; at the same time, the Committee is cognisant of a number of trade-offs that must be evaluated in considering an explicit treatment of maturity. Thus, maturity will be an explicit feature for any bank which uses an advanced approach for the estimation of one or more risk components – LGD, EAD or the advanced treatment for credit derivatives and guarantees. For IRB purposes, this estimate will be based on a standard supervisory definition of effective maturity which emphasises the profile of a loan's contractual principal payments over time. The Committee is also considering whether it would be possible to allow banks to use their own estimates of effective maturity, or even own internal estimates of the effects of maturity on portfolio credit risk, provided that robust, cost-effective methods for validation and supervisory minimum requirements can be developed.

63.   For the foundation approach, it is the Committee's view that a balance needs to be struck between the importance of maturity as a component of credit risk, and the extent to which such a dimension could render the foundation approach too complex or impose additional costs on banking systems. Thus, for the foundation approach, the Committee has prepared an option where all exposures would be treated as having the same conservative assessment of average maturity. In this case, an exposure's risk weight would depend only on its PD and supervisory LGD. The average maturity of all exposures is assumed to be three years for the calibration of the risk weights for this approach. The Committee is also considering whether inclusion of the explicit maturity adjustment should be an option that some supervisors could implement for banks in the foundation IRB approach.

64.   The following section presents a discussion of these four risk components. A full discussion of credit risk mitigation in the standardised approach is presented in the separate Supporting Document *The Standardised Approach to Credit Risk*. Rather than repeat that discussion here in the context of the foundation approach, readers are encouraged to refer to that document for background as to the basis of the foundation treatment for collateral, guarantees and credit derivatives and on-balance sheet netting. As intimated above, given that such techniques are an integral part of the estimation of risk factors in the IRB approach, it has been decided not to present credit risk mitigation as a separate chapter in this Supporting Document, but rather to integrate it into a discussion of the risk component in respect of which the particular form of credit risk mitigation is relevant. This structure of presentation also makes comparison between the foundation and advanced approaches to PD, LGD and EAD (in particular in respect of the minimum requirements) more tractable.

B.   Probability of Default (PD)

65.   The core of the IRB approach is the use of banks' own estimates of the probability of default (PD) associated with an exposure. For IRB purposes, this is defined as the greater of the one-year PD associated with the internal borrower grade to which that exposure is assigned, or 3 basis points (i.e. 0.03%). The Committee has decided to impose a floor of 3 basis points both to place a minimum bound on risk weights (and hence capital requirements) and also in recognition of the difficulty banks face in validating PD estimates of this magnitude.

66.   There are two aspects of this worthy of further discussion, as highlighted below:

(i)   Average PD per grade

67.   The Committee recommends that a bank be required to generate a measure of "pooled" or average PD for each borrower grade. Hence all borrowers within that grade are treated as having the same PD. Possible alternatives that were considered by the Committee include requiring PD estimates for each borrower in each grade and PD ranges (rather than averages) for each grade. There are several reasons why the pooled PD was deemed preferable:

- the average PD for each internal grade, rather than estimates of PD for each borrower, is the input which currently drives internal economic capital allocation at many best-practice banks;

- banks which estimate PDs using historical observations of their own default experience do so via an average PD;

- the ability of a bank to estimate and validate average PD is likely to be greater because of the efficiency properties of averages, as long as each borrower grade represents an underlying population of borrowers that is relatively homogeneous;

- using a single average figure avoids the problem of overlapping bank/regulatory PD ranges, and there are attractions to using a pooled PD concept in terms of its interaction with other elements of the IRB framework.[2]

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[2]   An example is the granularity adjustment.

(ii)   One year PD

68.   The Committee proposes that banks provide an estimate of the PD associated with each grade over a one-year time horizon. The Committee's Range of Practice Paper and its discussions with the industry suggest that one year PDs are the typical inputs into internal capital allocation systems, where one year coincides both with the usual financial reporting period and the typical minimum frequency with which ratings are reviewed internally. By building upon PD information that uses a common time horizon, supervisors can achieve greater internal consistency within the IRB framework and provide for consistent validation across banks and exposure classes. This would not be the case in using a time horizon equivalent or driven by, for example, the maturity of each specific exposure.

69.   In specifying that banks must provide a one-year PD, this is not to say that they should assess borrowers solely on the basis of their likely performance over the next 12 months. Sound lending practice calls for banks to consider all relevant information in the rating (and lending decision), including information that is relevant to the credit capacity of the borrower beyond one year. This is an important standard in respect of how banks assign borrowers to ratings. It does not, however, impact upon the PDs associated with each borrower grade. Minimum requirements for how banks assign borrowers to ratings, the appropriate time horizon to be used in this rating assignment, and the 'orientation' of these ratings are presented in full in *The New Basel Capital Accord.*

(iii)   Methods for quantifying PD

70.   There are a variety of methodologies and data sources which a bank may use to associate an estimate of PD to each of its internal grades. The three broad approaches are use of data based on a bank's own default experience, mapping to external data or the use of statistical default models. Minimum requirements in respect of the estimation process for each of these broad approaches are a critical underpinning to the credibility of the IRB approach. In particular, these requirements note that the estimates should represent a conservative view of the long-term average of the probability of default associated with borrowers in each grade. Banks are free to use more conservative estimates if they wish.

(iv)   Impact of credit derivatives and guarantees on estimation of PD

71.   There are two approaches for the recognition of credit risk mitigation in the form of guarantees and credit derivatives in the IRB approach; a foundation approach and an advanced approach for those banks which meet the specific minimum requirements.

Foundation approach

72.   This treatment draws heavily upon the treatment of guarantees and credit derivatives in the standardised approach. The proposed approach is based on the substitution approach of the current Accord, but includes an additional capital floor element. For a full discussion of this treatment, see the discussion in the Supporting Document, *The Standardised Approach to Credit Risk*, as well as in *The New Basel Capital Accord* for how this standardised treatment translates into the foundation approach.

Advanced approach

73.   Following long-established sound banking practice, banks evaluate the risk of a each exposure during the loan approval and monitoring process. For exposures that involve a guarantor, this evaluation necessarily involves a thorough credit analysis of – and

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assignment of an internal borrower rating to – the guarantor as well as the borrower. The precise treatment of guarantees is analysed by banks individually on a case-by-case basis, and depends on the details of the credit transaction.

74.   An important distinction among guarantees is that between embedded guarantees – those that are integral to the underlying transaction/exposure/legal documents – and purchased guarantees or credit derivatives. Embedded guarantees are generally integrated into the assignment of an internal rating (i.e. a facility grade, if the bank uses a facility dimension, rather than the borrower grade) and are factored explicitly into the decision by the bank to extend credit. Purchased guarantees are functionally identical to embedded guarantees, except that the guarantee is provided at an explicit price rather than as part of the consideration provided to the bank in negotiating a credit transaction. Purchased guarantees or credit derivatives are generally acquired some time after the underlying transaction is completed. The Committee, however, proposes to adopt the same approach to these different types of credit risk mitigants, on the basis that they share the same economic effect.

75.   To reflect this established bank practice, the Committee proposes a "substitution ceiling" approach for guarantees and credit derivatives under the advanced methodology. Under this approach, a bank would base its capital calculation on the borrower grade of the underlying obligor adjusted by the bank to reflect the effect of the guarantee. Banks regularly perform this analysis, and banks that make use of a facility rating dimension already perform this type of adjustment. Thus the use of such information would be fully incentive-compatible. In particular, this approach allows the IRB framework to be informed by the credit evaluation performed by the bank as to the degree to which it recognises the effect of a guarantee.

76.   Consistent with banking practice in evaluating individual exposures, this "notching" would not be allowed to go beyond the higher of the borrower or guarantor grades – as such it would provide for treatment that is no more favourable than full substitution. In so doing, the substitution approach will not give recognition to the so-called "double default" effect of guarantees and credit derivatives. The Committee believes that various challenges, including data limitations, must be overcome before supervisors can have a sufficient degree of confidence in banks' estimates of the correlation between possible default events for the borrower and the guarantor. The Committee welcomes further developments in risk management practices, which may pave the way towards such recognition.[3]

77.   For similar reasons, the Committee will require that such internal substitution analysis may only take account of embedded guarantees and those purchased guarantees and credit derivatives for which the reference asset on which the guarantee or credit derivative is based is the same as the underlying borrower exposure, unless the conditions outlined in the foundation approach are met, namely:

- The reference and underlying exposures are issued by the same obligor (i.e. the same legal entity); and

- The reference exposure ranks pari passu or more junior than the underlying exposure, and legally effective cross-reference clauses (e.g. cross-default or cross-acceleration clauses) apply.

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[3]   See again *Credit Risk Modelling: Current Practices and Applications* (April 1999).

78.   To allow for recognition of other reference obligors would once again require robust estimates on the correlation between default events involving the reference and underlying obligors.

79.   Thus, in terms of risk inputs, banks would be allowed to adjust their estimates of PD to take account of the guarantee or credit derivative. The guaranteed facility would receive a PD appropriate to the borrower or the guarantor's borrower grade, or an intermediate grade if a bank deems full substitution treatment not to be warranted. A bank wishing to adopt the substitution ceiling treatment will have to demonstrate to its supervisor that it complies with the minimum requirements for this advanced approach. In contrast with the foundation approach, there are no limits on the range of eligible guarantors in the advanced approach, nor is a *w* factor applied to the guarantor (see *The New Basel Capital Accord* and the Supporting Document *The Standardised Approach to Credit Risk* for details on calibration of the *w* factor). However, the minimum requirements seek to ensure that the risks identified in the standardised approach and addressed through operational requirements or the *w* factor are adequately addressed in the bank's own internal processes and estimation of the risk-reducing effect.

80.   The Committee is also considering alternative methodologies for the treatment of guarantees and credit derivatives in the advanced approach. These include allowing banks to recognise the risk reducing effect through amending its estimates of LGD, or the development of a two-legged approach, similar to that being considered for securitisation transactions in the IRB framework. The Committee will continue to explore these options during the consultative period. The availability of any such alternative options would be subject to the bank meeting prescribed minimum requirements to be developed by the Committee.

C.   Loss Given Default (LGD)

81.   A bank must provide an estimate of the expected loss given default (LGD) for each corporate exposure. This is a measure of the expected average loss that the bank will experience per unit of exposure should its counterparty default. Unlike PD, where a borrower can have only one borrower rating (and thus one probability of default), different exposures to that borrower may have very different LGD profiles, given facility-specific features.

82.   The Range of Practice survey revealed that few banks at this time have robust data on which to base estimates of LGD across a range of transaction and borrower types. In general these banks have invested in the development of LGD data based on the institution's historical loss experience, while others have not. Few banks have internal data spanning more than 5 or so years.

83.   At the same time, there are relatively few available sources of external LGD data (i.e. LGD experience of other creditors), and internal use of such data requires analysis and evidence that the exposures on which the data is based are directly comparable to the bank's own loss history. There are also indications that LGD can vary significantly from one bank to another, reflecting differences in lending standards, the type of (and extent to which) collateral is taken, policies and procedures in pursuing recoveries from defaulted borrowers, and other areas. LGD can also be dependent on the economic cycle.

84.   For these reasons, the Committee believes that it is not appropriate at this stage for all IRB banks to be using their own estimates of LGD for the purpose of deriving IRB risk weights. Instead, it proposes two alternative treatments – a foundation approach, in which estimates of LGD are provided according to standardised supervisory parameters, and an advanced approach, in which those banks which demonstrate that their estimates of LGD are

suitably robust are permitted to use them. The Committee hopes that, over time, more banks will be in a position to use their own estimates of LGD, consistent with the goal of promoting greater risk sensitivity and better risk measurement and management.

(i)   Foundation approach

85.   In setting out a conceptual framework for LGD in the foundation approach, the Committee was again driven by a desire to balance simplicity with risk sensitivity. As with the standardised approach, the foundation approach is essentially a 'one-size fits all' framework. As such, for a factor which influences LGD (a so-called 'LGD driver') to be recognised, the Committee needed to be sure that this driver had a material, reliable and consistent impact on LGD across both banks and countries, and over time. In the absence of such evidence, a conservative approach was taken.

86.   The analysis conducted by the Committee revealed that banks see a range of borrower and transaction specific characteristics as having an impact on LGD. Borrower characteristics include asset size, country of incorporation, industry sector and whether the corporate is a holding or operating company. Transaction specific characteristics include the seniority of the transaction, the amount and nature of any collateral taken and loan covenants. The Range of Practice survey and further discussions with the industry revealed little consistency across banks in terms of the factors they take into account, or the effect they have on estimates of LGD. As such, for the foundation approach, the Committee proposes a relatively simple categorisation of exposures according to whether the loan is senior or subordinated, and whether and to what extent certain restricted forms of collateral have been taken.

Treatment of unsecured exposures and non-recognised collateral

87.   Senior claims on corporates without specifically recognised collateral will be assigned a 50% LGD. Subordinated claims on corporates without specifically recognised collateral will be assigned a 75% LGD. A subordinated loan is a facility that is expressly subordinated to another facility – this is legal and contractual subordination. At national discretion supervisors may choose to employ a wider definition of subordination. This might include economic subordination, such as might be the case with a senior unsecured facility where the bulk of the borrower's assets are used to secure other obligations.

88.   The Committee believes these figures – 50% and 75% - will be conservative for most banks and in most countries, as they will also be applied to exposures associated with many forms of collateral which banks take but which are not recognised in the foundation approach.

Eligible collateral under the foundation approach

89.   There are two broad categories of eligible collateral under the foundation IRB approach – eligible financial collateral and eligible physical collateral.

Financial collateral

90.   The treatment of financial collateral in the foundation approach is consistent with that set out under the standardised approach. For background on the standardised approach treatment, see the Supporting Document, *The Standardised Approach to Credit Risk*. For details of how this translates into foundation IRB requirements, see the document, *The New Basel Capital Accord*.

Eligible CRE and RRE under the foundation approach

91.   In addition to the eligible financial collateral specified, the Committee proposes to recognise physical collateral in the form of certain eligible commercial and residential real estate (CRE and RRE respectively) in the foundation IRB approach. The Committee recognises the risk reducing effect that can arise when these types of collateral are taken, and recognition of these collateral types is consistent with the desire to make the IRB approach more risk sensitive. At the same time, the Committee is aware of the broad spectrum of real estate that could fall within these categories, and the wide variety of lending practice and recovery rates across banks and countries when this form of collateral is taken. The Committee wishes to recognise collateral types whose risk reducing effect is material, reliable and consistent across banks and countries. It believes that CRE and RRE can meet this requirement, but only on the basis of strict eligibility criteria, robust operational requirements and the adoption of a conservative approach. The Committee wishes to stress that recognition of these collateral types is aimed more at real estate pledged by small and medium size corporates, rather than specific-purpose plant or premises which could be pledged by a larger entity.

92.   The minimum requirements for CRE and RRE (eligibility criteria and operational requirements) are presented in detail in *The New Basel Capital Accord.*

Methodology for recognition of CRE and RRE collateral

93.   The methodology for determining the effective LGD under the foundation approach for cases where a bank has taken CRE or RRE collateral to secure a corporate exposure is based upon the amount of collateral relative to the size of the exposure.

94.   Exposures where the minimum eligibility requirements are met, but the ratio of collateral value (C) to the nominal exposure (E) is below a threshold level of 30% would receive the appropriate LGD for unsecured exposures or those secured by non-recognised collateral of 50%.[4]

95.   This serves as a materiality threshold; a bank must take a meaningful amount of collateral before it receives recognition for such collateral. This approach is predicated on a presumption that, in setting this threshold level, supervisors may take greater comfort that the bank has an incentive to monitor and recover the collateral, and that the operational requirements outlined in the previous section are being met - if the level of collateral is below this amount, it may not make sense for the bank to sell the collateral as the benefit may be lower than the expenses incurred in the sale.

96.   Exposures where the ratio of collateral value to the nominal exposure exceeds a second, higher threshold level of 140% would be assigned an LGD of 40%. This is essentially the floor LGD that can be applied when this form of collateral is taken. The Committee believes that setting the upper threshold level at 140% (this equates to a loan to value ratio of just over 70%) and the minimum LGD at 40% represents a suitable balance between risk sensitivity and conservatism. Exposures where the ratio of the collateral value to the nominal exposure is between the threshold levels as defined in the previous paragraphs would receive an effective LGD* that is a weighted average of the secured and unsecured LGD figures as specified below.

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[4]   If there were a loan that was subordinated as defined in *The New Basel Accord*, and secured by collateral that met the eligibility requirements, the effective LGD would be based on the LGD of the subordinated loan (i.e. 75%). This treatment would also apply in the calculation of effective LGD under pools of collateral.

97.   These three cases can be summarised in the table below:

Table 1

	Condition	**Effective LGD**
Case 1	C/E<=30%	50%
Case 2	C/E>140%	40%
Case 3	30%<C/E<=140%	(1-(0.2 x (C/E)/140%)) x 50%

98.   In contemplating two broad types of eligible collateral in the foundation IRB approach – financial and physical – and two similar though not identical methodologies for recognition, an approach to deal with situations where exposures are supported by both types of collateral (i.e. "pools of collateral") is required. The Committee is therefore proposing a specific methodology for calculating the LGD of a transaction under the foundation approach for such cases. For further detail, please refer to *The New Basel Capital Accord.*

Other forms of collateral

99.   The Committee considered whether recognition could be provided to any other forms of collateral which banks frequently take as part of their lending activities. Examples are inventory, accounts receivable and plant and equipment. On the basis of evidence provided by the banking industry, it was clear that a wide variety of practice existed across banks and countries, in terms of the lending standards followed, and historic recovery and loss experience. As such, the Committee does not feel at this time that any specific additional collateral types are capable of meeting the "test" for recognition (i.e. that they provide for a meaningful, consistent and reliable reduction in losses across banks and countries). As such, beyond eligible CRE and RRE, no additional forms of physical collateral will be recognised in the foundation IRB approach.

(ii)   LGD under the advanced approach

100.   The evolutionary approach adopted by the Committee provides the opportunity for those banks with robust and reliable internal LGD estimates to use these estimates in the determination of risk weights. Use of own estimates of LGD more closely aligns regulatory capital with risk measurement and management at best-practice banks, and provides incentives for banks to develop further their abilities to measure and manage credit risk and its key components more effectively. These estimates should represent a conservative view of long-run average LGD values for exposures in each internal LGD grade or category. Banks are free to make use of much more conservative estimates, such as those appropriate to conditions of economic stress, if they choose.

101.   Use of own estimates of LGD has a number of additional benefits. Firstly, the benefit of being able to recognise banks' own loss experience. The foundation approach by its nature is a 'one-size fits all' approach – hence the extent to which it can take into account important differences in lending standards and legal environments across markets and products which impact upon LGD estimates is limited. Furthermore, there is evidence that LGD is bank specific, in that the internal definitions of default and loss used by the bank, the products the bank offers, the lending standards it employs and its policies and procedures in

respect of pursuing recoveries from defaulted borrowers can have a material impact on its LGD estimates. Allowing banks to use their own estimates of LGD provides supervisors with a mechanism of taking such bank specific factors into account.

102. In using own estimates of LGD, a mechanism is provided to recognise a much wider range of LGD categories or types, possibly linked to borrower as well as transaction characteristics. In particular, the advanced approach allows for recognition of a wider range of collateral than that provided by the foundation approach. Where a bank takes any form of collateral and it can demonstrate that this serves materially, consistently and reliably to reduce its experience of loss, then this should be recognised in the bank's own internal estimates. The advanced approach therefore does not limit the recognition of collateral to high-quality, highly marketable financial collateral, or specified forms of commercial and residential real estate. Moreover, banks are not required to make use of the techniques for recognition outlined in the foundation approach, such as the 'haircut' approach to financial collateral. Instead, the emphasis is on banks demonstrating that their LGD estimates are reliable and consistent with their underwriting standards, risk profile and available and relevant data (either historic experience or comparable external data).

103. The quid pro quo for banks using their internal estimates of LGD is adherence to an additional set of minimum requirements. These attest to the robustness of their process for differentiating LGD across facility or borrower characteristics, and the internal estimates of LGD they attach to their LGD grades. In terms of collateral, the minimum requirements also seek to ensure that the risks identified in the standardised approach and addressed through operational requirements or the *w* factor are adequately addressed in the bank's own internal processes and estimation of LGD when any form of collateral taken.

104. Given the findings of the Committee's analysis of bank practice, the Committee does not envisage at the outset that all banks will be able to meet these requirements. It hopes, however, that those banks not in a position to meet the requirements from the date of implementation undertake the necessary steps (e.g. in terms of data gathering) to be in a position to meet the requirements at some stage in the future.

Mechanics of incorporating own-estimates into the IRB approach

105. A bank would provide information on the LGD breakdown for exposures (EAD) in each grade, based on its internal LGD estimates. It would provide these breakdowns consistent with its internal practices, reporting exposures per LGD grade. Thus, if a bank has 10 internal obligor grades and 10 categories or LGD grades, that bank would need to produce estimates of exposure for a maximum of 100 PD-LGD combinations as the basis for calculating its IRB capital requirements. In practice, many of these combinations will likely prove to be empty.

D. Exposure at Default

106. For a risk weight derived from the IRB framework to be transformed into a risk weighted asset, it needs to be attached to an exposure amount. This can be seen as an estimation of the extent to which a bank may be exposed to a counterparty in the event of, and at the time of, that counterparty's default. In many banks' internal credit systems, this is expressed as estimated exposure at default (EAD).

107. For on-balance sheet transactions, EAD is identical to the nominal amount of exposure. On-balance sheet netting of loans and deposits of a bank to a corporate counterparty will be permitted to reduce the estimate of EAD on an exposure subject to the

same conditions as under the standardised approach. For off-balance sheet items, there are two broad types which the IRB approach needs to address: transactions with uncertain future drawdown, such as commitments and revolving credits, and OTC foreign exchange, interest rate and equity derivative contracts.

108.   All estimates of EAD should be calculated net of any specific provisions a bank may have raised against an exposure.

(i)   Transactions with uncertain future drawdown

Foundation approach

109.   As with LGD, two methods for the estimation of EAD on such transactions are presented: (a) a foundation approach in which estimates are derived through the application of a simple supervisory-imposed methodology, and (b) an advanced approach that contemplates use of own estimates. Use of own estimates of EAD is consistent with promoting sound risk management practice, as the ability to monitor historical and expected average utilisation rates is an additional and integral part of a bank's exposure management. As with LGD, however, use of such estimates is available only for those banks which can demonstrate that they meet the requisite minimum requirements.

110.   Under the foundation approach, the Committee proposes to measure EAD on commitments and similar revolving credits as 75% of the off balance sheet amount. The 75% figure works in the same way as a credit conversion factor in the standardised approach. Where a facility comprises both a drawn amount and an undrawn amount, EAD will thus be calculated as (100% of) the drawn amount plus 75% of the undrawn balance. Thus, for a committed line of 100, with current outstandings of 40%, the EAD would equal 40 + 75%(100-40), or 85.

111.   The 75% credit conversion factor is an estimate of the extent to which that part of a committed line which is currently undrawn will be drawn down prior to default. On the basis of surveys of bank practice and some published studies in this area, the Committee feels that 75% is both a reasonably representative and suitably conservative estimate of this factor for use in the IRB approach. The Committee proposes to use this figure regardless of the credit quality of the underlying obligor or the maturity of the commitment. The Committee is aware that in their internal rating systems, a number of banks take account of such factors in the estimation of credit conversion factors or alternatively estimate EAD as a single percentage of the total (drawn and undrawn) limit. However, practice varies, and the Committee does not propose to introduce such a differentiation on the basis of striking an appropriate balance between simplicity and accuracy.[5]

112.   In terms of transaction type, the Committee recognises that the treatment outlined above may not be appropriate for all commitments. Therefore, committed lines which are

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[5]   Empirical analysis suggests that the commitment factor falls as credit quality declines. While top quality borrowers tend to have low average utilisation rates, experience suggests that they will draw heavily on undrawn lines should they encounter difficulties; a commitment factor of 75% seems appropriate to capture this. In contrast, while lower quality borrowers tend to have higher utilisation rates, banks have mechanisms in place, such as more frequent review of the account or covenants to restrict further drawdown, which serve to reduce the possibility of further drawings. For these borrowers, 75% may be on the high side, but given that these borrowers tend to draw quite heavily (and have few unused lines), the degree of model fit in imposing a single commitment factor is not in the Committee's view unduly undermined.

unconditionally and immediately cancellable by the borrower and uncommitted lines (which are not legal commitments) will attract a zero credit conversion factor.

113.   The Committee has not at this stage evaluated the extent to which the 75% figure could be used for the other off-balance sheet items which are listed under the standardised approach. As such, and for the time being, the credit conversion factors applied to certain transactions in the foundation approach remain the same as under the standardised approach. See Table 2 below for specifics.

Table 2

Off Balance Sheet Item	Credit Conversion Factors
1. Direct Credit substitutes – e.g. general guarantees of indebtedness (including standby letters of credit serving as financial guarantees for loans and securities) and acceptances (including endorsements with the character of acceptances);	100%
2. Certain transaction-related contingent items (e.g. performance bonds, bid bonds, warranties and standby letters of credit related to particular transactions)	50%
3. Short-term, self-liquidating trade-related contingencies (such as documentary credits collateralised by the underlying shipments)	20%
4. Sale and repurchase agreements and asset sales with recourse where the credit risk remains on the bank;	100%
5. Forward asset purchases, forward forward deposits and partly-paid shares and securities which represent commitments with certain drawdown;	100%
6 Note Issuance Facilities and revolving underwriting facilities	50%

Advanced approach

114.   In terms of own estimates, the Committee proposes that those banks which can demonstrate that they meet specified minimum requirements will be permitted to use their own internal estimates of EAD for transactions with uncertain drawdown. This applies not only to commitments but also to the other off-balance sheet items listed in Table 2 above. These estimates should represent a conservative view of the long-term average EAD value, although banks are free to use more conservative values if they choose, such as those associated with conditions of economic stress. The minimum requirements which accompany own estimates of EAD are presented in detail in the document, *The New Basel Capital Accord.*

(ii)   OTC derivatives

115.   The amount of credit risk which a bank would face should its counterparty to an OTC derivatives transaction default is often only a small percentage of the nominal amount of the transaction. Essentially, the credit risk on such instruments is limited to the potential cost of replacing the cash-flow (on contracts with positive value) if the counterparty defaults.

116.   Under the current Accord, credit risk equivalent amounts on these contracts are measured as the sum of the replacement cost (positive mark to market) of the transaction plus specified "add-ons" (which vary by transaction type and residual maturity) to reflect potential future exposure (PFE). These add-ons are expressed as a percentage (ranging from 0%-15%) of the notional amount. The Committee proposes to use both the same methodology and numbers for the purpose of measuring EAD on OTC derivatives in the foundation approach.

117.   In terms of own estimates, the Committee is aware that many banks are applying modelling techniques to the estimation of individual transaction and portfolio-based PFEs. In principle, the Committee believes that banks should be allowed to use the output of such models in the advanced EAD approach, subject to compliance with additional sound practice requirements and possibly some core supervisory-imposed modelling parameters. The Committee will be undertaking further work in the Consultative Period to evaluate the feasibility of own-estimates of PFE, and the requirements which would be needed to underpin such an approach.

E.   Maturity

(i)   Introduction

118.   The Committee wishes the IRB approach to be as risk sensitive as possible and, in principle, explicit consideration of maturity as a risk driver would be consistent with this goal. Maturity is a key factor affecting the credit risk of a bond or loan. Other things the same, the shorter the maturity of a loan, the less its underlying credit risk. A shorter maturity increases a bank's flexibility to limit future losses to customers whose financial conditions deteriorate unexpectedly by denying credit, by raising the price sufficiently to compensate for the increased risk, or by demanding greater protections (e.g. collateral, seniority, etc.) as a condition for continued lending. The maturity of a loan can be seen as an important credit risk mitigation tool.

119.   Banks recognise the importance of maturity as a driver of risk through their pricing, in their internal assessments of capital adequacy, and in performance measurement reviews such as return of risk adjusted capital. Bank credit policies impose tougher internal requirements on longer maturity loans and impose limits on maturity for certain borrowers and transactions. However, the approach for addressing maturity differs across banks, as discussed in the next section.

120.   The conceptual methods by which maturity effects on credit risk are measured and managed differ amongst the industry. Economic capital systems capture maturity effects with either judgmental or credit risk model-based maturity adjustments. The latter has become increasingly prevalent as best-practice banks are shifting from credit risk models based on the one-period default-mode (DM) paradigm toward adjusted (multi-period) default-mode models or models based on the mark-to-market (MTM) paradigm.[6] Within the latter

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[6]   At present, those credit risk models that consider maturity effects generally have adopted either a multi-period adjusted default-mode or a mark-to-market conceptual framework. Both model types have been used for the maturity adjustment calculations below; their main concepts are described in the respective sections. Within one-period default mode or two-state credit risk models, increasing a loan's maturity beyond the chosen (one-year) time horizon has no effect on the portfolio's economic capital because, by assumption, defaults occurring after one-year are not considered for purposes of estimating portfolio credit risk. In such models, maturity is (by necessity) treated outside the formal credit risk modelling framework.

framework, longer-term loans tend to face higher economic capital requirements for credit risk, reflecting the greater sensitivity of a longer-term loan's value to a deterioration in a borrower's credit quality short of default. Although a long-term and a short-term loan may respond similarly to defaults within the chosen time horizon, a borrower downgrade from, say, Baa to Ba will tend to have a larger relative price effect on a 10-year loan compared with a 1-year loan. Best-practice banks recognise the importance of more formal maturity adjustments and more institutions are moving in this direction.

121.   The Committee believes that incorporating maturity directly into the computation of required capital for credit risk under the IRB approach would have a number of advantages. Required capital would be made more risk sensitive, more consistent with the underwriting and other risk management practices of major financial institutions, and more consistent with the pricing of credit risk in financial markets. Indeed, a failure to recognise the role of maturity as a credit risk mitigant under the IRB approach could result in unduly high capital charges on loans to lower-quality customers by not accounting for a common technique (i.e. the use of shorter maturities) to reduce the riskiness of such loans. Incorporating maturity directly into the computation of required capital for credit risk also potentially allows the capital treatment of maturity-mismatched credit hedges to be made more consistent with the capital treatment of whole loans, thus possibly lessening capital arbitrage incentives. For these reasons, the banking industry has argued in favour of the inclusion of maturity adjustments noting, in particular, that such adjustments allow for the most sensible treatment of maturity mismatched credit risk mitigation, particularly in the form of credit derivatives.

122.   Notwithstanding these potential benefits, however, the Committee is concerned that treating maturity as an explicit risk driver under the IRB approach could have some undesirable consequences. In this regard, the Committee is aware that the implementation of an explicit maturity adjustment could impose additional costs on banking systems, as it could have some direct implementation burdens on banks and supervisors in terms of IT resources and validation requirements. In addition, to the extent that the effects of maturity on economic capital cannot be estimated precisely, errors in both the choice of the most appropriate framework for calibrating maturity adjustments and in the calibration itself under the IRB could render minimal any gains in risk sensitivity. A related concern is that banks might 'game' an explicit maturity adjustment, by restructuring a long-term exposure as a series of short-term contracts, for example.

123.   Lastly, it could be argued that an explicit maturity adjustment could discourage some banks from making longer-term loans, thus driving up the cost of longer-term credit and leading to potential distortions in lending markets. In this regard, the Committee recognises that long-term finance is distinguished by its system stabilising contribution due to predictable payments over long time horizons, and that it reduces the vulnerability of borrowers to interest rate risk. Furthermore, banking systems with a high proportion of long term financing have indeed been less vulnerable to financial crises.

124.   In developing a balanced IRB approach to maturity adjustments, therefore, there is an inherent trade-off between potential accuracy, complexity, the banking and supervisory resources needed to measure and validate the requisite inputs, and the potential for unintended consequences. The specific options proposed for the foundation and the advanced approach represent different points along this trade-off.

(ii)   Treatment of maturity under the foundation IRB approach

125.   With respect to the foundation approach, the Committee has prepared an option where all exposures would be treated as having the same conservative assessment of average maturity of 3 years. In this case a risk weight of an exposure would depend only on

its PD and LGD. The appropriateness of the assumption of the average 3-year maturity is an explicit issue on which the Committee is seeking comments from the industry.

126.   The Committee is also considering whether inclusion of the explicit maturity adjustment - as detailed in the next section with respect to the advanced approach - should be an option that some supervisors could implement for banks on the foundation approach.

(iii)   Treatment of maturity under the advanced IRB approach

127.   With respect to the advanced IRB approach, any bank employing the advanced approach for LGD, EAD, or guarantees/credit derivatives would be required to explicitly incorporate maturity effects on risk weights. As such, a credit's risk weight would depend on its PD, LGD, and "effective maturity", which emphasises the contractual rather than economic maturity of exposures. The Committee is seeking specific comment on the approach for calibrating the maturity adjustments using this concept of effective maturity; see section 4 of this chapter for further detail on the maturity adjustment.

128.   The Committee is also considering the possibility of allowing individual banks to use their own internal estimates of effective maturities, or even own internal estimates of the effects of maturity on portfolio credit risk, provided that robust, cost-effective methods for validation and supervisory minimum requirements can be developed. A major concern is that the validation of a bank's own estimates of maturity effects would raise many of the same conceptual and practical problems that have precluded the Committee from proposing a full internal models approach to setting overall required capital for credit risk.

(iv)   Definition of 'effective maturity'

129.   For IRB purposes, the proposed definition of effective maturity (M) places great weight on minimising complexity and operational burden to both banks and supervisors, albeit at some cost in terms of potential accuracy. This is accomplished, in part, by selecting a definition that, while easy to calculate and verify, is somewhat conservative.

130.   An instrument's effective maturity would be defined as the *greater of* one year and the following:

(i)   Unless otherwise provided below, the maximum remaining time (in years) that the borrower could take to fully discharge its contractual obligation (principal, interest, and fees) under the terms of loan agreement. (Normally, this will correspond to the nominal maturity of the instrument.)

(ii)   For an instrument subject to a pre-determined, minimum amortisation schedule, the weighted maturity of the remaining minimum contractual principal payments, defined as:

$$\text{Weighted Maturity} = \sum_t t P_t / \sum_t P_t \ ,$$

where Pt denotes the minimum amount of principal contractually payable t months in the future.

131.   An exception to the above definition is that, for any asset, the measured effective maturity would be capped at 7 years, regardless of the implications of conditions (i) and (ii).

132.   This definition would apply to both drawn loans and off-balance sheet commitments. In order to minimise potential gaming and burden on banks and supervisors, the definition

emphasises simplicity and objectivity. Notably, within 'grey areas' (e.g. credits involving embedded options) the definition adopts a conservative approach. Except in clearly controlled and delineated circumstances (condition ii), effective maturity would be measured as the *greater of* one year *and* longest possible remaining time before the obligor is scheduled to fulfil its obligation (condition i).

133.   Apart from the 7-year ceiling, the only exception to condition (i) pertains to amortising exposures. Amortising loans generally repay faster than non-amortising loans, and so generally entail less credit risk, other things the same. Under the recommended definition, to the extent principal is required to be repaid at a faster rate, a loan's effective maturity would be shortened. In these cases, measured effective maturity would be based on the contractually specified minimum rate of principal payments.

134.   Importantly, the definition would *not* recognise embedded options that might reduce the term of a loan, although it would recognise embedded options that might lengthen the term. Thus, for IRB purposes, effective maturity would not be affected either by a borrower's option to pre-pay or by a bank's option to accelerate scheduled payments. Effective maturity would, however, increase to the extent a loan agreement provided options that might permit the borrower the option to roll over or lengthen an exposure's term.

135.   The proposal places a ceiling of 7 years on effective maturity as measured for IRB purposes. As described below, the proposed methods of adjusting IRB risk weights for the effects of maturity approximate these adjustments as linear functions of M. Research suggests that as M extends much beyond around 7 years this approximation begins to significantly overstate the impact of maturity on economic capital for credit risk.

136.   For other than very long-term assets, this proposed definition would generate a conservative measure of maturity for use in determining IRB capital requirements. First, this definition would *not* recognise reductions in effective maturity below one year. Qualitatively, this treatment is consistent with many economic capital systems, which do not recognise reductions in maturity below some floor amount. Setting the floor at one year is broadly consistent with evidence indicating that banks typically reassess the internal risk rating and overall credit limits for corporate borrowers on a one-year cycle. Subject to established limits, a bank will normally extend or roll over a loan at the discretion of the borrower - without formally re-underwriting the entire credit relationship. Setting the floor at one year also would attenuate incentives and opportunities for gaming an IRB maturity adjustment.

137.   Second, this definition would result in measures of effective maturity that are at least as large as standard norms used within financial markets for pricing loans and assessing credit spreads, such as the duration of future contractual cash flows. For example, in the case of plain-vanilla, fixed-rated loans, the recommended measure of effective maturity will exceed a loan's effective duration except for zero-coupon instruments, where the two are equal.

(v)   Information required by banks

138.   The implementation burden of the above definition should be relatively small. The only information required for its computation is knowledge of a loan's future contractual principal, which should be readily determinable by any well-managed bank. Banks would

provide information on the exposure-weighted effective maturity (as defined above) for each internal borrower grade.[7]

F. Discussion on definition of default

139.   In setting out a framework based on a separate and explicit assessment of the PD, LGD and EAD of an exposure, the Committee recognises that in order to promote consistency, a reference definition of default is required. Even where banks are on the advanced approach for LGD and EAD, a reference definition of default is still required as the risk weights are not directly proportional in PD.

140.   The Committee proposes a standard, reference definition of default for corporate exposures. To be eligible for the IRB approach, the internal definition of default used by the bank and the data sources which it uses to quantify its estimates of PD must be consistent with this reference definition. A discussion of this issue, together with the reference definition itself, is presented below.

141.   In the default-oriented IRB framework, data sources used to estimate PDs and other loss characteristics necessarily incorporate a view of what represents an event of default. Similarly, accounting procedures and other internal administrative processes in the credit risk area are linked to specific interpretations of the meaning of a "default". Discussions with banks and surveys indicate that, in practice, definitions of 'default' used in the credit risk measurement context vary across banks, across accounting regimes, and across external databases of historical borrower performance.

142.   Under the proposed structure of an IRB approach, these differences could affect the comparability of capital requirements on otherwise identical portfolios, possibly placing some banks at a competitive disadvantage solely due to the default definition associated with the data source(s) they utilise. In the extreme, such differences could provide opportunities for banks to manage their working definitions and estimation procedures toward inappropriately low capital requirements.

(i)   Current practice for corporate exposures

143.   Most banks consider in their definition of default for corporate exposures events such as missed payments, restructuring, and filing for bankruptcy. In addition, some banks consider situations in which loss is deemed to be probable or unavoidable in the judgement of bank staff, where specific credit loss provisions have been raised, or where the exposure has been transferred to the problem loan department. Internal definitions are more relevant to middle market corporate exposures; as noted elsewhere, banks tend to rely on rating agencies' experience for large corporate exposures (and thus on the default definitions used by the agencies).

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[7]   One advantage of the maturity adjustments presented in the next section is that a bank's capital requirement can be calculated by applying maturity adjustments *either* at the individual asset level or at the risk bucket level (defined in terms of a particular combination of PD and LGD). Under the latter approach, for a given PD and LGD combination, the risk weight applicable to the exposures in that bucket can be calculated as the risk weight applicable to a hypothetical 3-year loan (having that PD and LGD), multiplied by $1 + b(PD) \times (\overline{M} - 3),$ where $\overline{M}$ denotes the exposure-weighted average effective maturity of the credits in that risk bucket.

144.   In general, the range of different default definitions can be described as occurring "early" in the process of a borrower's deterioration, or alternatively as coming "late" in that process. An example of an early definition of default would be violation of a loan covenant (e.g. a minimum operating cash flow). An example of a late definition would be filing for protection from a bankruptcy court. Because many borrowers experience some initial problems yet recover fully later, a tabulation of historical defaults based on an "early" definition would tend to count a higher number of defaults. A "late" definition, in contrast, would tend to lead to a smaller number of defaults, but each with a larger associated loss amount.

(ii)   Reference definition of default

145.   As a first key step in addressing these concerns, the Committee proposes to relate these differing internal definitions to a regulatory "reference" definition, for use in tabulation and analysis of the IRB approach to corporate lending. Under this inclusive reference definition, a default is deemed to occur when one or more of certain events have taken place. The elements of the reference definition were drawn from among the range of default definitions currently in use at a number of banks with well-managed risk management systems, and include both objective and subjective events.

146.   This definition would be intended as a to guide to collection and use of data sources as well as estimation procedures toward the goal of consistency. Banks using the IRB approach must estimate PD, and collect default data from their own experience, using this reference definition. Banks operating under the advanced approach(es) would also need to estimate LGD and/or EAD, and collect loss and exposure data from their own experience, using this reference definition.

Proposed Reference Definition of a Default Event

For the IRB Framework

*"A default is considered to have occurred with regard to a particular obligor when **one or more** of the following events has taken place.*

(a) It is determined that the obligor is unlikely to pay its debt obligations (principal, interest, or fees) in full;

(b) A credit loss event associated with any obligation of the obligor, such as a charge-off, specific provision, or distressed restructuring involving the forgiveness or postponement of principal, interest, or fees;

(c) The obligor is past due more than 90 days on any credit obligation; or

(d) The obligor has filed for bankruptcy or similar protection from creditors."

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147.   This reference definition is not intended in any way to affect a bank's legal rights and remedies should a borrower fail to meet its obligations under a credit agreement, nor is intended to establish or alter accepted accounting standards. It is intended solely to address issues related to consistent estimation of IRB loss characteristics across banks and data sources for use in regulatory capital calculations.

148.   In survey work conducted by the Committee in this area, most respondent banks claimed their definition was sufficiently consistent with the reference definition, and that its use would not affect the shape of the PD distribution or the calculation of an unexpected-loss basis economic capital requirement. However, few banks provided specific detail on their

internal definitions. The majority of banks also claim to use the same definition of default when generating PD and LGD estimates.

149.   The survey evidence also suggests that some banks rely on rating agencies' data for both PD and LGD calibration. For purposes of comparison, the standards for default used by the rating agencies focus on whether a borrower has entered bankruptcy or receivership, failed to make a required payment of interest or principal on a timely basis, and/or a "distressed exchange" or restructuring has occurred. Credit events identified by one industry association include bankruptcy, failure to pay, obligation acceleration or default, repudiation/moratorium, and restructuring.

(iii)   Prospects of a "mapping" for estimates based on other definitions

150.   As stated, banks must make use of default definitions consistent with the reference definition if they are to be eligible for the IRB approach. Conceivably, it may be possible to develop a technique through which PDs derived by a bank using definitions of default which were not consistent with the reference definition could be mapped to the reference definition. The latter PD (and/or LGD/EAD) would form the basis for setting a regulatory capital requirement that is comparable and consistent across banks and countries, and could be used with both the foundation and advanced approaches.

151.   The Committee conducted initial quantitative surveys to begin the process of estimating such a mapping, but the results were largely inconclusive. As such, it does not at this stage propose to allow any bank to make use of such a mapping technique. Nonetheless, if there is compelling evidence for such a proposal, the Committee would consider whether banks could continue to use their internal (non-qualifying) definition for quantifying PD estimates in the short-term, and use the reference definition as the basis for the exercise of "mapping".

IV.   Risk Weights for Corporate Exposures

A.   Determination of risk weighted assets

152.   For each broad classification of exposure (corporate, retail, etc.), risk weights are derived from a specific, continuous function. A risk-weighted asset is defined as the risk weight of a transaction multiplied by a measure of exposure for that transaction. Total risk weighted assets (RWA) are the sum of individual RWA across all transactions.

153.   The calculation of total RWA for non-retail exposures under the IRB approach is a two-step process. First, the bank computes a *baseline* level of RWA for the non-retail portfolio. This baseline level is calculated by summing the individual exposures multiplied by their respective IRB risk weights which, in turn, depend on each instrument's PD, LGD, and, where applicable, M. Second, the bank's *total* RWA for the non-retail portfolio is calculated by adding to this baseline level an adjustment, which may be positive or negative, reflecting granularity (i.e. the degree of single-borrower risk concentrations) within the non-retail portfolio. The effect of this adjustment is to increase (reduce) the total RWA of portfolios having relatively large (small) single-borrowers risk concentrations.

154.   The mechanics for the derivation of risk weights, exposure amounts and hence the *baseline* level of RWA for corporate exposures are presented below (the mechanics for other exposure classes are discussed in the respective chapters). Chapter 8 then sets out the proposals for the granularity adjustment, and the mechanics for calculating *total* RWA.

B.   Formula for RWA for corporate exposures

155.   Where there is no explicit maturity dimension in the foundation approach, corporate exposures will receive a risk weight (RW_C) that depends on PD and LGD (after recognising any credit enhancements from collateral, guarantees or credit derivatives). The average maturity of all exposures will be assumed to be three years. An exposure's risk weight, RW_C, would be expressed as a function of PD and LGD according to the formula below in paragraph 156:

156.   Throughout this section, PD, LGD, and EAD are expressed as whole numbers rather than decimals, except where explicitly noted otherwise. For example, LGD of 100% would be input as 100. The exception is in the context of the benchmark risk weight (BRW) and the maturity slope (b) calculations. In these equations, PD is measured as a decimal (e.g., a 1% probability of default would be represented as 0.01).

RW_C = (LGD/50) x BRW_C(PD) or 12.50 x LGD, whichever is smaller.[8]

In this expression, RW_C denotes the risk weight associated with given values of PD and LGD, while BRW_C(PD) denotes the corporate benchmark risk weight associated with a given PD. The derivation and calibration of this benchmark risk weight is described below.

157.   A graphical representation of these risk weights for a hypothetical corporate exposure having an LGD of 50% is presented below:

Chart 1

Proposed IRB Risk Weights for Hypothetical Corporate Exposure Having LGD equal to 50%.
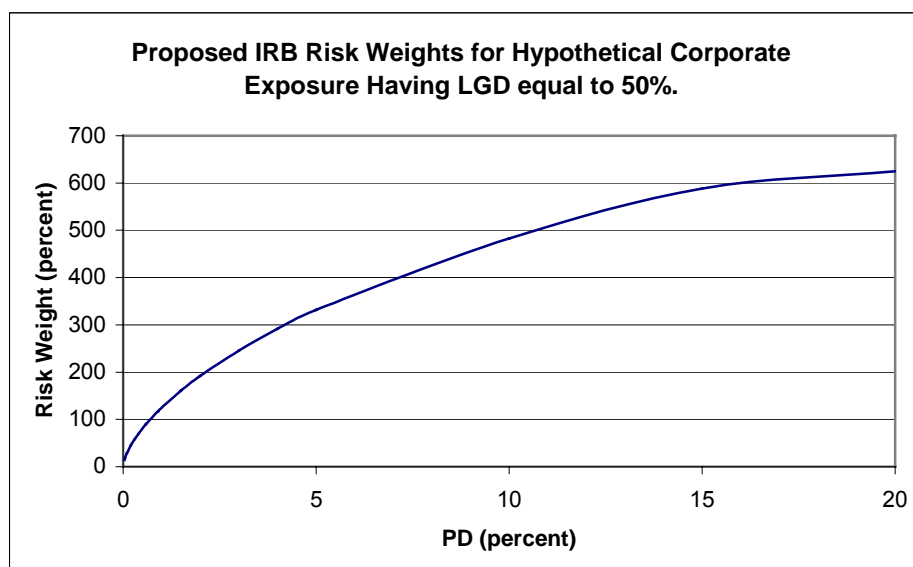
158.   Representative values for the above benchmark risk weights are presented in Table 3 below.

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[8]   The purpose of the cap is to ensure that no risk weight can be more penal than would be the effect of deducting the exposure from capital.

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Table 3

PD(%)	BRW$_C$
0.03	14
0.05	19
0.1	29
0.2	45
0.4	70
0.5	81
0.7	100
1	125
2	192
3	246
5	331
10	482
15	588
20	625

159. In the advanced approach, or where there is an explicit maturity dimension in the foundation approach, for an exposure with an effective maturity (M) different from 3 years, an asset's maturity-adjusted risk weight would be calculated by scaling up or down the corporate benchmark risk weight for a hypothetical 3-year loan having the same PD and LGD. Thus, a corporate exposure's risk weight in the advanced approach, RW$_C$, can be expressed as a function of PD, LGD, and the effective maturity M according to the following formula:

$$RW_C = (LGD/50) \times BRW_C (PD) \times [1 + b (PD) \times (M - 3)], \text{ or } 12.50 \times LGD, \text{ whichever is smaller.}$$

160. In this expression, BRW$_C$(PD) is the corporate benchmark risk weight associated with PD and the term $1+b(PD) \times (M-3)$ is a multiplicative scaling factor, linear in M, where the maturity adjustment factor b(PD) also is a function of PD

161. For maturities ranging from one to about 7 years, a linear relationship between maturity and credit risk is viewed as a reasonable approximation to both industry-standard mark-to-market (MTM) credit risk models, such as CreditMetrics™ and Portfolio Manager™, and a multi-period default-mode (DM) model developed by the Committee (see below).

162. Research undertaken by the Committee to calibrate the maturity adjustment factor indicates that this factor is very sensitive to whether the underlying credit risk modelling approach is based on a mark-to-model (MTM) or a default-mode (DM) framework. Since at present there appears to be no consensus within the banking industry regarding which framework is superior, the Committee has developed two alternative calibrations of b(PD), one based on the MTM framework and the other on the DM framework. The Committee seeks comment from the industry regarding whether either of these approaches, or perhaps another approach, should be basis for maturity adjustments within the IRB.

C.   Calibration of benchmark risk weights for corporate exposures

163. The most important precedent for indexing capital requirements directly to measures of risk – and thus to an economic capital concept – is the Market Risk Amendment to the

Accord. The "Value at Risk" (VaR) approach recognises that trading activities on average generate a return for the bank, but that there is a range of possible outcomes that includes the possibility of some significant operating losses. The market risk approach considered capital as being required to insulate the institution against a very severe, although not the worst imaginable, negative event (or series of events) in its trading portfolio. Thus, using various probability-based measures, the VaR approach relates capital to some target level of confidence that capital for market risk will not be exhausted.

164.   This calibration of the risk weights under the IRB approach builds upon the same basic framework, but with significant modifications to reflect the special nature of credit risk. The terminology used in this paper also builds on the concepts used by the most sophisticated banks in allocating economic capital. The concept of economic capital is based on the idea that the future gains or losses of a bank's portfolio of credit exposures can be described by its probability density function (PDF) over a specified time horizon. In theory, a bank (or a regulator) that knows this PDF can assign capital that will reduce the bank's probability of failure (over the appropriate time horizon) to any desired confidence level. This confidence level, in turn, can be thought of as the target solvency probability for the bank and is sometimes termed the loss coverage target. Since total regulatory capital includes at least a portion of a bank's general loan loss reserves, IRB risk weights have been developed within the context of achieving adequate coverage of total credit losses (i.e. the sum of expected plus unexpected losses) over an assumed one-year horizon.[9]

(i)   Introduction

165.   The calibration methods described below are based broadly on the same credit risk modelling framework underpinning the economic capital systems of the most sophisticated banks, but modified so as to ensure coverage of both expected and unexpected losses. Under this framework, risk weights are implicitly calibrated so that with a specified minimum probability (the target solvency probability) capital will cover total credit losses. Implicitly or explicitly, the calibration of risk weights involves (1) estimating the volatility or uncertainty in portfolio credit losses over a time horizon taken to be one year, and (2) given this estimated volatility, determining the level of capital needed to achieve possible target solvency probabilities.

166.   The Committee has applied two broad empirical approaches – one direct and another survey-based or indirect – for calibrating risk weights under an IRB standard. The Committee has looked to survey data from banks (and trade groups). This approach extracts the relative economic capital requirements implied by respondent banks' internal economic capital systems, thus building upon research already conducted within the private sector. The Committee has also looked to direct or model-based calibration of risk weights to support the survey evidence. This method has involved using formal credit risk models to estimate the required economic capital associated with an individual loan within a large, well-diversified portfolio in which the loan's credit quality is differentiated by PD, LGD, EAD and maturity. The Committee has looked to an appropriate balance between the survey-based and direct methods to develop benchmark risk-weights for corporate exposures.

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[9]   The unexpected loss (UL) is the difference between the loss incurred with probability one minus the desired confidence level (e.g. 0.5% for a 99.5% confidence level).

(ii)   Survey-based evidence

167.   To implement the indirect approach to estimating risk weights, the Committee has collected from major banking organisations and trade associations around the world detailed information on their internal economic capital allocations against large corporate loans. For each institution these data were used to estimate the implied risk weights (i.e. *relative* economic capital requirements) attributed by each bank to corporate loans having particular PD, LGD and maturity configurations. The Committee reviewed each bank's reported economic capital associated with different levels of PD, holding other factors, such as LGD and maturity, fixed.

168.   On balance, over a wide range of PD values, these survey data indicated broad comparability across banks in the relationship between PDs and relative economic capital levels, holding LGD and maturity fixed. In contrast to the current Accord's 100 percent risk weight for all corporate loans, the survey evidence highlighted the consistently greater relative credit risk attributed to higher-PD borrowers. These findings suggest that for large corporate portfolios of financially sound and well-managed banks, an IRB capital standard could be constructed to generate risk weights whose sensitivity with respect to PD would be broadly compatible with banks' existing internal economic capital processes. The survey evidence also suggested that economic capital levels were reasonably proportional to banks' LGD assumptions. In contrast to the effects of PD and LGD on economic capital allocations, the effects of maturity were much less consistent across surveyed banks, and depended critically on whether the underlying credit risk modelling approach was based on the MTM or DM framework.

(iii)   Direct estimates of risk weights

169.   The Committee also undertook a number of studies to independently estimate appropriate risk weights for large corporate loans using formal credit risk models based on MTM and DM methods. Key assumptions, such as correlation parameters, reflected a range of values based on industry practice and independent research conducted with borrower default data from multiple countries. The assumed loss coverage targets also reflected a range of values.

170.   These credit risk modelling exercises produced results comparable to those obtained from the survey evidence. In particular, while the sensitivity of economic capital levels to PDs and LGDs were reasonably well defined across a range of modelling frameworks and parameter specifications, the effects of maturity on economic capital were found to be quite sensitive to particular modelling choices.

171.   On the basis of the pooled survey and model-based evidence, the following continuous function was selected as providing a reasonable representation of the relationship between a corporate borrower's PD and the associated risk weight for a benchmark loan to that borrower having a 3-year maturity and LGD equal to 50% (please note that in this equation, PD is entered as a decimal – thus, a PD of 10% would be input as 0.1):

$$\text{BRW}_C(PD)=$$
$$976.5 \times N\ (1.118 \times G\ (PD)+1.288) \times (1+.0470 \times (1-PD)/PD^{0.44})\ ^{[10]}$$

where $N\ (x)$ denotes the cumulative distribution function for a standard normal random variable (i.e. the probability that a normal random variable with mean zero and variance of one is less than or equal to x), and where $G(z)$ denotes the inverse cumulative distribution function for a standard normal random variable (i.e. the value x such that $N\ (x) = z$).

172.   The above expression is the product of three separate factors:

- The term $N\ (1.118 \times G(PD)+1.288)$ represents the sum of expected and unexpected losses associated with a hypothetical, infinitely-granular portfolio of one-year loan having an LGD of 100%, using a so-called Merton-style credit risk model in which there is a single systematic risk factor and the values of borrowers' assets are assumed lognormally distributed. This class of models includes special cases of two industry-standard credit risk models, CreditMetrics ™ and Portfolio Manager ™, and provides a reasonable approximation to a third, CreditRisk+™. The coefficients within this expression are calibrated to an assumed loss coverage target of 99.5% and an average asset correlation of 0.20; the latter figure is broadly consistent with industry practice and research carried out by the Committee. This is a hypothetical loss coverage target used for calibrating minimum capital requirements for credit losses only. It does not represent the Committee's view of expected or optimal default rates for banking organisations;

- The term $(1+.0470 \times (1-PD)/PD^{0.44})$ is an adjustment to reflect that the IRB benchmark risk weights are calibrated to a 3-year average maturity; and

- The scaling factor 976.5, which is calibrated so that the IRB benchmark risk weight equals 100% for values of PD and LGD equal to 0.7% and 50%, respectively.

D.   Maturity-adjustments to corporate risk weights

173.   Broadly speaking, within the banking industry two classes of credit risk models tend to be most prevalent: Mark-to-market (MTM) models and default-Mode (DM) models. In practical applications, both are generally employed under the assumption of a one-year time horizon, which also was the basis for the Committee's calibration work. By design, both frameworks explicitly capture credit losses associated with defaults that occur within the time horizon. However, the two approaches differ with regard to how they deal with credit deterioration short of default.

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[10]   The functions N and G in the equation are generally available in spreadsheet and statistical packages. For both functions, the mean should be set at zero and the standard deviation should be set at one.

174.   The Committee believes that there is no consensus within the banking industry regarding the preference for either MTM or adjusted DM modelling approaches. However, as noted below, the sensitivity of economic capital to maturity appears to depend critically on this choice. In this light, the Committee has developed two alternative schedules of maturity adjustment factors, b(PD), one based on an MTM framework and another based on the adjusted DM framework described below.

(i)   Maturity-adjustments based on MTM approach

175.   Under the MTM approach, simulated changes in a loan's credit quality over the horizon (for example, as reflected in its risk rating) are translated into changes in the loan's economic value based on an assumed valuation relationship. This relationship links the loan's simulated risk rating to an assumed market-based credit spread that is used to value the loan at the end of the horizon. A credit deterioration short of default is presumed to reduce a loan's value, generating an implicit credit loss. Within this framework, the sensitivity of a loan's end-of-horizon value to a credit quality deterioration short of default is dependent on its maturity: for a given downgrade short of default, longer-maturity loans will tend to display a greater change in end-of-horizon value. As a consequence, maturity tends to have a substantial influence on economic capital within MTM models, with longer-maturity loans requiring greater economic capital, other things equal.

176.   The schedule of maturity adjustment factors based on an underlying MTM calibration approach is shown in the next paragraph. This calibration of b(PD) reflects the Committee's judgmental pooling of information from several sources. These include survey evidence on the sensitivity of internal economic capital allocations to maturity obtained from banks that employ MTM-based credit risk models (provided by individual banks and trade associations). In addition, the Committee has carried out independent research on the sensitivity of economic capital to maturity using a variety of simulation-based industry-standard MTM credit risk modelling approaches and a range of assumptions regarding average asset correlations and loss coverage targets. The survey evidence and simulation results were then pooled judgementally to develop a smooth functional relationship between values of PD and the maturity adjustment factor b(PD):

$$b(PD) = \frac{.0235 \ x \ (1-PD)}{PD^{0.44} + .0470 \ x \ (1-PD)} . \text{[11]}$$

177.   As can be seen from the Chart 2 below, the MTM-based maturity adjustment factors are a decreasing function of PD. This inverse relationship reflects the fact that, within MTM models, maturity has a greater proportional effect on economic capital the greater is the probability of downward credit quality migrations short of default relative to the probability of default. For very low PD values (i.e. very high credit quality), the likelihood of a downgrade short of default within one year is high relative to the likelihood of a default. Consequently, the effect of maturity on economic capital is relatively large as well. In contrast, as PD values increase, empirical studies suggest that the likelihood of default within one year increases more rapidly than the likelihood of a downgrade short of default, implying a reduced sensitivity of economic capital to maturity. In the limit as PD approaches 100% it becomes nearly certain that the borrower will default within the one-year horizon, and the likelihood of a downgrade short of default tends to zero, implying that maturity has little or no effect on economic capital. Thus, for PD equal to 100%, b(PD) equals zero.

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[11]   PD is expressed as a decimal (e.g., 0.01 for 1 percent)

Chart 2

MTM-based Maturity Adjustment Factors:
Corporate Exposures
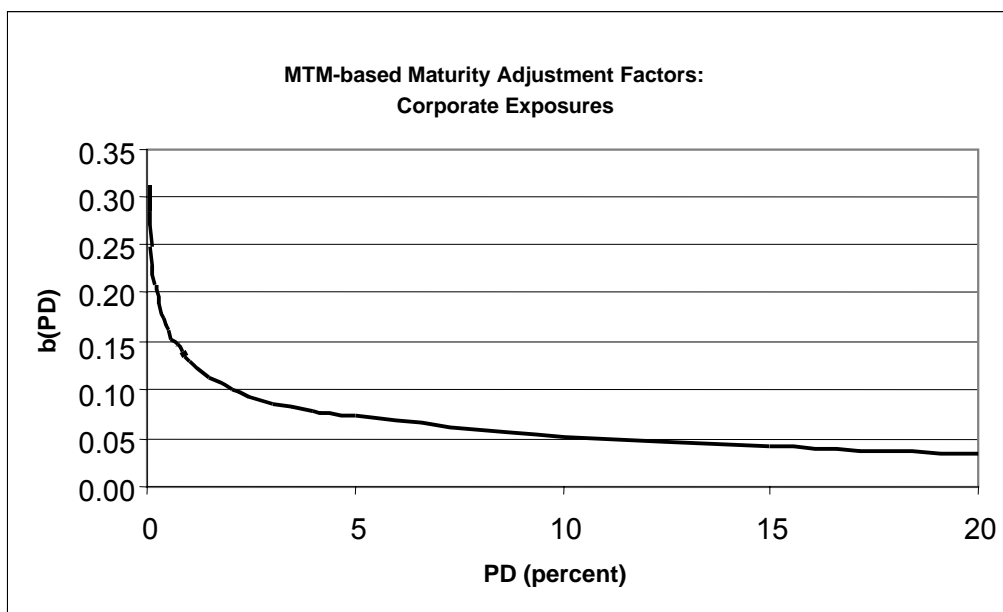
Table 4

Maturity adjustments to the risk weights, derived from MTM-models

	Maturity Adjustments			
PD (%)	**1 year**	**3 years**	**5 years**	**7 years**
0.03	0.4	1.0	1.6	2.3
0.05	0.4	1.0	1.6	2.1
0.10	0.5	1.0	1.5	2.0
0.20	0.6	1.0	1.4	1.8
0.50	0.7	1.0	1.3	1.6
1.00	0.7	1.0	1.3	1.5
1.40	0.8	1.0	1.2	1.5
3.30	0.8	1.0	1.2	1.3
6.60	0.9	1.0	1.1	1.3
15.0	0.9	1.0	1.1	1.2

(ii) ***Maturity-adjustments based on adjusted DM approach***

178.   Losses in a default-mode model arise as a result of defaults of individual borrowers. Maturities longer than the holding period assumed in the credit risk model do not lead to a higher economic capital since the probability of default of a borrower during the holding period does not depend on maturity.

179.   The philosophy behind default risk models is that a loan is held until maturity. In this case losses only arise as a result of a borrowers default. This assumption is sensible for the banking book. In most jurisdictions the assessment in the banking book is usually based on book value which corresponds to this understanding of credit risk.

180.   Credit risk in multi-period default mode models is similar to default mode models driven by the default of a borrower, but they do recognise the effect of maturity on credit risk by means of downgrading or upgrading individual borrowers and the respective migration analysis. There are different possibilities to adjust a default mode model to a multi-period default mode model to incorporate migration between rating-grades over time.

181.   One common approach is to determine the annualised default rates by using the cumulative default rates (e.g. if for a five year loan the cumulative probability of default is p_5, the annualised probability of default is given by $p = 1 - \sqrt[5]{1 - p_5}$). These annualised default rates depend on maturity and can be used to determine the maturity adjustments by using the formula $volatility \sim \sqrt{PD(1 - PD)}$.

182.   The functional relationship between values of PD and the maturity adjustment factor b(PD) in the adjusted DM is given by:

$$b[PD] = 7.6752 \, PD^2 - 1.9211 \, PD + 0,0774 \text{ for PD<0.05.}^{12}$$

$b[PD] = 0$ for PD > = 0.05 (to avoid negative maturity adjustments).

183.   The proposed schedule of maturity adjustment factors, b[PD], under a multi-period default mode approach is shown in Chart 3 below.

Chart 3

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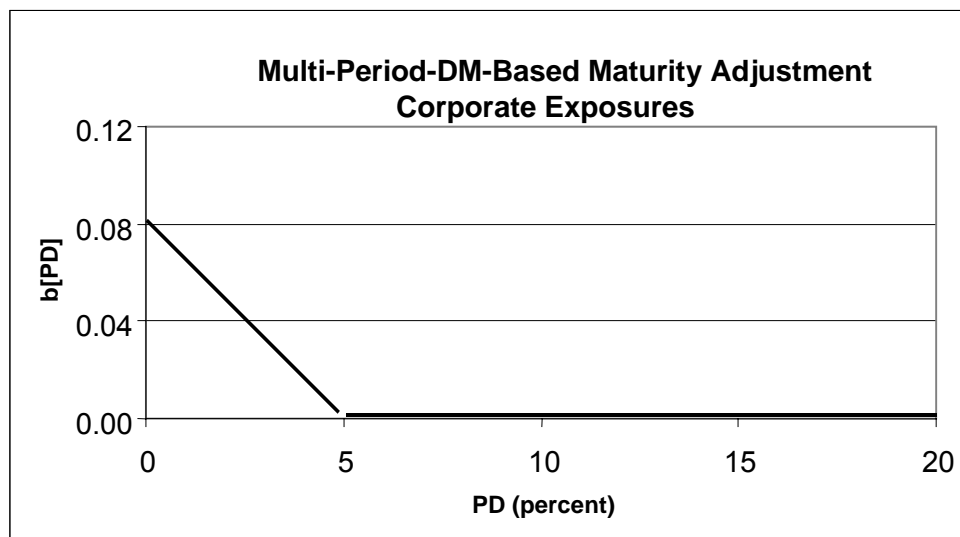
[12]   PD is expressed as a decimal (e.g., 0.01 for 1 percent)

Table 5

Multi-Period-DM-Based Maturity Adjustments to the Risk Weights

	Maturity Adjustments			
PD (%)	1 year	3 years	5 years	7 years
0.03	0.8	1.0	1.2	1.3
0.05	0.8	1.0	1.2	1.3
0.10	0.8	1.0	1.2	1.3
0.20	0.9	1.0	1.1	1.3
0.50	0.9	1.0	1.1	1.3
1.00	0.9	1.0	1.1	1.2
1.40	0.9	1.0	1.1	1.2
3.00	0.9	1.0	1.1	1.1
6.60	1.0	1.0	1.0	1.0
15.0	1.0	1.0	1.0	1.0

184.   In Chart 3 above, it is implied that b(PD) is a decreasing function of PD. This means that, relative to a one-year loan, a given increase in maturity has a greater proportional effect on economic capital for low-PD borrowers compared with high-PD borrowers. This pattern stems from the observation that b(PD) is a measure of the relative importance of downgrade risk (i.e. the risk of a one-period deterioration in credit quality short of default) compared to pure default risk.

E.   Expected loss and the determination of corporate risk weights

185.   The Committee has considered whether capital charges should be calibrated to cover only unexpected losses (UL) arising from credit exposures or both expected and unexpected losses (EL plus UL). There is a prominent line of argument in both financial theory and industry practice to the effect that capital should be set against unexpected loss, while some combination of margin income and/or provisions should be used to off-set EL. This view is adopted by many international banks in determining the appropriate level of economic capital. The Committee is conscious, however, that under the current Accord general provisions are eligible as an element of supervisory capital (within tier 2) and that this will continue as part of the revised Accord.

186.   The Committee is also aware that in most countries the definition of a provision or loan loss reserve is determined by national accounting rules and that such definitions are often not orientated to a concept of expected future loss. In a number of countries, the definition of a provision focuses primarily, or even solely, on a concept of estimated but incurred or current loss (whether this can be identified in the form of a specific provision or is covered through an unallocated general provision). Provisions that are determined on this basis are conceptually different from a 'reserve' that is intended to cover *future* expected losses arising from a portfolio of loans and which is not linked directly to identifiable instances of impairment of individual loans.

187.   The Committee has therefore decided to publish corporate risk weights based on calibrating to assessments of EL plus UL. This will result in a modest difference for higher quality/low PD assets but the issue is more important for assets with higher PD values. The effect of setting weights in this manner will also vary depending on national definitions of provisions and loan loss reserves and on the extent to which banks have general provisions that are greater or less than the 1.25% of risk weighted assets limit that applies to the inclusion of general provisions in supervisory capital. The Committee welcomes comment on this specific issue as well as on the broader issue of how to ensure adequate coverage of both EL and UL within the context of regulatory definitions of capital.

188.   Another related issue is the assessment of IRB capital against defaulted loans. One possible treatment is to measure exposures as loans net of charge-offs and specific provisions and to apply the IRB risk weight which is not affected by charge-offs and specific provisions. In this case, however, for each dollar of charge-off taken, the bank's total capital (numerator of the capital ratio) declines dollar for dollar, but IRB capital requirements for that loan decline only by a significantly lesser amount. This creates incentives for banks not to charge-off loans in a timely fashion. The Committee invites comment on this issue.

V.   Minimum Requirements for Corporate Exposures under the Foundation Approach

A.   Introduction

189.   To be eligible for the IRB approach a bank must meet certain requirements at the outset and on an ongoing basis. Banks that do not meet the minimum requirements will not be able to make use of the IRB approach.

190.   Adherence to a fully developed set of minimum requirements is essential to ensuring the integrity, reliability, consistency, and accuracy of both internal rating systems and estimates of risk components for each grade. This section describes requirements for those banks on the foundation approach (i.e. using internal estimates of PD but supervisory estimates for LGD, EAD and for the treatment of credit derivatives and guarantees). Readers should consult the document *The New Basel Capital Accord* for a full presentation of all applicable requirements.

191.   The foundation requirements described here have been developed with close reference to the best practices observed at banks with strong internal credit risk management and measurement systems, as described in the Range of Practice paper. At the same time, these requirements are fully consistent with, and build upon, the key elements of sound credit risk management described in the Committee's September 2000 paper entitled *Principles for the Management of Credit Risk*.

192.   These foundation minimum requirements represent the Committee's view of what is necessary to base regulatory capital requirements on internal rating systems. As such, they represent neither "typical" bank practice nor the full extent of "best" practice as now followed by those institutions with the strongest risk management and measurement capabilities. Furthermore, the Committee recognises that "best" practices in rating systems and credit risk measurement are not fixed, but rather are advancing rapidly within the industry. As overall industry practice develops, the Committee intends to review the requirements to ensure that they continue to reflect and promote sound credit risk management practice.

193.   The foundation minimum requirements described here (and outlined in detail in *The New Basel Capital Accord*) focus on those key elements of the bank's internal processes that

promote meaningful identification and differentiation of estimated borrower risk across exposures, reliable and disciplined estimation of risk components, and clarity in the documentation of rating systems and decisions. When validating adherence to these minimum requirements, supervisors will need to make objective comparisons as well as subjective judgements. The minimum requirements thus include "objective" and measurable criteria as well as more "subjective", judgement-oriented criteria.

194.   The requirements fall into nine broad categories, each relevant to a different aspect of the rating and risk measurement process. Each category has a vital role to play in determining the overall quality of the information that banks would provide to supervisors for the purpose of determining minimum capital requirements.

(a)   Meaningful differentiation of credit risk;

(b)   Completeness and integrity of rating assignment;

(c)   Oversight of the rating system and processes;

(d)   Criteria of rating system;

(e)   Estimation of PD;

(f)   Data collection and IT systems;

(g)   Use of internal ratings;

(h)   Internal validation; and

(i)   Disclosure (requirements described in the Supporting Document *Pillar 3: Market Discipline*).

B.   Criteria to ensure meaningful differentiation of risk

(i)   Overall rating system structure

195.   The cornerstone of the IRB proposal is that banks possess risk rating systems that differentiate borrowers representing similar levels of credit risk. The proposal distinguishes between the risk of borrower default, on the one hand, and transaction characteristics that influence the loss severity that a bank would likely suffer if the borrower were to default, on the other. As a result, banks that adopt the IRB approach will need a risk rating system that provides a separate assessment of borrower and transaction characteristics. One rating scale must be oriented to the risk of the borrower defaulting on its obligations. The second dimension may be satisfied by developing a rating scale that explicitly estimates LGD or by a facility orientation which takes into account both borrower and transaction specific factors. The Committee concludes that a two-dimensional approach is necessary to provide supervisors with confidence that the assignment of borrower ratings (and, in turn, PDs to borrower grades) is not "tainted" by consideration of the specific structure of the transaction.

196.   Another consideration of the Committee was the desire not to mandate specific risk rating definitions and to assign specific levels of risk estimates that must be associated with each internal grade. To accomplish this the Committee found it necessary to specify the dimensions of credit risk for banks' internal risk rating systems, but to allow banks broad discretion in defining the borrower and facility grade parameters. Furthermore, the Committee's decision to define a continuous risk weight function is designed to provide flexibility and accommodate variations between different banks' risk rating systems. The Committee believes these proposals reflect both a flexible framework and the appropriate degree of guidance to further the comparability and integrity of the internal risk rating systems that are the foundation to the IRB approach.

(ii) *Rating grade structure*

197.   The Committee believes that banks adopting the IRB approach should have risk rating systems that effectively distinguish the level of credit risk across the entire spectrum - from borrowers that are virtually risk-free to those in default. Risk rating systems that have overly broad grade definitions, which result in borrowers of significantly different risk characteristics being assigned the same grade, are not acceptable. Likewise, risk rating systems that materially assign borrowers of comparable risk to different grades are also unacceptable.

198.   The requirements specified by the Committee are fashioned to further the goal of adequate credit risk differentiation. Qualifying risk rating systems must have a minimum of 6 to 9 grades for performing borrowers and a minimum of 2 grades for non-performing borrowers. The range for the minimum number of grades is due to the variation of banks' lending activities and the use of specialised rating schemes for different types of borrowers, products or market segments. For example, a bank that has significant exposure to small business, middle market, and large corporate lending activities across a broad spectrum of credit risk, a minimum of 9 performing borrower grades would likely be appropriate. If a bank focuses on a specific market segment or has developed unique risk rating schemes for different types of borrowers, products, or market segments, a smaller number of risk ratings could also be appropriate. Individual supervisors will have discretion in determining whether a bank's risk rating system meets this requirement. However, the minimum of 6 performing borrower grades and 2 non-performing borrower grades represents a floor, which cannot be modified.

199.   The Committee also believes that a grade should only qualify as such if bank management has provided specific rating criteria that distinguishes the grade from others. The criteria must be adequate to ensure to bank management that personnel responsible for assigning risk ratings can consistently and reliably apply the requirements. In addition, bank management must provide sufficient training and communications to risk rating personnel to foster the consistent and reliable application of the risk rating definitions throughout the institution and across its lines of businesses. The criteria should also be intuitively consistent with the PD estimates provided for each grade. For example, if the criteria describe a borrower whose repayment capacity is speculative in nature, the PD estimate should reflect the level of risk commensurate with its degree of financial flexibility or lack thereof.

200.   There should also be meaningful distribution of exposure across grades with no excessive concentrations in any particular grade. Specifically, the Committee is proposing that no more than 30% of the gross exposures should fall in any single borrower grade.

C.   Completeness and integrity of rating assignments

(i) *Introduction*

201.   The Committee believes that the effective implementation and maintenance of the IRB approach rests firmly on institutions' abilities to ensure the integrity and independence of the risk rating process. To foster this objective, it has designed a number of requirements which attest to the strength of the control environment for assigning and updating grades.

(ii) *Coverage of ratings*

202.   Each borrower and facility must be assigned a rating prior to the bank entering into a commitment to lend. In addition, all of the requirements regarding maintenance of ratings

apply to each borrower and facility. For inter-related borrowers, such as affiliates and subsidiaries, every separate legal entity to which the bank has exposure should be separately assessed and assigned to a borrower rating.

(iii) Independent assignment or review

203. At origination, borrower risk ratings must be assigned, and/or at a minimum reviewed, by a person or unit that does not stand to benefit from the grade assignment. The bank must document the risk rating assignment process and the organisational controls to ensure the independence of the grade assignment or its validation. Management must ensure that the party assigning or reviewing the rating has access to all of the relevant information to make an informed determination and has competency in evaluating firms in the subject industry as well as the material risks posed by the facilities.

204. The bank must have an explicit policy for the frequency of reviews post-origination. At a minimum, borrowers should be annually re-rated or reviewed by an independent credit unit. Higher risk borrowers and where material new information comes to light should have their risk rating updated more frequently. Banks also need to have adequate capabilities to gather, prioritise, and analyse new information. The Committee has provided specific requirements for refreshing ratings once a bank has received periodic financial information. Generally, it is 90 days from receipt for non-problem borrowers and 30 days for borrowers with a weakened financial condition.

D. Oversight over the rating system and processes

(i) Introduction

205. Oversight and supervision of the operations of the banks' risk rating systems should be designed to ensure the risk rating system is properly functioning by identifying borrowers, industries and portfolios that are experiencing financial deterioration in a timely fashion. Control functions, such as credit risk or internal and external audit, are at the centre of identifying and resolving risk rating system deficiencies that threaten its proper operations. Ultimately, it is the responsibility of senior bank management and the board of directors to ensure integrity of the risk rating system. It is often the case that control functions need the organisational weight of the bank's senior management and/or its board of directors to effect change and resolve the root causes of risk rating deficiencies.

206. Without adequate feedback mechanisms between the parties responsible for assigning ratings, the control functions and senior management, a once effective system can drift and become inaccurate and misleading. With most large banks using their risk rating systems as a key input for numerous critical functions, such as transaction pricing, risk adjusted return on capital, strategic planning, compensation, exposure limits, officer limits, provisioning, and allowance adequacy.

207. The effectiveness of the system is critical to the overall management of the bank. A properly functioning risk rating system has long been a hallmark of a well-run bank. However, the IRB approach places an additional burden on its accuracy – the determination of regulatory capital. As a result, the IRB approach proposes requirements to ensure that senior management and the board of directors are actively involved in the monitoring and operations of the internal risk rating system.

208. To this end, the proposal makes specific recommendations regarding the responsibilities of banks' boards of directors and senior management. They include the

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approval of the material aspects of the rating and PD estimation process, frequency and content of risk rating management information reports, documentation of risk rating determinations and statistical model methodologies, interaction with and evaluation of control functions, and provision of adequate resources to the control functions.

209.   The proposal also specifies operational requirements for banks' internal audit and credit risk control units. The requirements are designed to ensure that these areas employ adequate scope and frequency to their control responsibilities that test the proper functioning of the risk rating system. The credit risk control unit is usually responsible for developing and monitoring controls that impact the effective identification of credit risk, while internal audit will provide testing of controls such as the integrity of the risk rating database and controls over collateral and lien perfection. Some national supervisors may also require external audit to play an explicit role in reviewing a bank's rating assignment and estimation of loss characteristics.

E.   Criteria and orientation of rating system

(i)   Introduction

210.   The requirements mandate banks to document their assessment criteria and also to track when an assigned grade deviates from that indicated by the application of the criteria. The requirements are designed to promote the consistent application of the risk rating criteria, a conservative credit evaluation when greater uncertainty exists, a comprehensive assessment of the borrower's financial condition over the future horizon, and the use of risk rating models that have statistical power and encompass all significant variables.

211.   The bank must demonstrate that its criteria covers all factors that are relevant to the analysis of borrower risk. These factors should demonstrate an ability to differentiate risk, have predictive and discriminative power, and be both plausible and intuitive in order to ensure that ratings are designed to distinguish risk rather than to minimise regulatory capital requirements. At a minimum, the Committee proposes that banks should look at a number of factors articulated in *The New Basel Capital Accord*. These factors are not intended to be either exhaustive or prescriptive; furthermore, the Committee recognises that certain factors will be of particular relevance for certain borrowers than they are for others.

212.   The requirements set out in *The New Basel Capital Accord* address the range of possible rating systems a bank may have: those based on the expert judgement of credit personnel, those which use statistical models, and those which rely on both techniques (see discussion in Chapter 1 for additional detail on these approaches to rating assignment).

(ii)   Assessment horizon

213.   The requirements distinguish between two similar but distinct concepts of time horizon. When assigning a borrower grade, the personnel responsible for assigning a grade must evaluate the rating criteria over the future horizon based on current information and experience with the borrower, including its ability to meet contractual obligations and withstand normal business stresses. The following example highlights the point. One borrower's financial condition may be very stable with the strong likelihood of industry conditions also remaining stable over the next several years. Another borrower is in an industry characterised by rapid technological change, cyclical demand and competitors with significantly greater financial resources. Industry experts believe that industry consolidation will continue and some competitors may fail if an industry downturn were to occur.

214. All other things being equal, the later borrower should be more severely rated than the former. Given difficulties in forecasting distant events and the influence they will have on a particular borrower's financial condition, a bank must take a conservative view of projected information. For example, it would be inappropriate to reflect in a severely troubled borrower's grade a projected financial improvement that has yet to materialise as of the evaluation date. The assessment period should have a conservative basis when it comes to projected information; banks should evaluate information over a period into the future where reasonable assessments can be made. These assessments should be grounded in the borrower's historical financial performance and its ability to withstand economic stresses.

215. Another concept of time horizon is associated with risk quantification or the process of assigning PDs to grades. It is important to distinguish between these two concepts of time horizon. Risk quantification is simply the estimated PD assigned to pools of similarly risky borrowers that are the result of the risk rating process. Requirements in this respect are outlined below.

F.   Minimum requirements for estimation of PD

216. The primary input for the IRB approach is the bank's PD estimate for each of its internal rating grades. A one-year PD estimate for each grade must be provided as a minimum input for the IRB approach. The bank's PD estimates will vary substantially across the entire credit risk spectrum. From risk-free to defaulted borrowers, the PD estimate for each grade can vary by many orders of magnitude, thus making this risk measurement highly sensitive.

217. PD estimates must represent a conservative view of a long-run average PD for the borrower grade in question, and thus must be grounded in historical experience and empirical evidence. At the same time, these estimates must be forward looking. In meeting these requirements, banks may incorporate relevant adjustments based on a variety of factors. Where adjustments are made, the bank must ensure that such adjustments are applied conservatively and consistently over time. For example, if current realised PDs for a given grade is materially higher than the bank's long-run average experience, it would be inappropriate to utilise the long-run average. Likewise, if current realised PDs for a given grade is materially lower than the bank's long-run average experience, it would be prudent to utilise the long-run average. It is desirable for banks to estimate this long-run average over an entire economic cycle.

218. To facilitate similarly risky borrowers and facilities being assigned substantially the same regulatory capital across institutions, a regulatory reference definition of default is proposed (see discussion earlier in the document). This reference definition of default is only for PD estimation and data collection purposes. It is not intended to represent a legal or accounting definition of default.

219. When banks formulate their PD estimates, they can utilise three estimation techniques: (1) internal default experience, (2) mapping to external data, and (3) statistical default models. Banks should consider all available information for estimating the average PD per grade; the Committee recognises that some data sources will be richer for some borrowers than they are for others. As such, it feels it is not appropriate to prefer one technique over another, or to require that all three techniques are used. Clearly, however, the more techniques and data sources a bank uses, the more confidence it can have in its estimates of PD. A bank may have a primary source of information, and use others as a point of comparison and potential adjustment to the initial PD estimate. Banks must recognise the importance of judgmental considerations in this process, particularly in ensuring a forward-looking PD estimate. Such judgement must be applied with a conservative bias.

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220.   It is unlikely that most banks will have sufficient internal data which on their own could support reliable PD estimates for corporate exposures. As a result, many banks will rely on external data sources to either complement their internal data or extend the observation period. Caution must also be taken in relying on internal data in situations where, for example, rating criteria, the definition of default used, the composition of the portfolio or the number of grades have changed during the observation period. Furthermore, if a bank has completed a substantial merger, the data is likely to be incomplete and potentially not representative of the combined portfolio.

221.   The use of external data requires the bank to map its internal risk ratings to rating agency equivalents. Banks may also employ pooled data where the data was shared among a number of institutions to increase the breadth and depth of data. There are risks associated with both of these processes. Mapped and pooled data can prove unreliable for a number of reasons. If the rating criteria differ significantly between the external and internal grades the mapping may be inaccurate. Likewise, there may be inaccuracies if the relationship between internal grades does not correspond to that implicit in the external data (for example, if each grade is expected to represent a doubling of risk, but this relationship is not consistent with that of the external grades)The orientation of the ratings can also result in inaccuracies (for example, if the bank's rating system is oriented to the risk of borrower default, but the external data source considers both borrower and transaction specific characteristics. Differences in the definition of default from the external data and the reference definition can also distort default observations and result in inaccurate PD estimates.

222.   Given these data limitations, banks will need to use judgmental considerations in their use of data – be it internal, external or pooled. Such judgement must be applied with a conservative bias.

223.   In an effort to limit the potential sources of errors cited above, the following requirements were developed for the PD estimation process:

- the population of borrowers represented in the data set is closely matched or at least clearly comparable to those of the contemplated portfolio;

- the lending or underwriting standards used to generate the exposures in the data source are strongly comparable to those used by the bank in building its current portfolio of exposures;

- economic or market conditions under which the historical experience took place is relevant to current and foreseeable conditions; and

- the number of the loans in the sample and the data period used for quantification provide strong grounding in historical experience, and thus, confidence in the accuracy and robustness of the default estimates and the underlying statistical analysis.

224.   The Committee also proposes minimum requirements for the use of statistical default models. The Committee believes strongly that banks need to have a clear understanding of the key model inputs and the model's methodology. Clearly, a "black box" that is not well understood by bank personnel does not provide confidence over the rating process or the estimation of PDs.

225.   Irrespective of the data source employed, PD estimates should be developed using a minimum historical observation period of at least 5 years. This should very much be seen as a minimum amount of data – other things being equal, the more data a bank has, the more confidence it can derive in its estimation of long-run average default rates.

G.   Data collection and IT systems

226.   The proposals require banks to collect and store substantial historical data on borrower defaults, rating decisions, rating histories, rating migration, information used to assign the ratings, the party/model that assigned the ratings, PD estimate histories, key borrower characteristics and facility information. The data collection and IT system requirements serve a number of purposes:

- Improve the bank's internally developed data for PD estimation and validation;

- Provide an audit trail to check compliance with rating criteria;

- Enhance the predictive power of the rating system;

- Modify risk rating definitions to more accurately address the observed drivers of credit risk; and

- Provide accurate and meaningful internal and external disclosure of the bank's credit risk profile.

227.   By collecting this diverse data, banks should be able to substantially improve the predictive power and robustness of their borrower risk rating models and PD estimates. In addition, bank management will be able to improve their internal risk management information systems due to the greater detail, consistency and depth of available data. These requirements should also facilitate banks sharing information on a more consistent basis. The transparency of banks' credit quality will also improve as a result of this improved data aggregation. Internal management information systems should also benefit. For example, many large, sophisticated institutions struggle with their information systems to answer modest inquiries such as whether the root cause of an observed deterioration in the risk rating profile is caused by lower quality new loans or a deterioration of existing exposures.

H.   Use of internal ratings

228.   The Committee does not wish banks to develop risk rating systems simply for IRB purposes. To be in a position to demonstrate to supervisors that an internal rating system should be used for the purpose of determining minimum regulatory capital requirements, a bank must first demonstrate that the rating system is an integral part of its current business and risk management culture. As earlier discussed, among best-practice banks, their risk rating system is a critical input to many important risk management and financial performance measurements. As a result, the proposals require that a common risk rating system is used for both IRB purposes and the following complementary functions:

- Credit approval authorities and limits;

- Evaluation of loan pricing;

- Reporting the portfolio's risk profile to bank management and the board of directors;

- Analysis of the bank's capital adequacy, reserving and profitability; and

- Performing stress tests to assess capital adequacy.

229.   Due to the many functions that risk ratings impact, considerable time and effort needs to be committed to adequately implement all of these functions. As a result, the requirements mandate that a bank use a risk rating system that broadly meets the minimum requirements for at least three years prior to implementing the IRB approach. It is not the intention of this requirement to mandate that the risk rating system remains static during this

period. The requirement is not intended to place a moratorium on amending and improving a bank's rating system.

I. Internal validation

230. This standard describes the requirements for internal validation for both the PD estimates assigned to the rating grades and the techniques used to assign the ratings. It is one of the most important requirements for banks to properly execute if they are to credibly estimate their level of credit risk and the resulting regulatory capital requirements. As a result of its importance, validation will likely receive significant supervisory attention prior to allowing a bank to adopt the IRB approach. A bank should also be able to readily demonstrate these capabilities to its supervisor prior to adoption of the IRB approach and on an ongoing basis. The data collection requirements are closely aligned with banks' abilities to validate their PD estimates and risk rating models.

231. The Committee however recognises that the statistical power and hence degree of reliance banks can place on techniques for the validation of PD estimates is less than it is in the field of market risk, principally on account of the lower number of historical observations. As such, it does not at this stage wish to set quantitative thresholds on what differentiates a valid estimate (a pass) from an invalid one (a fail).

J. Disclosure of key internal ratings information

232. The disclosure requirements are a critical element to the IRB approach. As a result, if a bank fails to meet the requirements for the foundation IRB approach set out in the discussion of Pillar 3 in *The New Basel Capital Accord*, they are ineligible to use the IRB approach.

K. Use of supervisory estimates of EAD, LGD, and guarantees/credit derivatives

(i) Requirements for LGD

233. For banks which seek to reflect the risk reducing effect of financial collateral in their LGD estimates, the methodology for recognition and the operational requirements that underpin it map over from the standardised approach. Where the bank takes collateral in the form of eligible CRE or RRE, certain additional standards must be met. These are specified in *The New Basel Capital Accord*, and cover the criteria for eligibility and the operational requirements that must be met when this form of collateral is taken.

234. In terms of the eligibility criteria, the Committee sought to focus on types of real estate which would serve materially, reliably and consistently to reduce loss in the event of default of the borrower. Of particular importance in this respect was to exclude collateral where the risk of the borrower was materially dependent on the performance of the underlying property, or where the value of the collateral was materially dependent on the credit-worthiness of the borrower. Strong correlation between the borrower and the collateral can make the risk reducing benefit of the collateral more illusory than real. In this sense, certain forms of real estate, such as construction lending and raw land, would be specifically excluded from recognition.

235. The operational requirements are designed, among other things, to ensure that the bank can obtain and liquidate the collateral should it need to do so, that it can attach an

objective value to it and that the risk management process underpinning the collateral is robust. An important requirement is that the bank should have a first claim on the collateral, such that its interest in the proceeds are not subordinated to those of other lenders.

(ii)   Standards for supervisory estimates of EAD

236.   A number of requirements for use of the supervisory estimates of EAD are presented in detail in *The New Basel Capital Accord*. This seeks to ensure that the 75% conversion factor for commitments and 0% for those which are unconditionally cancellable are not applied mechanistically, but rather in the context of the bank's management of the credit facility.

(iii)   Standards for supervisory treatment of guarantees/credit derivatives

237.   The foundation approach to guarantees and credit derivatives closely follows the treatment outlined in *The New Basel Capital Accord* for the standardised approach. In particular, the minimum conditions and operational requirements for recognition are identical. In terms of the range of eligible guarantors or protection providers, credit protection will be recognised for the same entities as under the standardised approach. These include sovereign entities, PSEs and banks with a lower PD than the obligor, and corporates (including insurance companies) including parental guarantees rated A or better, or unrated companies which are internally rated and associated with a PD equivalent to A or better.

VI.   Minimum Requirements for the Advanced Approach to Corporate Exposures

A.   Requirement for Loss Given Default

238.   Many of these minimum requirements build upon those outlined in the previous section with respect to the assignment of exposures to borrower grades and the estimation of PD attached to those grades. The discussion in this section is not exhaustive of all the requirements that must be met for a bank to be able to use its own estimates of LGD – rather it highlights the main differences between these requirements and the ones applicable to the foundation approach. *The New Basel Capital Accord* should be consulted for a full presentation of all the applicable requirements.

239.   Banks must have an LGD rating dimension which provides for a meaningful differentiation of loss rates across exposure types. Unlike the requirements in respect of the borrower rating dimension, no minimum number of LGD grades is specified. This reflects greater divergence of practice across banks in the way they seek to capture LGD and the importance of different transaction types (e.g. the range of collateral taken). Instead, banks are expected to have at least several distinct LGD grades – these should be as many as is necessary to reflect the full range of their credit-extending activities.

240.   The criteria for assigning an exposure to an LGD grade must be plausible and intuitive. Again, the supporting paragraphs are less prescriptive than their counterparts in the foundation approach to reflect the greater diversity across banks in the range of factors – both borrower, product and transaction specific – that may impact upon LGD. As with the other advanced approach requirements, the onus is on the bank to choose the way in which it seeks to capture LGD, and for both the bank and its supervisor to validate these estimates

and ensure that they adequately reflect and differentiate between exposures with different loss profiles.

241.   In terms of the estimates of LGD attached to each LGD grade, many of these requirements are the same as for PD. One notable difference is in respect of the minimum observation period. Banks must have at least 7 years of data (either internal or external) on which to base their estimates of LGD, as compared to the minimum of 5 for PD. The higher figure was chosen for LGD to reflect the greater uncertainty reported by banks in their estimates of LGD, and the fewer external data sources available to serve as a benchmark for LGD estimates. LGD estimates can also be volatile over the economic cycle – as such the Committee feels that at least 7 years of data is required before banks can have confidence that their estimates of LGD are robust and reliable across all anticipated business conditions.

242.   The final sections of the LGD minimum requirements set out specific requirements when collateral is taken. Collateral can be a material driver of LGD. These requirements build upon similar requirements in the foundation approach for when financial and physical collateral in the form of CRE and RRE are taken. There is no limit on the range of collateral that may be recognised in the advanced approach, nor do concepts such as the techniques for recognition (e.g. the haircut approach or the explicit *w* factor for residual risk) map over into the advanced approach. These requirements, however, seek to ensure that the risks identified in the foundation approach and addressed through either operational requirements or the *w* factor are adequately addressed in the bank's own internal processes and estimation of LGD when any form of collateral is taken.

B.   Requirements for Exposure at Default

243.   These requirements are very similar to the those for own-estimates of LGD. Banks are free to use their own estimates of EAD on facilities with uncertain drawdown, subject to meeting these requirements. As with LGD, these requirements are not prescriptive in terms of the factors which banks must consider in the assignment of exposures to EAD categories (e.g. facility types). Instead, the onus is on the bank to demonstrate that the criteria it uses are plausible and intuitive and can be supported by evidence.

244.   In terms of assigning estimates of EAD to broad EAD classifications, banks may use either internal or external data sources. Given the perceived current data limitations in respect of EAD (in particular external sources) a minimum data requirement of 7 years has been set.

C.   Requirements for guarantees and credit derivatives

245.   The requirements set out in *The New Basel Capital Accord* support the substitution ceiling approach to guarantees proposed by the Committee. They specify the process by which banks may 'notch' the grade of the underlying borrower to reflect both the extent of the guarantee and the nature and type of the guarantor. An important requirement is that the guarantor must itself be assigned to an internal grade in the same way as the underlying obligor.

246.   In terms of the extent to which a borrower's grade may be adjusted, the bank may in no case assign to the guaranteed exposure and adjusted borrower grade more favourable than the higher of the borrower or the guarantor's internal rating. Similarly, neither rating criteria nor the rating process are permitted, for regulatory capital purposes, to consider possible favourable effects of imperfect correlation between default events for the borrower

and the guarantor – this so–called double default effect would require the bank to model the degree of correlation between the two parties. As currently configured, the IRB framework stops short of providing recognition for such analysis.

247.　　There is no limitation on the range of eligible guarantors in the advanced approach, nor are there any requirement that banks deal in a specific way with the residual risks that may remain when credit protection in the form of guarantees and credit derivatives is taken out (such risks are covered by the *w* factor in the foundation approach). Nonetheless, banks must seek to ensure that these residual risks are dealt with through an appropriate combination of criteria for the recognition of different forms of credit protection and credit protection providers and/or through the adoption of a conservative view of the risk mitigating effect.

VII.　　Corporate Exposures: Key Issues where Feedback is Sought

A.　　Maturity

248.　　The Committee has sought to develop a treatment of maturity that is feasible and risk sensitive, while avoiding perverse incentives that could distort bank lending practices or encourage gaming to minimise regulatory costs without reducing economic risk.

249.　　With respect to feasibility and risk sensitivity in the foundation approach where there is no explicit maturity adjustment, the Committee seeks comment on whether the assumption of a 3 year average maturity for all exposures is appropriate.

250.　　With respect to the advanced approach, or where there is an explicit maturity adjustment in the foundation approach, the Committee seeks comment on the burdens of tracking, compiling, and validating the requisite maturity data.

251.　　The Committee also invites comment regarding the proposed definition of effective maturity and the proposed linear method of adjusting IRB risk weights for maturity. In this respect, the Committee has developed two alternative schedules of maturity adjustments – one based on an MTM approach, and one based on an adjusted DM approach. The Committee invites comments on the strengths and weaknesses of the two approaches.

252.　　With respect to potential distortions to bank lending practices, the Committee recognises that, by design, a risk sensitive approach to setting regulatory capital requirements is intended to affect bank behaviour by providing incentives for more effective risk management practices. However, there is some concern that inclusion of an explicit maturity dimension in the advanced approach could lead to unintended and unwarranted reductions in the availability of longer-term bank lending. The Committee specifically welcomes comment in this area.

253.　　The Committee also invites comment on the interaction between the proposals for maturity and the treatment of maturity mismatches.

254.　　The Committee also welcomes comment on the feasibility of incorporating banks' own internal estimates of effective maturities, or even own internal estimates of the effects of maturity on portfolio credit risk, as well as on the possible validation methods and minimum requirements that could be associated with such a proposal.

255.　　With respect to potential gaming, given the widespread gaming associated the treatment of maturity within the current Accord, there is concern that maturity adjustments

within an IRB approach might create similar problems.[13] Conceivably, significant gaming could sharply limit any potential benefit arising from a more risk-sensitive capital treatment of maturity effects. For example, it has been suggested that longer-term loans might be restructured as short-term loans with the implicit or explicit understanding that they would be rolled-over repeatedly. From a regulatory capital perspective, the main issue arising from such restructured transactions is whether portfolio credit risk was actually reduced, in which case lower regulatory capital charges still might be warranted. Such a restructured transaction is likely to imply lower credit risk to a bank if (a) future roll-overs are not legally binding, and/or (b) the bank can adjust the price or non-price credit terms on future roll-over dates in light of any significant deterioration in a borrower's financial condition. The Committee seeks comment from the industry on the materiality of potential gaming concerns and possible steps that might be taken to attenuate such problems.

B.   Reference definition of default

256.   The Committee seeks comment on the proposed reference definition of default, and on the applicability of this definition to banks' historical data.

257.   Conceivably, it may be possible to develop a technique through which PDs derived by a bank using definitions of default which were not consistent with the reference definition could be mapped to the reference definition. Industry is invited to provide feedback on the feasibility of such an approach, and on the data required to calibrate it.

258.   The Committee would welcome comments on the internal relationship between non-performing loan categories and the definition of default. In this context, the Committee also seeks comment on the treatment of non-performing loans within banks' internal capital allocation systems. One issue of special interest would be the treatment of EAD for on-balance-sheet assets with regard to partially provisioned loans.

C.   Calibration of corporate risk weights

259.   The proposed risk weights are based on calibration to assessments of EL plus UL. The effect of setting weights in this manner will vary depending on national definitions of provisions and loan loss reserves and on the extent to which banks have general provisions that are greater or less than the limit of 1.25% of risk weighted assets that applies to the inclusion of general provisions in supervisory capital. The Committee welcomes comment on this specific issue as well as on the broader issue of how to ensure adequate coverage of both EL and UL within the context of regulatory definitions.

260.   Another related issue is the assessment of IRB capital against defaulted loans. One possible treatment is to measure exposures as loans net of charge-offs and specific provisions and to apply the IRB risk weight which is not affected by charge-offs and specific provisions. In this case, however, for each dollar of charge-off taken, the bank's total capital (numerator of the capital ratio) declines dollar for dollar, but IRB capital requirements for that

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[13] It is worth noting that a principal contributor to the present-day overuse of 364-day loan commitments is the large cliff effect built into the current Accord. Because the risk weight is 0% for commitments of 364 days or less, and 50% otherwise, banks incur an onerous cost – in terms of higher capital charges – as the length of a commitment is increased beyond 364 days. Under the proposed IRB maturity adjustments, there would be no such cliff effect.

loan decline only by a significantly lesser amount. This creates incentives for banks not to charge-off loans in a timely fashion. The Committee invites comment on this issue.

D.   Minimum requirements

261.   Feedback on the proposed minimum requirements for corporate exposures is welcome, including (a) the minimum requirements for estimation of the risk inputs, such as the estimation of PD using mapping techniques, and (b) the requirements for internal validation.

Chapter 3: IRB Framework for Retail Exposures

262.   While the broad conceptual framework and quantitative approach discussed in respect of corporates is appropriate for retail exposures, the practical differences in asset characteristics and risk management practices specific to retail necessitate certain modifications to the IRB framework discussed in Chapter 2. This section highlights these key issues, and develops the Committee's proposed framework for retail exposures. The section also sets out illustrative risk weights for the retail portfolio. In this respect, the Committee notes that the risk weights presented below should be seen as indicative and aimed at providing a basis for constructive discussions – as such, they should not be viewed in the same manner as the risk weights described in the previous chapter on corporate exposures. The Committee will continue its work on retail exposures during the consultation period, and particularly invites industry comment and input in this area.

I.   Definition of Retail Exposures

263.   The work undertaken by the Committee thus far highlights that the definition of "retail" differs markedly across banks and countries. In some countries, the category principally comprises high volume, typically low value consumer lending. In others, the definition extends to include some significant business relationships. Given that the Committee is proposing an IRB approach for retail portfolios distinct from that for the corporate portfolio – both with respect to the inputs, the risk weight structure, and the minimum requirements – an objective definition of "retail portfolios" is required to ensure consistency in application of the regulatory IRB framework.

264.   The Committee's proposed definition is based on a number of criteria which seek to capture homogeneous portfolios comprising a large number of small, low value loans with either a consumer or business focus, and where the incremental risk of any single exposure is small.[14] As such, an exposure will be categorised as retail if it meets all of the following criteria:

265.   The first criterion focuses on the specific product types included in a bank's portfolio: As such, the following types of lending would be considered retail in nature: credit cards, instalment loans (e.g. personal finance, education loans, auto loans, leasing) revolving credits (e.g. overdrafts, home equity lines of credit), residential mortgages, and small business facilities. This product test would be viewed as the key test for whether a portfolio is considered under the retail framework. However, because of the challenges associated with certain business lines – particularly small business lending - additional tests (listed below) were viewed as necessary to capture these grey areas and to ensure that the approach does not create adverse incentives.

266.   The second criterion is that the exposure is to an individual person or persons, and/or guaranteed by such person or persons. Lending to a small business which does not meet this criterion (and which meets additional criteria to be developed by the Committee) may be included in this treatment with explicit approval of supervisors, provided (a) that the

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[14]   The Committee notes that these tests are intended to be applied at a portfolio level, and are not intended to constrain the maximum degree of risk segmentation within each portfolio.

bank treats such exposures in its internal risk management and risk assessment processes consistently over time in the same way as other retail exposures and (b) they also meet the other three criteria listed above and below. This takes into account differences regarding the legal status of small businesses in different member countries.

267. The third criterion requires the exposure to be one of a large pool of loans that are managed by the bank in a comparable fashion. Supervisors may choose to set a minimum threshold number of exposures within a pool for exposures in that pool to be treated as retail.

268. The fourth criterion is that each individual exposure has a low value. The Committee recognises the difficulties involved in setting a single exposure threshold which would fit all countries. However, this test could be a valuable tool for national supervisors, who may choose to set a maximum value for individual exposures. There are various considerations and trade-offs which would need to be taken into account in choosing such a threshold, for example, the figure must be high enough to encompass the higher end of residential retail transactions – in doing so it might accommodate some large, lumpy exposures. On the other hand, setting the figure too low runs the risk of encouraging loan splitting of facilities to the same borrower or between closely related parties, such as spouses. Some of these considerations could be accommodated by the establishment of a separate limit for particular product types.

269. The criteria listed above are expected to be used to determine on a case-by-case basis whether particular portfolio classifications used by banks fit more naturally into the corporate or the retail IRB approach. The main argument in favour of this approach – which relies on objective indicators, but leaves room for supervisory judgement in determining whether a portfolio is "retail" in nature - is that it would be consistent with the philosophy of the IRB approach in that 'internal means internal' – so long as a bank meets the broad objective criteria. This approach would thus minimise disruptions to banks' own portfolio classification system, internal procedures and/or business strategies, and would avoid possibly rendering invalid existing internal data sources. The approach would also address issues related to the translation of these criteria across national boundaries, while the absence of a more detailed level of specificity would cope well with product innovation.

270. The proposal also allows some flexibility in how small business lending is classified. There are some advantages to classifying it as part of the retail portfolio, since many banks deal with small business lending on a pooled basis similar to other portfolios comprised of a large number of relatively small value exposures. Also, in some cases, it is difficult to separate lending to a business from personal lending. On the other hand, some lending to small and medium sized business has greater risks than other retail products, and, to the extent that there are capital differences between retail and commercial portfolios, it would be undesirable for all such lending to be classified as retail regardless of risk. The Committee is considering whether further criteria are appropriate to distinguish between these cases. This could include whether there ought to be global limits to restrict the size of small business loans that could be classified as retail to smaller credits (the current proposal allows for thresholds to be set on a national basis, subject to supervisory discretion.) Other criteria for classification could also apply – these include requirements for a connection between lending to the small business enterprise and lending to the individual principals of the business.

II.   Range of Practice

271. The Committee's analysis has highlighted a diverse range of practice in the approach to rating retail exposures. One of the most significant differences between commercial and retail portfolios occurs in the methods used to differentiate risk. From a

bank's perspective, the objective of risk differentiation is to improve management's ability to monitor and manage components of the portfolio with similar risk-return. For corporate exposures, the dominant practice (and the basis of the corporate IRB approach) is to use a structured rating system that assigns a specific rating to each borrower or loan based on a combination of objective and subjective criteria. The rating is oriented to the risk of borrower default – therefore, changes in asset quality are expected to result in changes to this rating. This allows the rating system to remain relatively constant, with shifting portfolio quality reflected in a changing distribution of ratings. Because they can remain relatively fixed over time, these internal ratings are often linked to a schedule of average default probabilities.

272.　　For retail loans, the use of a fixed borrower rating scale and the assignment of individual borrower ratings is much less common. Rather, banks commonly divide the portfolio into "segments" made up of exposures with similar risk characteristics, or that are thought to behave in a consistent manner based on underwriting or other criteria. Banks then assess risk and quantify loss characteristics (PD, LGD, EL, and EAD) at the segment level rather than at the individual exposure level. The expectation is that the exposures in a give segment will exhibit homogeneous default characteristics, and that loss performance will follow predictable patterns over the forecast periods.

273.　　Another key distinction between banks' practices for corporate and retail portfolios relates to the use of score-driven processes. In marked contrast to commercial lending, where judgement plays a significant role for banks that employ statistical rating models, one common characteristic of retail portfolios found at most banks is the fundamental reliance on *scoring*, or associated automated practices, for managing the approval, monitoring, control, and collections functions. These scoring models may be statistical in nature, or they may employ other computational techniques such as artificial intelligence or neural networks. Development and maintenance of these scoring approaches are fundamental prerequisites for effective and dynamic risk control in these markets.

274.　　The structure of the IRB retail framework, and the minimum requirements that banks must meet to be eligible for this approach, draw on these and other key practices in banks' retail rating systems.

III.　　Risk Components

A.　　Two families of inputs: PD/LGD, or EL

275.　　There are two families of risk components or "inputs" for retail portfolios, and therefore two approaches for implementing the IRB framework. Both approaches rely upon banks providing their own internal estimates for the risk inputs. Therefore, in contrast to the approach taken for corporate exposures, there is no "foundation" approach for the retail IRB approach. Instead, for each identified risk segment (subject to banks' meeting the minimum requirements for segmentation discussed in section 4) banks are expected to provide one or the other of the following, subject to meeting the requisite minimum requirements:

- Separate estimates of PD and LGD: under this option, banks provide internal estimates for each risk segment of both the average PD and LGD of exposures within that segment;

- Estimate of Expected Loss: under this option, an estimate of the average expected loss (EL) associated with each risk segment is required. At the level of the individual exposure, EL is defined as the product of PD and LGD. While the bank must provide

an internal estimate of EL, under this option, it need not be able separately to identify the underlying PD and LGD of exposures within each risk segment.

276. Under either of the above two options, banks are also required to provide an estimate of exposure. As with corporate exposure, retail exposure is measured as the nominal outstanding balance for on-balance sheet items. For off-balance sheet items, banks are permitted to use their own estimates of credit conversion factors on retail off-balance sheet items. No conversion factors need to be applied for uncommitted lines, or for facilities (such as credit cards) which effectively provide for automatic or unconditional cancellation due to a deterioration in the borrower's credit worthiness at any time by the bank without prior written notice.

277. Consistent with the requirements for the corporate portfolio, the Committee further proposes that the above loss estimates are quantified to a one-year time horizon. However, unlike corporate exposures, the maturity (M) of an exposure is not recognised as a risk input for retail IRB purposes. Given the seasoning properties of retail loans, however, the Committee recognises that restricting attention to a one-year horizon may not be appropriate and is open to considering alternatives.

278. The Committee's decision to put forward these two options to banks reflects the diversity in bank practice in the retail portfolio. In proposing both options, the Committee acknowledges that there exists both EL based and PD-LGD based risk management systems that are well established, that have been working reliably for several years, and which would meet the objectives of the IRB framework.

279. Those banks relying on separate component estimates of PD and LGD benefit from the added informational content and analytical discipline that separate estimates provide. These banks recognise the increased information value from understanding the components of expected-loss forecasts, and believe this significantly improves their risk management and portfolio quality analysis.

280. On the other hand, the most compelling argument supporting a single EL estimate is that component estimates may not provide sufficient incremental benefits to warrant the expense and effort associated with changing established loss forecasting methods. While separate PD and LGD estimates may be the ultimate goal for many portfolios, there will be specific portfolios for which generating the underlying components of EL will add little to the quality of the risk analysis or the estimation of appropriate capital levels. Such cases are likely limited to those where key aspects of the underwriting standards are particularly conservative, underwriting practices are generally consistent, and loss rates have exhibited little volatility over time. The most obvious example would be residential real estate mortgages, loans with very low loan to value ratios (LTVs), or loans for which third party government guarantees cover virtually all of the bank's exposure.

B.   Own estimates approach to inputs

281. For corporate portfolios, the Committee has developed a foundation and an advanced approach within the IRB framework. The foundation approach is characterised by a requirement for banks to estimate their own PD according to their internal rating system, and to rely on supervisory treatment of LGD, EAD, and guarantees and credit derivatives. Within the advanced approach, banks are required to provide own estimates for these parameters. The Committee has considered the question of whether a similar twofold IRB approach is sensible for retail portfolios – specifically, whether there is a need for supervisory LGD and EAD estimates, and a supervisory treatment of credit derivatives.

282.	One of the principal advantages of retail portfolios in an IRB approach is the availability and usefulness of source-data on risk and borrower performance. Thus, the Committee expects that well-managed banks will have the capability to record and process the data necessary to support the required inputs for the IRB approach. The availability of data is further enhanced given the choice available to banks in quantifying either PD and LGD separately identified, or a combined EL measure as inputs into the approach. As such, it is the Committee's view that a foundation approach with supervisory treatment of these parameters is not warranted. Thus, under the proposed framework, banks would use their own estimates of each of these parameters as inputs into the framework.

283.	These internal estimates would reflect the risk of the transaction, including the effect of credit risk mitigation techniques such as collateral, guarantees, and credit derivatives.

## IV.	Risk Weights for Retail Exposures

### A.	Introduction

284.	The determination of the regulatory risk weight for a pool of retail exposures within a given segment under the IRB framework would involve the following steps:

- For each exposure, the bank would determine the loan's estimated exposure at default (EAD) and either the average PD and average LGD or, alternatively, the average EL associated with the contemplated segment;

- A 'benchmark risk weight' would then be assigned to each exposure in that segment, reflecting just the PD and LGD or EL of the segment. The benchmark risk weights detailed below are calibrated to a three-year maturity.

285.	The following sections lay out the structure of the benchmark risk weights and the analytical framework and empirical evidence used to calibrate these risk weights.

286.	While these risk weights are similar in derivation and format to those for corporate exposures, the Committee stresses that these are much more tentative than their corporate counterparts. This reflects the following concerns:

- Because retail data tends to be much more bank-specific, the Committee has not had access to historical loss time series that would permit independent validation of the economic capital levels presented in trade association surveys and recommendations. Specifically, on the basis of these surveys it appears that there is less uniformity in economic capital allocation methodology in retail than is the case for the corporate portfolio;

- While the current proposals provide for a single risk weight function across all retail products, the Committee is also considering whether different risk weight formulae are warranted for different product types. Information derived from one industry survey relied on a single risk weight function across products – this survey indicated that there were no significant differences in the data across products. However, other sources of information suggested that there are significant differences in retail behaviour and, more importantly, differences in portfolio correlation that could require separate risk weights - at a minimum for residential mortgages and perhaps for other product categories. Given these discrepancies, for the time being the Committee does not propose different risk weight schemes for the different product categories as required for segmenting bank's retail exposures.

287.   For these reasons, the risk weights presented should be seen more as illustrative or indicative, rather than as estimates in which the Committee has the same degree of confidence as in the proposed risk weights for the corporate portfolio. The Committee seeks input from the industry on these tentative proposals, and intends to continue work to develop and refine the risk weight structure during the consultative period.

B.   Conceptual framework for the calibration of risk weights

(i)   Introduction

288.   The calibration methods described below are based on the same framework underpinning the economic capital systems of the most sophisticated banks and that has been used for the calibration of corporate risk weights. For a given target solvency probability, the calibrated risk weights are associated with quantifying the volatility of (one-year) credit losses.

289.   In principle, the Committee has applied the same two broad empirical approaches as for corporate exposures – one direct and another survey-based or indirect – for calibrating risk weights under an IRB standard. The Committee has looked to survey data from banks and trade groups in this effort. This approach extracts the risk weights implied by the respondent banks' economic capital systems, thus building upon research already conducted within the private sector. The Committee has also looked to direct or model-based calibration of risk weights to support the survey evidence. Given these empirical estimates, an implied capital requirement can then be derived based on a desired target solvency probability.

290.   The Committee wishes to stress that the proposed risk weights are mainly based on the qualitative results from the industry survey results and the industry's broad-brush approach to retail risk weights, which are believed to be approximately half as risky as corporate risk weights. The tentative nature of the risk weights is due to the above-mentioned shortcomings and the fact that the Committee has not had the data to independently assess the reasonableness of the economic capital estimates reported in these industry surveys.

(ii)   Industry survey results

291.   The retail data sources available to the Committee have been very limited. The surveys solicited both qualitative and quantitative information regarding the analytical underpinnings and operational details of the economic capital allocation systems. This included summary statistics of the actual economic capital allocations against various types of retail portfolios. The industry provided not only summaries of the overall results from their respective surveys, but also the responses from the individual respondents, after masking their identities.

292.   The aggregated results of these surveys are discussed below. The Committee wishes to stress the need to further explore and understand the concepts and methodologies underlying this data during the consultative period. This effort will be critical in developing the Committee's understanding of the specific risk characteristics of retail exposures, and the impact of differing modelling assumptions in the derivation of risk weights. Industry input is particularly sought in these areas.

(iii)   Qualitative results

293.   The findings suggest that while there appear to be broad similarities across banks in the conceptual frameworks underpinning their economic capital systems for retail portfolios,

below the surface there is substantial diversity of practice in terms of how key concepts are operationalised. Most of the respondents indicated that they employ a one-year, default-mode, EL-UL approach when allocating economic capital against retail portfolios. The majority also claim to base these allocations on separate estimates of PD, LGD, and EAD associated with relatively homogenous segments. Some banks do, however, use an EL approach as the basis for the allocation of economic capital. Amongst those banks using a combined EL approach, a considerable fraction indicated that they plan to move to a PD-LGD approach in the future. Few, if any, banks treat maturity as an explicit risk driver of economic capital for retail portfolios, the reason for this being the rather short average maturity of most retail products.[15]

294.   Despite this apparent similarity in analytical approaches, the survey responses suggest wide differences across respondents in terms of how the concepts of PD, LGD, EL, and economic capital are operationalised in practice. This impression is confirmed in the overview summary prepared by one international industry trade association, which explicitly cautions that more detailed work concerning default definitions, portfolio and market structures, and modelling constructs would be necessary before conclusions can be drawn from this survey for the regulatory capital framework.

295.   In contrast to corporate exposures, there appear to be wide differences in how banks define PD or EL, with some focusing on the next 12 months, some focusing on annualised default rates over a multi-year period, and some focusing on *long-run* average annual default rates over a hypothetical economic cycle. Some banks may take into account expected *peak* default rates.

296.   Although definitions of default were based mainly on past-due status, the particular cut-offs for categorising loans as 'defaulted' vary from 60 days past due to 210 days past due. With regard to this point, the Committee has applied the same generic requirements as for corporate exposures. The Committee notes that banks need not, however, use the same internal definition of default for both corporate and retail exposures; notwithstanding the precise internal definitions used, both should be consistent with the reference definition.

297.   The methods used for quantifying PD and EL appear to vary widely as well. Most respondents to the survey reported heavy reliance on the most recent 12-24 months of historical experience, using a variety of empirical techniques, although in some cases banks may employ many years of data through a largely mechanical process.

298.   The Committee observed a tendency on the part of some banks to adjust PD or EL estimates subjectively based on internal macro-economic forecasts. There is no reason for the Committee to believe that such adjustments are in any way inconsistent with sound or best-practice risk measurement and economic capital allocation. Nevertheless, a significant and largely subjective component to PD estimates will pose difficult challenges for the internal validation of these estimates.

299.   With regard to the methods used in quantifying PDs or ELs, a major area of uncertainty is the treatment of seasoning effects within retail portfolios. The Committee might wish to build a capital buffer today for predictable capital increases in the future that are due to seasoning effects. This problem is more material the less stable the seasoning distribution within the bank's portfolio. For example, it may pose a substantial problem for a bank that enters a new retail business, product, or customer class that is expanding rapidly, if the PD

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[15]   An exception in terms of maturity would be residential mortgages.

or EL measures of this new business line exhibit notable seasoning effects. The Committee has very little data at this time on how likely such scenarios are in reality.

(iv)   Quantitative results

300.   The Committee recognises that banks use a wide range of target solvency standards for the purpose of estimating economic capital requirements for retail exposures, ranging from 99% to 99.98%.

301.   According to the aggregated industry results in one survey, there were no specific product or country effects, and so no single set of 'average' results was purportedly applicable to all retail product types. In contrast, the range of solvency standards and the individual responses means that the above mentioned averaging exercise needs to be treated with caution with respect to the envisaged solvency standard and also with respect to the application of the single risk weight system to different types of retail exposures.

302.   The Committee does not have any explicit information about asset correlations used to allocate economic capital. While a small number of surveyed banks suggested asset correlations of around 10% across all retail exposures, the range of suggested correlations was quite wide, from around 0% to notably higher levels. However, the information provided seems to indicate that correlations in retail lie somewhat below those for corporate exposures, and that mortgages display a higher correlation than other retail products.

303.   On balance, the available information on the quantitative survey results needs to be considered carefully as the surveys did not provide specific information on the analytical and empirical methods used to quantify the reported relationships between EL and UL. Furthermore, some respondents are contemplating moving to a MTM framework in the future, suggesting some possible discomfort with the risk-sensitivity of their existing methods for dealing with maturity effects and allocating capital within retail portfolios.

304.   Even keeping in mind the caveats cited above, some tentative conclusions about reasonable levels of capital risk weights for retail exposures in comparison to corporate exposures can be inferred. Specifically, one of the industry surveys indicated that retail risk weights should be approximately half of the magnitude of the corporate risk weights for given PD/LGD pairs. They further suggest that this rough 50% rule would hold regardless of product type or country. There was some limited degree of support on an individual bank basis. It is important to treat the industry's assumption of 50% retail risk weights compared to corporate risk weights with considerable caution.

305.   Anecdotal evidence from banks also showed that the slope of the retail risk weight curve seems to be flatter than for corporate exposures (i.e. that in retail, the relationship between PD (or EL) and risk weights over the entire range is different, and less sensitive to, increases in PD than is the case for corporate exposures).

C.   Benchmark risk weights for retail exposures

306.   The Committee's limited research indicated that the industry's rule of thumb that retail exposures exhibit approximately half as much risk than corporate exposures can be used as a first step towards a risk based framework in the context of retail. This implies a significantly lower assumption on default correlation between retail exposures and a greater homogeneity per segment. The results also show that retail risk weights are nearly proportional to LGD, so that the risk weights for different levels of LGD can be obtained by multiplying the risk weight with the ratio of the desired level of LGD to the base level of 50%.

307. Retail exposures will receive a risk weight that depends either on the probability of default (PD) and loss given default (LGD), after recognising any credit enhancements from collateral, guarantees or credit derivatives (as noted in the document, the Committee is also developing a mechanism for translating EL estimates into the risk weight structure). The risk weight for a retail exposure would not depend on the maturity (M) of the exposure.

308. Throughout this section, PD, LGD, and EAD are expressed as whole numbers rather than decimals, except where explicitly noted otherwise. For example, LGD of 100% would be input as 100. The exception is in the context of the benchmark risk weight (BRW) and the maturity slope (b) calculations. In these equations, PD is measured as a decimal (e.g., a 1% probability of default would be represented as 0.01).

309. Thus, a risk weight will be assigned to each exposure reflecting the PD and LGD of the exposure based on the following formula:

$$RW_R = (LGD/50) \times BRW_R (PD), \text{ or } 12.5 \times LGD, \text{ whichever is smaller.}[16]$$

310. In this expression, RW_R denotes the risk weight associated with given values of PD for retail exposures, while BRW_R denotes the retail benchmark risk weight associated with a given PD, which is calibrated to an LGD of 50%. The BRW_R is assigned to each exposure reflecting the PD of the exposure based on the following equation (please also note that in this equation, PD is expressed as a decimal – e.g. a PD of 10% would be input as 0.1):

$$BRW_R(PD) = 976.5 \times N\,(1.043 \times G\,(PD) + 0.766) \times (1 + .0470 \times (1 - PD)/PD^{0.44})$$

where $N(x)$ denotes the cumulative distribution function for a standard normal random variable (i.e. the probability that a normal random variable with mean zero and variance of one is less than or equal to x), and where $G(z)$ denotes the inverse cumulative distribution function for a standard normal random variable (i.e. the value x such that $N\,(x) = z$).

311. A graphical depiction of this function specifying the benchmark risk weight on the basis of a given PD and calibrated to a 50% LGD is presented below:

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[16] The purpose of the cap is to ensure that no risk weight can be more penal than would be the effect of deducting the exposure from capital.

Chart 4

Proposed IRB Risk Weights for Hypothetical Retail Exposure Having LGD Equal to 50 Percent.
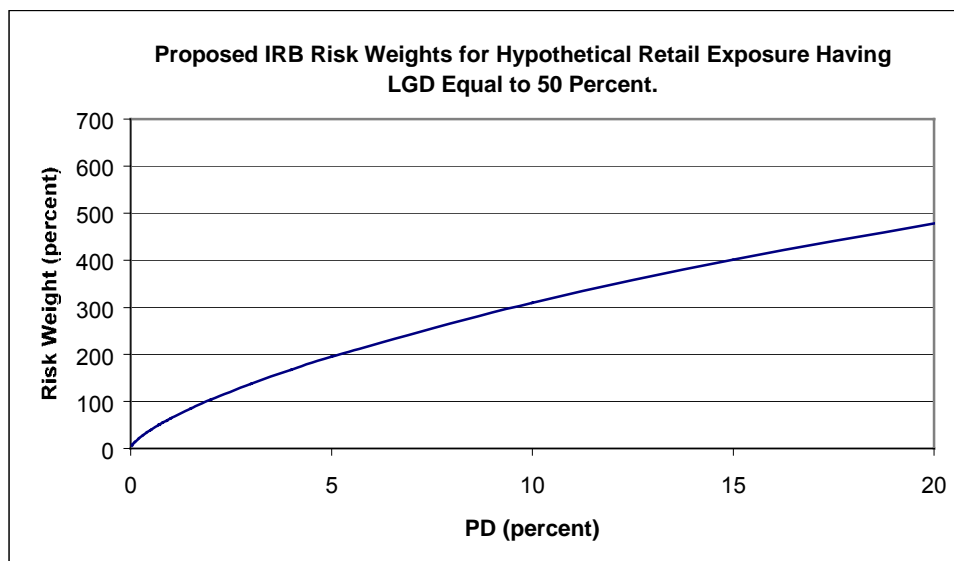
312.   Representative values of these benchmark risk weights are presented in the table below:

Table 6

PD(%)	BRW$_R$
0.03	6
0.05	9
0.1	14
0.2	21
0.4	34
0.5	40
0.7	50
1	64
2	104
3	137
5	195
10	310
15	401
20	479
30	605

313.   As this proposal calibrates retail risk weights as half those for corporate exposures, the risk weights cover the sum of both EL and UL. The Committee recognises that this treatment of EL can generate significant capital charges for high PD exposures. This may be problematic for certain retail portfolios, which may be managed in such a way as to generate expected margin income which, by itself, may have the capacity to absorb credit losses that are equal to or, possibly, multiples of, EL. As a consequence, the illustrative risk weights for retail portfolios may overstate appropriate minimum total capital levels for higher-PD retail products, such as credit cards. The Committee welcomes comment on this specific issue as well as on the broader issue of how to ensure adequate coverage of both EL and UL within the context of regulatory definitions of capital.

D.   Translation of EL inputs into risk weights

314.   As noted above, the Committee is contemplating two options for the estimation of risk components for retail exposures, one based on PD and LGD, separately quantified, and the other based on quantification of EL directly. The illustrative risk weights put forth in *The New Basel Capital Accord* and discussed in the section above are based only on separate assessments of PD and LGD as inputs to the risk weight function. As the Committee will also allow a direct estimate of EL as a risk input, a mechanism by which such an estimate can be translated into the PD-LGD risk weights structure is required. This mechanism must produce a comparable outcome for a given level of risk, thereby avoiding any penalty for banks choosing one option for risk quantification over another, as well as avoiding the introduction of any gaming opportunities.

315.   The Committee will continue to work on EL-based risk weights during the consultative period. At this point, the Committee has evaluated two approaches to deriving these EL-based risk weights: use of historical default frequencies, and use of a conservative option.

316.   Banks that measure risk by EL only should be able to collect historical data on the number of defaults in each retail risk segment. This would yield historical default rates (PD) for each segment, using simple or weighted average default frequencies. An implied LGD could then be derived from the simple definition EL = PD*LGD, or LGD = EL / PD.[17] With these estimated and implied parameters, the same PD/LGD-based risk weights could then be used by the banks that rely on EL risk measures.

317.   If such historical PDs and implied LGDs were to be used, there would be a question of setting minimum requirements, and of whether the historical PDs should be required to meet all the quantification requirements set forth for own estimates under the advanced IRB approach. Clearly, the most important drawback of these derived PDs would be that they are purely historical, and therefore not forward looking.

318.   One point of view in the discussions is that requiring banks using this approach to fulfil all the quantification requirements for PDs would impose a significant burden. In effect, this would mean asking banks to develop a kind of "shadow" PD-based risk assessment. As a consequence, this would seem to undermine the original decision to allow banks to choose either a PD/LGD or an EL approach to retail risk quantification. In this view, the historical default rates and implied LGDs should be acceptable proxies, thus allowing the use of PD-based risk-weight function.

319.   An alternative approach towards EL-based risk assessment tools would be as follows: a bank would (a) identify a wide range of reasonable combinations of PD and LGD that yield a given value of EL (i.e. such that PD * LGD = EL); (b) compute the risk weights associated with all of these combinations in the PD/LGD framework; and (c) choose the highest risk weight.

320.   This approach offers the advantage of simplicity, since it would not even require the estimation of historical default rates. However, it might result in consistently high risk weights, which would tend to penalise banks that use EL-based risk measurement in retail exposures. The Committee's assessment is that the use of an assumed LGD of 100% for all exposures

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[17]   Such an implied LGD is more reasonable in a retail context than it would be in corporate, since certain retail products are generally associated with a single type of collateral, e.g., residential mortgages or auto loans.

would deliver the highest risk weight for any given PD-LGD producing the same estimate of EL.

321. During the consultation period, the Committee will continue to work on the mechanics of translating EL estimates into the risk weight structure, including further exploration of these two alternative approaches. The Committee invites industry input on this issue, in particular from banks that use EL-based systems in their retail portfolios.

E.   Maturity

322. The illustrative risk weights for retail were derived on the basis of the assumption suggested by the industry surveys that retail risk weights might be on the order of 50% of the proposed corporate benchmark risk weights. In this derivation, the Committee used the same methodology from the corporate IRB approach where there is no explicit adjustment for maturity – as such, the risk weights are based on an assumed average 3-year maturity.

323. Most institutions in the industry surveys indicated that they do not explicitly take maturity into account in allocating capital for the retail portfolios. In addition, many institutions have stated that most of their retail exposures have maturities of 1 year or less. However, the Committee chose the 3-year maturity basis for the retail risk weights for two reasons. First, given the very tentative and illustrative nature of the retail risk weights, the Committee decided to take the more conservative approach that is reflected in the 3-year maturities. Secondly, since, for the time being, the Committee has not set out different risk weights for different retail product types, the longer maturity assumption represents, in part, an attempt to take into account the effects of residential mortgages, which make up a very significant portion of the retail portfolios and which have effective maturities considerably longer than 1 year. As the Committee continues its work on retail, it may consider separate risk weights for residential mortgages and for other retail products.

324. The Committee particularly invites industry comment and input on the issue of different risk weights for different retail exposures and the treatment of maturity in the retail risk weight derivation.

V.   Minimum Requirements for Retail Portfolios

A.   Introduction

325. As with corporate exposures, adherence to a fully-developed set of minimum requirements is essential to ensuring the integrity, reliability, consistency, and accuracy of both internal rating systems and estimated loss data for each segment. To be eligible for the IRB approach a bank must meet these minimum requirements at the outset and on an ongoing basis.

326. The requirements described fully in *The New Basel Capital Accord* paper have been developed with reference to the best practices observed at banks with well-managed rating systems. In many areas, these draw on the "benchmark" minimum requirements that were articulated for the corporate portfolio, and discussed in the previous chapter. In other areas, the Committee has identified a need for modifications to these "benchmark" requirements in order to address the particular characteristics of retail portfolios; in some regards, these modifications are quite significant. This section therefore discusses a number of the specific requirements – over and above (or in lieu of) the benchmark corporate requirements – with

which banks would need to comply in order to qualify for the IRB retail framework. The following discussion is not exhaustive; please refer to *The New Basel Capital Accord* for the full set of minimum requirements for retail.

327. The Committee recognises that bank practice in the retail portfolio is more diverse than is the case with the corporate portfolio. Thus, the Committee notes that its efforts to refine and expand on the proposed requirements for retail, in particular, will need to be informed by dialogue with the industry during consultation.

B.   Rating structure

328. Rating systems for retail portfolios must address both borrower and facility risk, and must take into account all relevant borrower and facility characteristics. This standard differs from that for corporate exposures and reflects the predominant industry practice for retail portfolios of combining both borrower and facility characteristics in the assessment of the risk of a segment.

329. In retail lending, the distinction between borrower and facility is typically blurred or eliminated. A small number of advanced-practice banks have made significant progress with respect to the development of comprehensive customer profile databases across multiple products or accounts. However, the most common practice with respect to retail exposures is to market, price, and manage each loan based on a set of risk factors that combine characteristics of the borrower (e.g. target population, income, and credit performance history) and those of the facility (e.g. product type, credit limit, collateral). [18]

C.   Segmentation

(i)   Introduction

330. The large volume and small money amounts of retail loans warrant a portfolio approach to risk management. Thus, it is not feasible to set a minimum number of "grades" along the lines of the 6-9 required performing grades in the case of the corporate portfolio. Instead, the objective of ensuring meaningful risk differentiation can be achieved by minimum requirements for risk segmentation.

331. These segments are designed to be used as the basis for quantifying loss characteristics. The requirements therefore seek to ensure that the PD, LGD or EL estimates quantified for each segment (and used as the basis for capital requirements) are representative of the underlying pool of loans. Thus, in order to properly structure the IRB approach for retail, and to calibrate risk weights that are appropriate for the underlying pool of loans, a bank's segmentation process must meet the following criteria: (a) the process must meaningfully differentiate levels of risk; (b) each segment must be made up of borrowers whose risk characteristics are reasonably homogenous, and (c) the segmentation process must ensure that the risk characteristics of the underlying pool of loans are relatively stable over time, and can be tracked.

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[18] Given this blurring between borrower and facility characteristics, in retail, many banks, including some best-practice institutions, use an EL rather than a PD/LGD framework for quantification of risk. See forthcoming section on quantification.

332.   In developing these requirements, the Committee recognises that bank practice in the area of risk differentiation in the retail portfolio is more diverse than is the case with the corporate portfolio. The nature of segmentation may vary from product to product and from institution to institution. Even within the same institution, there may be a distinction between a bank's decisions in segmenting the portfolio for risk management purposes, and its decisions on segmentation for product-marketing or underwriting purposes. Thus, these proposals set out minimum – though not exhaustive – requirements for segmentation. The Committee seeks particular input on bank practice with respect to segmentation.

(ii)   Proposed minimum requirements for risk segmentation

333.   A bank must allocate each exposure which falls within the definition of 'retail' for IRB purposes into a particular risk segment. A bank must demonstrate that the level of segmentation adopted internally provides for a meaningful differentiation of risk, provides for a grouping of sufficiently homogenous pools of loans and ensures that the risk characteristics of the underlying pool of loans are relatively stable over time, and can be separately tracked. The orientation of this segmentation should be towards the risk of both the borrower and the transaction.

334.   Once a risk segment has been identified, a bank should treat all borrowers and transactions in that segment in the same manner with respect to underwriting and structuring of the loans, economic capital allocation, pricing and other terms of the lending agreement, monitoring, and internal reporting. This serves to demonstrate the risk homogeneity of exposures within each segment.

335.   A bank is expected to segment its portfolio on the basis of the following four techniques. The first two must be met by all banks. The latter two must also be met by banks unless a bank demonstrates to its supervisor that such an additional level of segmentation is not appropriate given the nature of its retail exposures or the size of its operations.

Segmentation by product type

336.   Segmentation by product type follows established bank practice, as these product categories display very different risk characteristics, and banks often use different credit risk assessment tools for different products. Thus, the bank must at a minimum segment its retail portfolio by the following product types, subject to *materiality:*[19]

- Credit cards;

- Instalment loans (e.g. personal loans, auto finance (including leasing));

- Revolving credits (e.g. overdrafts);

- Residential mortgages;

- Small business facilities.

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[19]   For example, if a bank does not engage in credit card activity, it does not need to segment by this product type.

Segmentation by borrower risk

337.   Segmentation by borrower risk characteristics serves to meaningfully differentiate risk and cluster sufficiently homogenous pools of loans into each segment. Thus, as a minimum requirement, a bank must segment by credit scores or equivalent. This includes segmentation based on application scoring (score based on full information in a credit application).[20]

Segmentation by delinquency status

338.   Consistent with the process used for risk differentiation in the corporate portfolio, the Committee recognises that there should be distinct identification between loans that are delinquent and those that are not. At a minimum, there should be at least two distinct and identifiable categories for pools of loans that are in arrears. Banks which do not provide this level of segmentation will need to satisfy their supervisor that this is not a material driver or predictor of risk in their retail portfolios, and must collect sufficient data on this risk driver to enable them to periodically assess whether delinquency is material enough to warrant segmentation.

Segmentation by vintage

339.   The Committee also recognises that vintage analysis (based upon the time at which the loan was originated) could provide information on changes in underwriting practices over time, and capture risk effects that arise from loan seasoning. Best-practice banks indicate that vintage or 'seasoning' can be a significant element of portfolio risk monitoring. This is particularly the case with respect to residential mortgages, where there is a clear time pattern on default rates in certain markets. Thus, banks are expected to segment based on the vintage of exposures (the time at which the transaction was put on the books). The maximum length of the vintage period should be no more than one year. Banks which do not segment some or all of their retail exposures by vintage will need to satisfy their supervisor that vintage is not a material driver or predictor of risk in their retail portfolios, and must collect sufficient data on this risk driver so as to enable them to periodically assess whether vintage is material enough to warrant segmentation.

Additional Segmentation

340.   Banks are permitted to use additional techniques for segmentation for some or all of their retail exposures. Examples include:

• Different levels of LTV measures for secured loans;

• Marketing and distribution techniques (e.g. affinity cards for target markets, gold/premium cards);

• Borrower-type/demographics (occupation, age, etc.);

• Loan size;

• Maturity (e.g. 10 year mortgages, 30 year mortgages);

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[20] Ongoing or "behavioural" scoring (based on credit bureau data or bank's own internal data) should be used as a basis for reassessing the estimates of loss associated with each segment, rather than as a basis for segmentation.

341. Banks which segment their retail exposures on the basis of these risk characteristics will need to satisfy their supervisors that such segmentation provides for a meaningful differentiation of risk.

Number of exposures within a segment

342. For each segment identified, the bank must be able to provide a quantifiable measure of loss characteristics (PD and LGD or EL) for that segment. Therefore, the level of segmentation for IRB purposes must ensure that the number of loans in a given segment is sufficient so as to allow for reasonable power in the statistical tests used to quantify segment-based loss concepts. Furthermore, the Committee requires that there should be a meaningful distribution of borrowers and exposures across retail segments. No single segment should include an undue concentration of the bank's total retail exposure.

D. Requirements for estimation of risk components

343. As noted in section 3 of this chapter, a bank must provide an explicit estimate of either PD and LGD, separately identified, or EL, for each segment. With respect to the notion of LGD or EL, loss is to be understood as economic loss. This should include discount effects, funding costs, direct and indirect costs associated with collecting on the instrument in the determination of loss. A bank should not simply measure the loss recorded in accounting records, although should be able to compare the two. In addition, a bank must provide a explicit estimate for the exposure amount for each transaction (commonly referred to as Exposure at Default (EAD) in banks' internal systems. All these loss estimates should seek to fully capture the risks of an underlying exposure. The definition of default to be used in estimating risk components with respect to retail exposures is largely consistent with that set out in Chapter 2; in the context of retail exposures, any reaging of a facility (e.g. extending the life of a mortgage to reduce monthly payments) is regarded as a default event, so long as such reaging is undertaken in distressed circumstances to mitigate a default event.

344. Banks should consider all available information for estimating average PD and LGD or EL ("the loss characteristic") per segment, including the three specific techniques set out in the PD estimation requirements (internal loss experience, mapping to external data, and statistical loss models). Given the bank-specific basis of segmentation, a bank should regard internal data as the primary source of information for estimating loss characteristics. Banks are permitted to use external data or statistical models for quantification provided a strong link can be demonstrated between the bank's basis of segmentation and risk profile. In all cases banks should use all relevant data sources as points of comparison.

345. Banks must recognise the importance of judgmental considerations in this process, particularly in ensuring a forward-looking estimate of loss characteristics. Such judgement must be applied with a conservative bias. The degree of conservatism must be generally consistent over time.

346. For all methods of estimating loss characteristics the following requirements must be met:

- the population of exposures represented in the data set is closely matched or at least clearly comparable to those of the contemplated segment;

- the lending or underwriting standards used to generate the exposures in the data source are strongly comparable to those used by the bank in populating its current segments;

- economic or market conditions under which the historical experience took place are relevant to current and foreseeable conditions; and

- the number of the loans in the sample, and the data period used for quantification, provide banks with confidence in the accuracy and robustness of the loss characteristics and the underlying statistical analysis.

347. Banks are continuously required to have estimates of loss characteristics that are properly calibrated, and which incorporate new information promptly as it becomes available. At a minimum banks should review these estimates on a yearly basis.

348. No matter whether a bank is using external, internal, pooled data sources, or a combination of the three, for its estimation of loss characteristics, the length of the underlying historical observation period used should be at least 5 years. If the available observation period spans a longer period, this longer period should be used.

349. With respect to EAD, in contrast to the practice observed in the corporate portfolio, banks also tend to have a reasonable amount of relevant data on their retail portfolios. As such, the Committee does not envisage a supervisory treatment of the conversion factor for unused commitments on short-term, revolving credit products such as credit cards. Thus, banks will be permitted to use their own estimates of credit conversion factors on retail off-balance sheet items. Banks need not apply a conversion factor for undrawn amounts for products, such as credit cards, that are unconditionally cancellable, or for uncommitted lines, or for facilities which effectively provide for automatic cancellation due to a deterioration in the borrower's credit worthiness, at any time by the bank without prior written notice. For retail products with uncertain future exposures such as credit cards, banks would be required to take into account their history and/or expectation of additional drawings prior to default in their overall calibration of loss estimates (EL or LGD). In particular, where a bank does not reflect conversion factors for undrawn lines in its EAD estimates, it would be expected to reflect in its LGD estimates the likelihood of additional drawings prior to default.

VI.   Retail Exposures: Key Issues where Feedback is Sought

A.   Definition of retail exposures

350. The Committee seeks particular comment on the interaction between the criteria articulated in the proposed definition and banks' own internal definitions of retail portfolios, particularly with respect to the treatment of small business lending.

B.   Derivation of risk weights

351. The Committee would value feedback on the differentiation of risk segments, including issues pertaining to measurement of PD, LGD, and EL, and on the tentative risk weights proposed in this document. Information regarding the assumptions, methodologies, and underlying data used by banks in their internal economic capital allocation processes in the retail portfolio would be particularly helpful.

352. At this time, the tentative risk weights for all retail exposures would be determined by a common formula that relates an exposure's risk characteristics to a corresponding risk weight. Risk weights are currently based on separate assessments of PD and LGD as inputs to the function. As the Committee will also allow a direct estimate of EL as a risk input, a mechanism by which such an estimate can be translated into the PD-LGD risk weight

structure is required. Furthermore, while the current proposals provide for a single risk weight function across all retail products, the Committee is also considering whether different risk weight formulae are warranted for different product types. Feedback on these issues is particularly welcome.

C.   Minimum requirements

353.   Feedback on the proposed minimum requirements for retail exposures is welcome, particularly in respect to (a) the proposals for segmentation, (b) further development of the requirements for estimation of EAD, and either PD/LGD or EL, including estimation using the reference definitions of default and loss, and (c) the requirements for internal validation.

Chapter 4: IRB Approach to Bank Exposures

I.   Definition of Bank Exposures

354.   This treatment covers exposures to banks and securities firms. This includes Multilateral Development Banks (MDBs) that do not meet the criteria for a zero percent risk weighting under the standardised approach.

II.   Range of Practice

355.   Complex banks with well-managed risk management processes actively manage their bank counterparty exposure limits. Most inter-bank exposures result from capital markets activities such as securities lending, foreign exchange transactions, and derivative contracts. Short-term inter-bank exposures are also created by payment system and fund transfer activities. Exposure limits routinely differentiate exposures by attributes such as security, collateral types, price volatility of collateral, tenor, counterparty credit rating, etc. The assessment of the counterparty's level of credit risk is critical to establishing prudent exposure limits. Banks with well-managed risk management systems routinely use information from publicly available financial information and external rating agencies to internally assess counterparty credit risk. The risk ratings employed to rate banks may be consistent with their corporate lending risk rating system or distinct. While differences in practice exist between institutions, fundamentally both approaches lend themselves to the assignment of risk quantification estimates (PDs) to the ratings.

III.   Risk Components

A.   Probability of Default (PD)

356.   The probability of default of an exposure is the greater of the one associated with the internal borrower grade to which that exposure is assigned, or 3 basis points (0.03%). The minimum requirements for the derivation of the PD estimates for each internal borrower grade are consistent with those for corporate exposures, except where highlighted below. The definition of default for bank exposures is the same as the one for corporate exposures.

B.   Loss Given Default (LGD)

357.   LGD estimation requirements will be the same as those for corporate exposures.

C.   Maturity

358.   The assessment of maturity for bank exposures is the same as for corporate exposures.

D.   Exposure measurement

359.   The estimation of bank exposures is the same as those for corporate exposures.

IV.   Risk Weights for Bank Exposures

360.   The calculation of risk weights for bank exposures is exactly the same for corporate exposures.

V.   Minimum Requirements for Bank Exposures

361.   The minimum requirements for corporate exposures also apply to bank exposures. This section will briefly address the additional factors which will need to be considered in the criteria for assessing bank exposures.

A.   Rating criteria

362.   The specific minimum requirement in this area is identical to that put forward for corporate exposures. The Committee recognises, however, that in fulfilling this minimum requirement, the subjective and objective rating criteria and quantitative tools that are used to evaluate the degree of credit risk in a bank exposure will differ from that for corporate exposures.

363.   The asset quality of banks' interest earning assets, such as loans and investments, are of paramount importance for banks' quality of earnings and capital adequacy. Banking differs from most other commercial enterprises by requiring the firm's customers to contractually perform for a lengthy period after the bank has performed its material contractual obligations. Furthermore, the performance of a bank's borrowers impacts its liquidity by heavily influencing their access to the capital markets to fund asset origination. As a result of these characteristics, banks need to employ customised risk rating criteria to adequately differentiate the credit risk of bank counter-parties. Banks' internal credit expertise is well suited to evaluate the level of credit risk of other banks. Due to the magnitude of banks' exposure to other banks, it is imperative that they have risk rating capabilities that incorporate all available information and rapidly refreshes ratings when material information becomes available. The nature of many inter-bank liabilities allows banks to actively manage their counterparty credit risk if the rating process is proactive. An annual review of bank risk ratings without a procedure to routinely re-evaluate ratings to reflect new information would be inappropriate.

Chapter 5: IRB Approach to Sovereign Exposures

I.   Definition of Sovereign Exposures

364.   All exposures treated as sovereigns under the standardised approach will be treated as sovereigns for the purposes of the IRB approach. This includes sovereigns, non-central government public sector entities (PSEs) that are treated as sovereigns in the standardised approach, and MDBs which meet the criteria for a zero percent risk weighting under the standardised approach.

II.   Range of Practice

365.   In order to evaluate bank practice in rating sovereigns, the Committee interviewed, surveyed and discussed bank practices with numerous institutions with well-managed rating systems. Several themes emerged from this process. Banks generally utilise a common risk rating scale for both sovereigns and corporate borrowers. Unlike corporate relationships, banks generally have no informational advantage over other capital markets participants or third parties, such as external rating agencies, when evaluating sovereigns. As a result, the majority of banks rely heavily on the credit assessments of the rating agencies in assigning their internal risk rating for sovereigns. Banks also widely use credit spreads as a market-based indicator of a sovereign's relative credit risk. A minority of banks utilise either their own internally developed or vendor provided statistical models to arrive at a sovereign's rating and associated PD estimate. Some of these models utilise market based relationships to provide a PD estimate and others rely on more traditional credit quality factors such as liquidity, cash flow, leverage and vulnerability to shocks. In addition, some banks factor in subjective assessments of a sovereign's political risk in arriving at a risk rating.

366.   The Committee's work indicated that banks' assessment of loss severity or LGD for sovereign exposures is not well developed. The evaluation of LGD is difficult due to scarce loan recovery data. Some banks have tried to estimate loss severity by measuring the economic loss experienced by defaulted sovereign bondholders. However, this approach implicitly assumes that a sovereign defaults as frequently on both loans and bonds and negotiates equivalent recovery terms on both types of credit facilities. For a number of reasons, this assumption may not be accurate. The transparency of recovery negotiations on publicly held debt compared to bank loans may translate into a higher recovery rate on bonds. Sovereigns' desire to re-enter the public debt market may also strengthen the hand of bondholders in re-negotiating favourable repayment terms compared to banks.

III.   Risk Components

367.   The inputs for sovereign exposures will be the same as those for corporate exposures. Discussed below are a number of specific issues regarding the assessment of these inputs with respect to sovereigns.

A.   Probability of Default (PD)

368.   Similar to the structure of external ratings, a bank's borrower risk rating system should be consistent across borrower types. For example, a sovereign of a given grade should be similarly risky as a corporate borrower of the same grade. As a result of the grouping of borrowers into similarly risky pools, the PD estimates for a particular grade should be consistent across borrower types. However, due to the credit risk-free nature of many sovereigns, the 3 basis point floor on corporate PD estimates does not apply to sovereign exposures. The minimum requirements for the derivation of the PD estimates associated with each internal borrower grade are consistent with those for corporate exposures with exception of the area discussed below. With regard to PSEs that meet the criteria for sovereigns, banks should evaluate the degree of support (both legal and moral) offered by the sovereign and reflect this in the PSE's risk rating and resulting PD estimate. This evaluation should be similar to the treatment of guarantees in a corporate context.

B.   Loss Given Default (LGD)

369.   LGD estimation requirements will be the same as those for corporate exposures.

C.   Maturity

370.   The assessment of maturity for sovereign exposures is the same as for corporate exposures.

D.   Exposure measurement

371.   The estimation of sovereign exposure is the same as those for corporate exposures.

IV.   Calibration of Risk Weights

372.   The calculation of risk weights for sovereign exposures is exactly the same as for corporate exposures. Exposures to sovereign borrowers deemed to have a PD equal to zero would receive a zero risk weight.

V.   Minimum Requirements for Sovereign Exposures

373.   The minimum requirements for corporate exposures also apply to sovereign exposures with the exception of the modifications and additions noted below. This section will only address (a) these modifications and additions, or (b) areas where additional factors will need to be considered in applying these minimum requirements to sovereign exposures.

A.   Definition of default

374.   The reference definition of default developed for corporate exposures will be applicable to sovereign exposures. Within this definition, and in the context of sovereign

exposures, a credit loss event would include the rescheduling of debt payments or altering of any of the terms of the original contract that could ultimately inflict capital loss on the creditor.

B.   Rating grade structure

375.   The guideline that not more than 30% of all exposures should reside within a single grade does not apply to sovereigns. Many sovereigns are of high credit quality and are likely to result in a highly concentrated risk rating profile for the portfolio.

C.   Rating criteria

376.   Our discussions and surveys indicated that many banks rely on information provided by external rating agencies to arrive at their internal risk ratings for sovereigns. It is our expectation that banks' efforts to augment external ratings with other resources should be in proportion to the bank's direct and indirect exposure to a particular sovereign. For example, if a bank has a material amount of direct lending to a sovereign or an indirect exposure to corporate and/or retail lending in the sovereign, bank management should refine the risk sensitivity of its risk ratings by augmenting external rating agency information with an internal credit assessment.

377.   A bank's risk rating capabilities should be in proportion to the materiality of exposure to the sovereign. It is inappropriate for a bank that has a material exposure to a sovereign to rely exclusively on information provided by external rating agencies. Such a bank should be capable of independently assessing the relevant factors that are likely to impact credit risk. Factors such as economic and political developments should be evaluated with a goal of projecting their likely impact on the sovereign's capacity and willingness to meet their obligations. These capabilities should be timely with respect to the developments and forward looking. Banks with material sovereign exposures should utilise information such as key forecasted macroeconomic variables (e.g. GDP growth, exports, imports, external debt, external current account, fiscal balance, etc.) to assist in the risk rating process.

378.   Banks with a material exposure to a sovereign must regularly monitor credit spreads of traded securities issued by the counterparty. While credit spreads provide useful information they are also affected by factors such as market liquidity and risk premia and as a whole do not appear to be an ideal measure of default probability. However, significant relative changes in credit spreads provide an indication of changes in market's perception of the issuer's credit quality. In such circumstances, the bank should re-evaluate its assessment of the sovereign's risk rating.

D.   Oversight over rating system and process

379.   Personnel that have specialised expertise in making such assessments should perform the sovereign risk rating process. In addition, the unit should be independent from any function whose performance evaluation is tied to the line of business' profitability. The unit should also have adequate resources to effectively carry out its responsibilities.

E.   Requirements for use of own estimates of LGD under the advanced approach

380.   The requirements for own-estimates of LGD note that any currency mismatch between the underlying obligation and the collateral must be considered and treated

conservatively in the bank's assessment of LGD. Transfer risk must also be treated accordingly. This is particularly crucial for sovereign exposures – as such, a bank must also assess the potential impact of foreign exchange risk on its loss severity, as this is likely to be a primary driver of a bank's loss severity when a sovereign defaults on its obligations.

Chapter 6: Key Issues in Developing an Approach to Equity Exposures for IRB Banks

I.   Overview

381.   The Committee sees the need for developing more risk sensitive approaches to determining the capital charges for equity positions held in the banking book. The adoption of such approaches is inherently desirable in widening the range of exposures across which banks can apply capital charges that are more commensurate with underlying economic risks. It would also reinforce the resilience of the internal ratings approach for corporate debt exposures by removing the possibility that banks could incur a lower capital charge as a consequence of holding the equity rather than the debt of high PD obligors.

382.   In stating this aim, the Committee recognises that a change in the capital treatment of equity is a major step and will require particular care in its development and implementation, including transition arrangements and, where appropriate, the need to grandfather some types of investment. The Committee is cognisant of (i) the contribution that banks have played historically in certain markets towards the provision of equity finance and (ii) the different motives for equity investments, as well as (iii) the significant holdings that numerous banks have developed over time.

383.   The Committee currently feels that more than one approach for a risk sensitive methodology for equity capital charges will have to be developed. For the purpose of this section, equity exposures are ownership interests in a corporation, partnership or other business undertaking. Such exposures would include preference shares as well as common shares. They could derive variously from strategic cross holdings, other banking book holdings of tradable equity, start-up and venture capital positions, indirect positions through funds and equity held as a result of debt/equity swaps. The Committee has developed a treatment for investments in group companies as part of its work on the scope of application of the Accord and any internal ratings treatment of equity will complement this approach. Trading book exposures are specifically excluded. To ensure that the economic risks associated with equity positions are covered, the Committee proposes that debt claims designed to mimic the features of ownership claims (e.g. interest payments linked to dividends or profits) will be included in the approach to equity exposures.

384.   To give direction to this dialogue, the Committee has identified two broad approaches that merit further consideration. First, a PD/LGD based approach that would be conceptually similar to that adopted for corporate debt. This would keep all corporate exposure within a single framework and avoid the need to run separate methodologies in parallel. This methodology could be more appropriate for equity investments that are not primarily held with an intent to resale for capital gain purposes. Rather, it includes investments in equity of a borrower with an aim to improve the quality of information on such a borrower. Specific classes of equity investments favoured by national law (i.e. programs to foster small business investments) may also come under this approach. Developing this methodology would necessitate determining a workable definition of default for equity.

385.   Second, a methodology based on market risk or stress testing. This approach seems appropriate for equities held mainly for capital gain purposes. Venture capital positions and indirect positions through funds usually fall in this category. This would introduce an approach that is conceptually different to the internal ratings framework. It is, however, an approach that a number of international banks utilise and which aims to capture both general and specific risk factors. Given the very different nature of the holding, the

second option could be quite distinct from an application of the Market Risk Amendment, although the emphasis would be on price volatility over a defined holding period.

386.   The Committee recognises that the ultimate choice of a particular approach (or approaches) under the equity IRB framework should be based on the nature of its equity holdings and the appropriateness of the underlying methodology to those holdings. For example, where a bank's earnings are materially affected by the market volatility of its equity positions, the approach used should attempt to capture this risk.

387.   In developing an effective treatment, the Committee also wishes to take account of the following issues:

*   Incentives vis-à-vis the revised standardised approach and the internal ratings approach to corporate debt;

*   The interaction with equity holdings in the trading book;

*   Differences in accounting treatments, which might require a different approach to equity holdings held at a historic cost that is well below market price as compared to other holdings.[21] In this respect, the Committee notes that to the extent that the capital charge is based on the market value or fair value of equity holdings (rather than historical cost), unrealised gains incorporated in such values should reduce the capital requirement on a dollar-for-dollar basis. Unrealised gains in excess of the capital requirement would continue to be eligible for inclusion in tier two capital, subject to a 55% haircut on the extent of such excess unrealised gains.;

*   Statutory provisions relating to the provision of equity finance;

*   Current and developing market practice and the systems costs associated with particular options; and

*   Developments in the discussions on accounting standards, especially the implementation of IAS39 ("Financial Instruments: Recognition and Measurement").

II.   Discussion of Approaches

388.   To focus industry comments, the following section outlines some of the issues associated with an internal ratings approach and a market/stress test approach to determining equity capital charges, including potential pros and cons of each approach. This discussion is not exhaustive. The Committee would find it particularly helpful if respondents could differentiate between different equity types when noting where they feel the balance of advantage rests.

A.   Internal ratings framework

389.   The internal ratings approach to corporate debt will include subordinated as well as senior debt instruments. Given that debt claims can be structured with varying levels of subordination, one approach would be to treat equity claims as the most subordinated liability on a given obligor while applying the general corporate debt methodology for internal ratings.

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[21]   The latent reserves attached to such stakes are eligible as tier 2 capital subject to a 55% discount.

This could be achieved by making an appropriately conservative assumption about LGD (e.g. 100%). This would eliminate the need to establish a distinct methodology for equity. It would, however, necessitate the development of definition of default for equity. While in many cases default on a debt claim to the same obligor could be treated as credit event in respect of equity as well, banks may advance equity funding without providing debt finance. As equity is commonly regarded as a claim that does not confer a formal right to receive economic benefits, it is not possible to utilise a legal definition of default. It may, however, be possible to develop a multiple legged definition of default that could include, inter alia, (a) a default on another financial claim on the same obligor; (b) a decision to strike a provision against an equity holding; and (c) certain forms of company restructuring.

390.   A methodological objection that has been targeted at an internal ratings approach is that this is not so well suited to capturing the intensity of loss associated with equity positions. As equity represents a first loss position, the market value of a share claim could fall significantly prior to a corporate debt default being recorded in respect of the same obligor. The internal ratings methodology also focuses on the counterparty or issuer risk of a given transaction. It is not an effective means of assessing general market risk or the non credit elements of specific risk (e.g. liquidity). At the same time, an internal ratings approach will be applicable to other tradable items (e.g. various debt securities, including government bonds) in the banking book even though their market values may fluctuate widely.

391.   Preliminary survey evidence shows that internal ratings are not used by a majority of banks in determining the economic capital allocation against equity investments, whereas such grading techniques are commonly used for debt.

(i)   Pros of a corporate debt framework for equity

- An internal ratings approach would encourage the development of a forward-looking and risk-sensitive approach to equity;

- This option would achieve greater simplicity in the regulatory framework; it would not be necessary to devise another portfolio or methodology for assessing risk.;

- The divide between debt and equity is not clear cut. The corporate debt portfolio will accommodate various subordinated liabilities and equity is the most subordinated company liability;

- It would avoid an inconsistency between the treatment of equity and other tradable securities in the banking book.

(ii)   Cons of a corporate debt framework for equity

- Neither a PD/LGD nor an EL approach represent common industry practice;

- Equity as the residual claim on a firm exhibits greater price volatility than other liability claims. A PD/LGD methodology while more risk sensitive may not capture the full economic risk of an equity position;

- While an internal ratings framework seeks to capture counterparty risk, it does not address general market risk and certain elements of specific risk (e.g. liquidity);

- There is no legal or other common definition of default associated with equity holdings.

B.   A market risk or stress test approach to equity positions

392.   The Committee feels that it is premature to develop a model of how a market based approach would work. But it has become apparent from preliminary surveys that there are a number of banks that use either a methodology based on market risk or make very conservative assumptions concerning potential loss when allocating economic capital. The Committee would therefore welcome further information from banks that apply market risk based methodologies to equity. It is recognised, however, that this may involve an approach that this markedly different from that outlined in the Market Risk Amendment to the Accord. Specific assumptions would, for example, have to be made concerning the relevant holding period and the level of confidence or degree of shock required. At the same time, it would need to be recognised that (in contrast to the trading book) equity positions in the banking book are often directionally long and relatively illiquid.

393.   An attraction of a more market-orientated approach is that it could capture better the loss intensity associated with equity positions. It also has the potential to achieve a wider coverage of risks by including both general and specific risk factors. In developing such an approach, it will be necessary to recognise that equity holdings may well take the form of venture capital investments made ahead of an initial public offering and that direct price data may not be readily accessible.

(i)   Pros of a market risk/stress test approach

- Such an approach can potentially capture the price volatility and loss intensity associated with equities;

- It can potentially address general and specific risk factors;

- A number of banks with well-developed risk management processes apply a market risk based framework or make very conservative assumptions regarding economic capital allocation.

(ii)   Cons of a market risk/stress test approach

- Many equity positions may be fairly illiquid (especially in the venture capital sector) and therefore assigning a market price may involve the use of proxies;

- Addressing market risk in the banking book would mean adding a further methodology for at least some equities.

III.   Equity Exposures: Key Issues where Feedback is Sought

394.   The Committee has identified two broad approaches for the treatment of equity that merit further consideration: a PD/LGD approach, and a methodology based on market risk or stress-testing. The Committee has highlighted various challenges associated with each of these approaches. Feedback on ways of overcoming these challenges and developing risk sensitive treatment for equities is particularly sought. Comments on other possible approaches for the treatment of equity are also welcome.

395.   The Committee recognises that the ultimate choice of a particular approach (or approaches) under the equity IRB framework should be based on the nature of its equity holdings and the appropriateness of the underlying methodology to those holdings. The

Committee would value comment on the desirability and feasibility of applying the two broad approaches identified in this document for different types of equity holdings, and on the interaction between such a treatment with the considerations highlighted above.

Chapter 7: Key Issues in Developing an IRB Approach to Project Finance

I.   Overview

396.   A number of challenging issues arise in considering how best to accommodate project finance lending within an IRB framework. When taken collectively, these suggest that a number of elements of the framework for corporate exposures may be inappropriate for project finance and that a separate approach is required.

397.   The key challenges identified by the Committee centre on the following points:

- The unique characteristics of the transactions that comprise project finance lending which make it difficult to define the scope of this portfolio;

- The limited availability of data for quantifying key risk characteristics and validating banks' estimates; and

- The challenge of calibrating risk weights given the specific risk characteristics of project finance (e.g. higher correlations among PD, LGD and EAD).

398.   The Committee feels that these challenges, while not making project finance ineligible for an internal ratings treatment, point to significant implementation and validation issues that need to be addressed. As a consequence, the Committee is reluctant at this stage to outline an articulated proposal for the IRB treatment of project finance.

399.   The Committee will be working over the coming months to expand and refine the IRB framework for project finance. Industry consultation will be a key element in this process. Following further analysis and industry feedback, the Committee will publish requirements for project finance as part of the new Accord.

II.   Range of Practice

400.   Project finance lending often exhibits characteristics that present challenges to the definition, quantification, calibration, and validation of an IRB framework. These characteristics include:

- The borrowing entity is typically a special purpose vehicle, which may insulate the 'actual' borrower(s) or sponsor(s) from obligations arising from the transaction;

- Lending supports large, long-term business operations backed by relatively unique and illiquid business assets; values can be volatile and/or difficult to establish and may evolve over the life of the project;

- The prospects for repayment are often measured against projected revenues and the financial standing of guarantors/sponsors in case projections are not met.

401.   The issues listed above suggest that material elements of the IRB approach for corporate exposures may be inappropriate for project finance. In devising a separate approach the Committee will need to take account of the issues highlighted below.

A. Definition of project finance portfolios

402. It will be necessary to devise a definition of default that ensures consistency across banks. The Committee proposes as a working definition that project finance is defined as lending in which the performance of the underlying, unique project, whether it is still under construction or already in development or use, is intended to warrant the debt service and, accordingly, serves as the primary source of repayment. This definition emphasises the extent to which loan performance depends on the performance of the underlying project. Project finance is likely to be a significant element in lending to sectors such as natural resources, mining, power, transport infrastructure, construction, telecommunications, and commercial real estate.

403. The Committee recognises that without amendment the above definition is likely to be too broad and additional qualifications are required to exclude some forms of lending that do not conventionally form part of project finance. The Committee will undertake further analysis to derive a more specific definition of project finance for IRB purposes.

B. Difficulties in measurement of PD, LGD, and EAD, and associated data limitations

404. The inputs to an IRB approach would also need to take account of some of the special features of project finance:

- The risk arising in project finance will often have two sources, namely risk associated with the vehicle company and risk associated with the sponsor(s);

- The uniqueness of each transaction makes estimation of PD and LGD – as well as supervisory calibration of unexpected loss – more problematic than for most other forms of business lending. In addition, given the more discrete nature of investments, good time series data may not be available to support PD/LGD assessments (or validation of these assessments);

- Projects are generally structured so that expected cash-flows from the project provide adequate debt service. The project's cash-flow analysis will very likely focus attention on forward-looking assessment of PD and LGD or EL directly;

- Projects do not have a track record (although their sponsors may well) and cash-flow projections depend on the assumptions made about future costs and revenues. The reliability of those assumptions is crucial.

405. These points highlight that the idiosyncratic features of project finance make it difficult to design standardised supervisory risk dimensions for use in any foundation approach.

C. The higher correlations among PD, LGD, and EAD

406. In corporate portfolios, the exposure risk and the recovery risk associated with individual loans are assumed to be idiosyncratic in nature. While the realised LGD and EAD of a bad loan may differ from their expected values, these differences are assumed to be independent across exposures. This assumption, while reasonable for corporate portfolios, may be less realistic for project finance portfolios.

407. Intuitively, it is reasonable to expect that the realised LGD and EAD associated with project finance loans may be driven by the same economic variables that affect loan defaults

(i.e. there is a higher correlation between the key risk drivers than is observed in the corporate portfolio). Project finance is structured and monitored so that present delinquency does not necessarily halt the availability of future financing and development of the project. Hence, rather than closing out the relationship with the borrower and the sponsor following a missed payment, the lender may choose to change the terms and conditions of its commitment. This results in strong interactions among PD, LGD, and EAD.

408. The structural and contractual features of project finance raise two further issues. First, the propensity for banks to seek a restructuring rather than a winding-up of projects makes the definition of PD less tractable than for C&I. Second, the role of the EAD measure is not always clear. A bank could say that EAD is represents current exposure, on the basis that it may withhold further drawings if the project is in difficulty. Alternatively, as long as the contractual schedule is met, it is likely that the full facility amount will ultimately be drawn. This points to having a conservative assessment of EAD.

409. Project finance is often secured by a charge on the receivables or assets of the borrower rather than collateral that is unrelated to the borrower's standing. But if a borrower defaults, it is likely to have reached a state where its assets or receivables have declined in value, again pointing to a strong relationship between default risk and recovery risk.

III. Potential Inputs into an IRB Framework for Project Finance

410. Given the issues outlined above, three broad options present themselves for the treatment of project finance portfolios within an IRB approach.

A. Option 1: separate analyses of PD, LGD, and EAD

411. Option 1 could be based solely on own estimates. This would result in a requirement for banks to have a rating system for project finance portfolios and to be able to derive separate estimates for PD, LGD, and EAD. Alternatively, as in the foundation approach for C&I, supervisory estimates of LGD and/or EAD could be set. The structure of the risk-weights would be similar to C&I, though the position and slope of the curve would probably be different for the reasons outlined above.

412. Such an approach would be consistent with that for corporate exposures. Supervisors could, moreover, take comfort from banks' assessment of each key risk driver. On the other hand, the likely correlations among the three components of risk, in particular between default risk and recovery risk, suggest that it may be difficult to separate these variables in this way. In terms of the feasibility of a foundation approach, data limitations and the unique characteristics of each product point to the difficulty in putting forward well-founded proposals in this regard.

B. Option 2: separate analyses of EL and EAD

413. Under this option, a bank's rating system would need to determine risk on the basis of expected loss (PD x LGD) rather than necessarily distinguishing between these variables. This would pick up the potential correlation between realised defaults and realised losses but perhaps only at the expense of the additional discriminatory power provided for by a separate assessment of PD and LGD. The risk weights would need to be based directly on the bank's estimate of EL (or through some decomposition of this EL estimate into PD and

LGD). A decision to use an EL measure could weaken the case for having a foundation approach for project finance.

C.   Option 3: provide for both options 1 and 2

414.   This is similar to the approach the Committee has adopted for retail portfolios. It provides options for those banks able to provide either separate estimates of PD and LGD or direct estimates of EL. Consideration would need to be given to whether an incentive (e.g. through the risk weight structure) was provided for banks to use one or other approach.

D.   Consideration of further dimensions

415.   The two complementary risk dimensions of maturity and granularity in the corporate approach also need to be considered.

416.   Maturity is relevant to a discussion of project finance exposures. First, project finance has long lead times and the notional maturity of exposures can be high. The effective maturity of such exposures can, however, be much shorter. Banks will regularly monitor the performance of the project against key contract terms. Loan covenants will stipulate that the ongoing provision of facilities or further drawings are conditional on these terms being met. This may strengthen the case for taking account of effective maturity within the revised Accord.

417.   In addition, as with retail portfolios there is a 'vintage' or 'seasoning' effect with project lending. Project finance deals can often be classified according to their point in the project life cycle, moving from conception to construction and development though to the commercial viability of the project. The risk profile attached to each period is very different, and estimates of PD, LGD and EAD may well be contingent on the phase of development.

IV.   Issues related to a risk weight structure

418.   The specific features of project finance portfolios noted above mean that the risk weights applied to corporate exposures may be inappropriate to apply in this area. A different set of weights therefore needs to be developed. These could have the same conceptual basis as the corporate risk weights but be set at different relative or absolute levels, or may have a different basis entirely (e.g. based on EL). The limited available data with which to derive a specific set of risk weights for project finance represents a considerable challenge to the Committee's ability to formulate proposals in this regard. This may require that a higher cushion for measurement error be incorporated in the risk weights for project lending subject to an IRB approach.

419.   The Committee therefore looks forward to working with the industry to develop credible risk weights based on experience of project based lending in the period immediately following the launch of this consultative paper.

V.   Preliminary thoughts on minimum requirements

420.   A set of minimum requirements will be required to support an IRB approach to project finance. As a starting assumption, it is likely that most of the minimum requirements specified for corporate exposures would also apply to project finance. In addition, these requirements would need to be supported by additional requirements specific to project finance. These would need to cover the following areas:

- *The structure of rating grades.* The requirements in respect of the minimum number of grades and the concentration of exposure within grades may need to be amended to take account of the more idiosyncratic and concentrated nature of project lending;

- *Rating criteria.* The factors that a bank ought to take into account in grading a project finance exposure are likely to be significantly different. These will place a much greater reliance on the use of cash-flow estimates and assumptions regarding future conditions;

- *The orientation of the rating system*. This will in part depend on the orientation of the IRB approach, in terms of whether this is three dimensional (PD, LGD, EAD) or two dimensional (EL, EAD);

- *Frequency of review*. Project finance exposures may be subject to more frequent review.

VI.   Project Finance: Key Areas where Feedback is Sought

421.   The Committee is seeking early industry comment during the consultative period on the issues identified in the following sections, in particular:

- Industry practice for rating project finance loans and allocating capital against such items;

- The definition of project finance proposed by the Committee;

- Industry views regarding the challenges identified by the Committee and its proposals for addressing them; and

- The extent to which the minimum requirements underpinning the IRB approach to project finance need to differ from those for corporate exposures.

Chapter 8: Granularity

I.   Importance of the Granularity Adjustment

422.   The *granularity* of a bank portfolio describes the extent to which there remain significant single borrower concentrations.[22] The more fine-grained the portfolio, the more thoroughly has the bank diversified away the idiosyncratic component of credit risk associated with individual positions, and, therefore, all else equal, the lower is the portfolio's economic capital requirement. In the theoretical limit of an infinitely fine-grained portfolio, such idiosyncratic risk has been diversified away perfectly, so that only systematic risk remains. As no bank portfolio can ever be infinitely granular, there is always in fact a residual of undiversified idiosyncratic risk in the portfolio. If this residual risk is ignored, then IRB regulatory capital will understate the appropriate economic capital requirement. Consultations with the banking industry indicate that significant single borrower concentrations can be found in banking institutions in many or all of the national markets. The granularity induced by these concentrations can have a material effect on bank risk profiles.

423.   Baseline IRB risk weights have been calibrated to reflect an estimate of the typical degree of granularity observed in large bank portfolios.[23] However, granularity can vary significantly across banks, even within the same national market. Bank portfolios with coarser than average granularity ought to require additional capital beyond that implied by the baseline risk-weights, and portfolios with finer than average granularity ought to require less capital than average. One particular concern is that portfolios of loans to small and medium-sized enterprises (SME) tend to be much more fine-grained than similarly sized portfolios of loans to large corporations. A granularity adjustment that fails to recognise such differences will inadvertently favour large corporate lending over SME lending, and thereby cause an unwarranted increase in the cost of funding for smaller companies. The need to recognise borrower concentration effects in the new Accord was also identified in industry comments on the 1999 June consultative paper. Therefore, the Committee concludes that a granularity adjustment is necessary to achieve a robust and appropriately risk-sensitive new Capital Accord.

II.   Conceptual Background

424.   Credit risk in a portfolio arises from two sources, systematic and idiosyncratic. Systematic risk represents the effect of unexpected changes in macroeconomic and financial market conditions on the performance of borrowers. Borrowers may differ in their degree of sensitivity to systematic risk, but few firms are completely indifferent to the wider economic conditions in which they operate. Therefore, the systematic component of portfolio risk is unavoidable and undiversifiable. Idiosyncratic risk represents the effects of risks that are peculiar to individual firms, such as uncertain investments in R&D, new marketing strategies,

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[22]   The granularity adjustment will be applied to all a bank's non-retail exposure classes, as defined in The New Basel Capital Accord (e.g., corporate, retail, sovereign exposures). For simplicity purposes, the discussion in this chapter may refer to these exposure classes as "portfolios."

[23]   The term "baseline IRB risk weights" refers to the risk-weights pre-granularity adjustment, but inclusive of any maturity adjustment (where there is an explicit maturity adjustment).

or managerial changes. Decomposition of risk into systematic and idiosyncratic sources is useful because of the large-portfolio properties of idiosyncratic risk. As a portfolio becomes more and more *fine-grained*, in the sense that the largest individual exposures account for a smaller and smaller share of total portfolio exposure, idiosyncratic risk is diversified away at the portfolio level. In the limit, when a portfolio becomes "infinitely fine-grained," idiosyncratic risk vanishes at the portfolio level, and only systematic risk remains.

425.   The design and calibration of the IRB approach to regulatory capital relies on decomposing risk in this manner. Under an IRB system, the risk weight on an exposure does not depend on the bank portfolio in which the exposure is held. That is, while capital charged on a given loan reflects its own risk characteristics, such as the credit rating of the obligor and the strength of the collateral, it is not permitted to depend on the characteristics of the rest of the bank's portfolio. To get this property of portfolio-independence, we must calibrate risk weights under the assumption of infinite granularity. Without this assumption, the appropriate capital charge for a facility would depend partly on its contribution to the aggregate idiosyncratic risk in the portfolio, and therefore would depend on what else was in the portfolio. With the assumption of infinite granularity, idiosyncratic risk can be ignored, so the appropriate capital charge for a facility depends only on the systematic component of its credit risk.[24]

426.   Of course, no real-world portfolio is infinitely fine-grained. Thus, there is always some idiosyncratic risk that has not been fully diversified away. If this residual risk is ignored, then a bank just satisfying IRB capital requirements will in fact be undercapitalised with respect to the intended regulatory soundness standard. To avoid such under-capitalisation, IRB risk weights have been scale upwards by a constant factor from the infinite granularity standard. The constant factor was chosen to approximate the effect of granularity on economic capital for a typical large bank. In order to capture variation across banks in granularity, we furthermore introduce a portfolio-level "granularity adjustment." This additive adjustment to risk-weighted assets is negative for banks with relatively fine-grained portfolios, and positive for banks with more coarse-grained portfolios.

III.   Scope of Application

427.   The granularity adjustment should, in principle, be applied at the most aggregate portfolio level possible. As a practical matter, we propose that it should be applied to the non-retail portion of total bank exposure. By its very nature, retail business is highly unlikely ever to worsen the granularity of a bank portfolio. Unless a bank has a very high proportion of its portfolio in retail loans, neither is it likely that the retail portion of the portfolio would greatly reduce the measured granularity of the total portfolio. The proposed treatment of granularity, therefore, is a conservative approach, but one that we believe is reasonable for the vast number of banks with well-managed risk management systems.

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[24]   A very similar intuition underpins the well-known CAPM model for equity returns. The idea in the CAPM is that returns on individual stocks are correlated with the market as a whole but also have their own idiosyncratic movements. Investors can diversify away the idiosyncratic movements by holding a broad basket of stocks, so need to be compensated with a "risk-premium" only for correlation with the market. To apply to our task at hand, substitute "capital" for "risk-premium."

IV. Methodology for the Granularity Adjustment

428. From a technical point of view, the challenge in the development of a granularity adjustment lies in the great variety of portfolios observed in the market. Some banks are predominantly exposed to large, highly rated corporate borrowers, other banks to lower-rated mid-market borrowers. Due to differences in policies towards collateral and work-outs, there may be significant differences in recovery experience both across banks and, within a single bank, across lines of business. Perhaps most importantly, some bank portfolios are more "lumpy" than others. That is, two banks might have the same number of borrowers, but still differ in the extent of concentration of exposure to their largest borrowers. In order to have a practical and robust rule for assessing the granularity adjustment, we need a way to cut through the complexity and variety of real bank portfolios.

429. The proposed granularity adjustment draws on the analytical result that, in the context of a homogeneous portfolio of loans to *n* borrowers, the additional economic capital needed to cover residual idiosyncratic risk takes a very simple form. Specifically, consider a portfolio where each borrower has the same rating (and so the same default probability) and the same sensitivity to systematic risk, and each loan has the same seniority and collateral arrangements (and so the same expected loss given default) and the same exposure size. For this portfolio, it can be shown that the economic capital for the residual idiosyncratic risk, expressed as a percentage of total exposure, is inversely proportional to the number of borrowers. The constant of proportionality depends on the probability of default (PD), expected loss given default (LGD), and the systematic risk sensitivity (F) of the exposures in the portfolio.

430. Throughout this chapter, it is assumed that PD and LGD are expressed in decimal form (e.g. 0.01 for a 1% PD.

431. The systematic *risk sensitivity* is a measure of the sensitivity of the borrower's performance to systematic risk. It takes the form

$$F = N\,(\alpha_1 \cdot G\,(PD) + \alpha_0) - PD,$$

where α_0 and α_1 are constants that depend only on the portfolio type.[25] The reasoning behind this functional form is explained in section 6 of this chapter. The N term of F is the same as the N component within the calculation of benchmark risk-weights (BRW), and the values of α_0 and α_1 are the same as those used in the BRW formula for each portfolio type. For commercial loans, we have α_0=1.288 and α_1=1.118. Coefficient values for other portfolios will be developed as the Committee determines the appropriate IRB benchmark risk weights for those portfolios.

432. The proposed granularity adjustment is designed to take advantage of the well-understood properties of economic capital for homogeneous portfolios. Under the proposal, this adjustment would be calculated through the following two-step process. In the first step, the bank's actual portfolio is "mapped" into a hypothetical portfolio of homogeneous exposures that exhibits a similar residual of undiversified idiosyncratic risk. The mapping method expresses the risk characteristics of the homogeneous portfolio in terms of four risk

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[25] Recall that N (x) denotes the cumulative distribution function for a standard normal random variable (i.e. the probability that a normal random variable with mean zero and variance of one is less than or equal to x), and G(z) denotes the inverse cumulative distribution function for a standard normal random variable (i.e. the value x such that N (x)=z).

drivers: (a) a weighted-average PD, denoted PD_{AG}; (b) a weighted-average LGD, denoted LGD_{AG}; (c) a weighted-average F, denoted F_{AG}; and (d) the portfolio's 'effective' number of loans, denoted n^*. In the second step, the granularity adjustment to risk-weighted assets is computed as a function of these four drivers. It is calculated as

$$\text{TNRE} \times \text{GSF}/n^* - 0.04 \times \text{RWA}_{\text{NR}},$$

where TNRE is total non-retail exposure, RWA_{NR} is total non-retail risk-weighted assets, and GSF is a "granularity scaling factor" given by

$$\text{GSF} = (0.6 + 1.8 \times LGD_{AG}) \times (9.5 + 13.75 \times PD_{AG}/F_{AG}).$$

433.   The term $\text{TNRE} \times \text{GSF}/n^*$ represents the gross quantity of risk-weighted assets needed to cover residual idiosyncratic risk. It is assumed that the baseline IRB risk-weights for non-retail assets (i.e. the RWA before granularity adjustment) incorporate a margin of 4% to cover average granularity. This 4% of baseline risk-weighted assets should therefore be netted out.

434.   In order to minimise reporting burden, the proposed mapping process expresses the risk characteristics of the homogeneous portfolio (i.e. PD_{AG}, LGD_{AG}, F_{AG}, and n^*) in terms of information already needed elsewhere in the IRB approach. Specifically, for each internal rating grade, defined for IRB purposes as loans having the same PD and the same portfolio type, the following information is required: (a) the PD and F for that grade; (b) the exposure-weighted average expected loss given default; (c) the share of total non-retail portfolio exposure held in the grade; and (d) a summary measure of exposure concentration within the grade called the "Herfindahl index." The first three of these items would be required to apply the baseline exposure-level IRB risk-weights, so impose no additional burden. The last item, the Herfindahl index, is easily computed from information on the distribution of exposures for loans within the grade, and is familiar to many practitioners due to its use in anti-trust analysis. A formula is given in the technical appendix.

435.   The PD_{AG}, LGD_{AG} and F_{AG} of the hypothetical portfolio are weighted averages of their grade-level counterparts from the actual portfolio. A weighted sum of the grade-level Herfindahl indices gives the "effective" Herfindahl index for the hypothetical portfolio. The effective number of loans, n^*, is simply the inverse of the effective Herfindahl index. All the formulae used in this procedure are trivial to implement in a spreadsheet. Details are given in *The New Basel Capital Accord* document.

436.   In calculating the granularity adjustment to risk-weighted assets, the role of the effective Herfindahl index within the calculations gives rigorous form to a compelling intuition. When we evaluate the risk in a portfolio, we know that it is not enough to ask how many borrowers the portfolio contains. We also need to know how the exposure sizes are distributed across the loans. If the portfolio contained 1000 borrowers, but 20 of these accounted for 40% of the exposure and another 60 obligors for most of the remainder, we would immediately recognise that the portfolio is not as well diversified as a portfolio of 1000 equal-sized loans. We might guess that the portfolio would behave comparably to an equal-sized portfolio of, say, 60 to 100 loans. Our proposed formula brings precision to what would otherwise be a subjective evaluation of the "effective n" for a portfolio. The more a portfolio's exposure is concentrated within a small number of loans, the higher is its effective Herfindahl index and thus (all else equal) the lower is our measure of effective n.

V.   Exposure Aggregation and Credit Risk Mitigation

437.   Accurate assessment of a granularity adjustment does depend crucially on appropriate aggregation of multiple exposures to a single borrower, and appropriate recognition of when borrowers with separate legal identity are effectively a single entity from a credit risk perspective. When a bank has multiple exposures to a single obligor, the *LGD* of the obligor is calculated as the average of facility *LGD*s, weighted by exposure size (EAD), and its systematic risk sensitivity is the average of facility *F* values, again weighted by EAD. As a guiding principle, if two borrowers have a strong corporate relationship and high default correlation, then they should be treated as a single obligor regardless of whether they have separate legal status. Under the proposal, related borrowers are to be identified using the same procedures as stipulated in national rules for limiting credit risk concentrations to single borrowers. With respect to a group of related borrowers, for purposes of calculating the granularity adjustment to capital, the *PD* of the aggregate group is assessed as the EAD-weighted-average *PD* of the individual legal entities.

438.   No special issues arise with respect to the treatment of credit risk mitigation techniques. Treatment of guarantees and credit derivatives in assessing the granularity adjustment should be consistent with the substitution rules specified for IRB treatment of credit risk mitigation techniques. For example, the guaranteed portion of an exposure is added to the bank's exposure to the guarantor and is deducted from the bank's exposure to the original obligor.

VI.   Technical Derivation

439.   The same mathematical properties of portfolio behaviour that underpin the IRB baseline risk-weights also offer guidance on the design of a granularity adjustment. Specifically, we can calibrate the granularity adjustment within a models-based framework that is broadly consistent with that used to calibrate the IRB risk-weights. The required theoretical results are stated below, but without proof.[26]

440.   By definition, the baseline IRB risk-weights are portfolio-independent, (i.e. the risk weight for an exposure is permitted to depend only on its own properties, and not the characteristics of the portfolio in which it is held). If it is assumed that there is only a single source of systematic risk, then value-at-risk (VaR) in an infinitely fine-grained portfolio can be decomposed into portfolio-independent exposure-level contributions. Thus, we can use the asymptotic large-portfolio behaviour of leading credit VaR models to calibrate our IRB system.

441.   To calibrate a granularity adjustment, we need to determine how quickly VaR converges to its asymptotic limit as a portfolio grows more and more fine-grained. This problem is most naturally and precisely framed within the context of a homogeneous portfolio. Say that we have a portfolio of *n* facilities, each with the same exposure size and risk properties. Let L_n be the random variable representing the credit loss suffered in the portfolio as a percentage of total portfolio exposure. In the default-mode case, this is simply

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[26]   For formal derivation, the reader is referred to Gordy, M.B., "*A Risk-Factor Model Foundation for Ratings-Based Bank Capital Rules*," September 2000. The proposed granularity adjustment is a slightly simplified version of the one described in that paper.

$$L_n = \frac{\sum_{i=1}^{n} D_i \cdot LGD_i \cdot EAD}{\sum_{i=1}^{n} EAD} = \frac{1}{n} \sum_{i=1}^{n} D_i \cdot LGD_i$$

where D_i is an indicator for default by obligor i (1 if default, 0 otherwise), LGD_i is the realised loss-given-default for i (which may be uncertain), and EAD is the exposure at default. The expression simplifies because EAD is assumed to be constant and the same across facilities. In the remainder of this chapter, we use "LGD" to denote the *expected* loss given default in order to distinguish clearly with the *realised* loss given default, which may be uncertain ex-ante.

442. Let VaR[L_n] be the value-at-risk associated with L_n at the target confidence level, and let VaR[L_∞] be the value-at-risk for the infinitely fine-grained portfolio (that is, for $n=\infty$) with the same exposure-level characteristics. It can be shown mathematically that, for reasonably large n, there is a coefficient β such that VaR[L_n] $\approx$ VaR[L_∞] + β/n. The larger is n, the more closely will the approximation hold. As we will see shortly, however, the approximation works quite well for relatively small values of n. It should be noted that this result does not depend on any particular model specification. It allows for idiosyncratic risk in recoveries, and also holds in the context of multi-state models in which credit loss is defined on a market-value basis.

443. Under a "total capital" definition of economic capital (i.e. representing EL+UL), the appropriate capital requirement on the portfolio is equal to VaR[L_n]. Assuming *for the moment* that IRB risk-weights are calibrated to an infinitely fine-grained portfolio, then the baseline capital charges will sum to VaR[L_∞]. Therefore, the appropriate portfolio-level granularity adjustment to capital is approximately β/n. At the end of this appendix, we show how to modify the granularity adjustment if IRB risk-weights are scaled to a standard other than VaR[L_∞].

444. Calibration of the β coefficient inevitably depends on the choice of model and its calibration. IRB benchmark risk-weights have been calibrated within a CreditMetrics™–style model. For the purposes of designing a granularity adjustment, however, we use a generalised version of the CreditRisk+™ model. The advantage is that the functional form of CreditRisk+™ risk-weights allows the granularity adjustment to be assessed with minimal reporting and computational burden. The obvious disadvantage is the greater potential for inconsistency with CreditMetrics™-based IRB exposure-level risk-weights. Fortunately, it is by now well-known that CreditRisk+™ can be calibrated so that the tail of its loss distribution will align closely with the tail of the CreditMetrics™ loss distribution.[27] So long as care is exercised in calibration, the discrepancy between our granularity adjustment and a full CreditMetrics™-based estimate can be kept to a minimum.

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[27] For details see Gordy, M.B., "*A Comparative Anatomy of Credit Risk Models*," Journal of Banking & Finance, January 2000.

445.   Default risk in our model is specified in the manner of the standard CreditRisk+™, but we also allow for idiosyncratic risk in LGD. The systematic risk factor, denoted X, is assumed to be gamma-distributed with mean one and variance σ^2. In our calibrated examples below, we set $\sigma=2$, which represents a reasonable but conservative assumption on the volatility of the business cycle. For a given VaR target percentile (or "confidence level") q, an exposure's contribution to asymptotic unexpected loss is given by

$$UL_{CR+} = LGD \cdot PD \cdot w \cdot (X_q - 1).$$

446.   The "factor loading" w measures the sensitivity of the obligor to systematic risk, and X_q denotes the qth percentile of the distribution of X. Note that X_q is a constant. It depends on the choice of σ, but not on the characteristics of the exposure or the portfolio. Therefore, if we are given a PD, LGD and UL for a particular exposure, we can immediately back out the value of w consistent with those inputs. In a default-mode version of CreditMetrics™, asymptotic UL for an exposure is given by

$$UL_{CM} = LGD \cdot (N(\alpha_1 G(PD) + \alpha_0) - PD),$$

where coefficients α_0 and α_1 are determined by the assumed asset-value correlations for obligors in the asset-class.[28] Therefore, if we set $UL_{CM} = UL_{CR+}$, we can solve for the CreditRisk+™ factor loading as

$$w = \frac{N(\alpha_1 G(PD) + \alpha_0) - PD}{PD \cdot (X_q - 1)} = \frac{F}{PD \cdot (X_q - 1)},$$

where F is the systematic risk sensitivity defined above.

447.   Loss given default is assumed to be gamma-distributed with expected value LGD and volatility VLGD (that is, variance is VLGD squared). To minimise the complexity of our calibration, we set VLGD as a function of LGD. Drawing on an empirical approximation rule sometimes applied in industry models, we set

$$VLGD = V(LGD) \equiv \frac{1}{2}\sqrt{LGD \cdot (1 - LGD)}.$$

Under this rule, VLGD is highest for LGD near 50% and is reduced to zero when LGD goes to zero or to one.

448.   Value-at-risk is reported in Table 7 below for LGD=50%, CreditMetrics™ asset-value correlation of 20%, and a range of PD values. Chart 5 below presents the same information in graphical form. Even for n as small as 200, it is clear that the idiosyncratic risk portion of VaR is disappearing in proportion to $1/n$. The slope of each line is equal to our estimated β for the corresponding grade.

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[28]   If ρ is the asset-value correlation for a given asset-class, then $\alpha_0 = \Phi^{-1}(q) \times SQRT(\rho/(1-\rho))$ and $\alpha_1 = SQRT(1/(1-\rho))$. The higher is ρ, the higher is ULCM, so the higher is the CreditRisk+ w. By including F directly in the calculations, we retain the flexibility to assign different ρ to different asset-classes.

Table 7

Convergence of VaR to its asymptotic value in homogeneous portfolios

PD (%)	N					
	200	500	1000	2000	5000	∞
0.10	1.179	0.962	0.884	0.844	0.820	0.803
0.50	3.369	3.122	3.038	2.995	2.969	2.952
1.00	5.432	5.175	5.088	5.044	5.017	5.000
2.50	10.084	9.812	9.720	9.674	9.646	9.628
6.00	17.508	17.212	17.114	17.064	17.034	17.014
15.00	29.000	28.657	28.543	28.486	28.451	28.428

Note: VaR reported as a percentage of total exposure. LGD=0.50, VLGD=0.25%.

Chart 5

Granularity Adjustment as Linear Function of 1/n
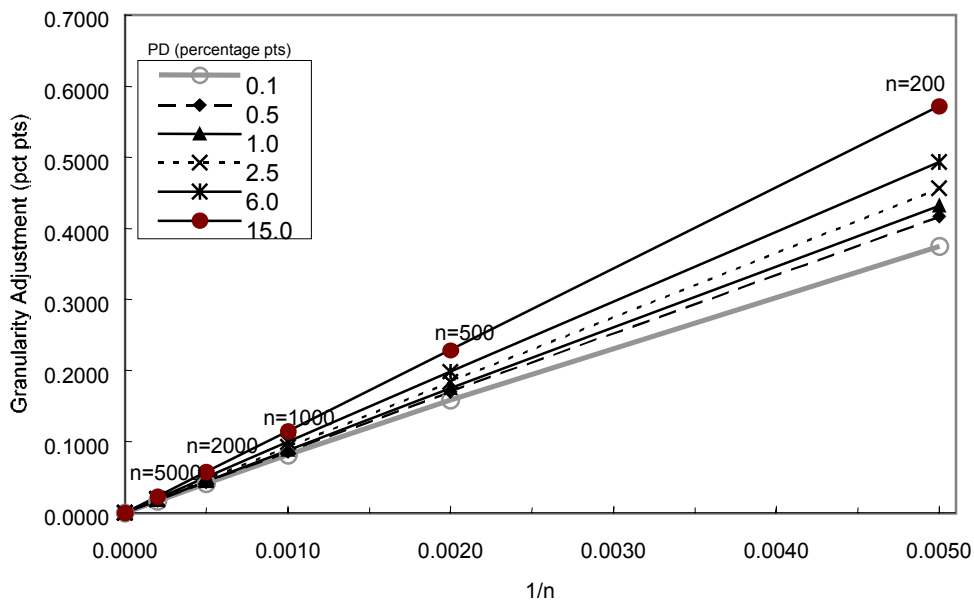
449.   So far, we have assumed a homogeneous portfolio. For a heterogeneous portfolio, no treatment short of full internal models can produce a perfectly precise granularity adjustment. Nonetheless, a simple approximation works quite well. We map the heterogeneous portfolio to a hypothetical homogeneous portfolio with similar aggregate behaviour. We need to solve for four characteristics of the hypothetical portfolio: the number n^* of equal-sized exposures in the portfolio, the default probability (PD_{AG}) of its borrowers, the expected loss given default (LGD_{AG}) of its exposures, and the systematic risk sensitivity (F_{AG})

on the exposures. The bank is assumed to provide the following information for each risk-grade *b* in the non-retail portfolio:[29]

- *TNRE* = total non-retail exposure (in units of currency), i.e.

$$TNRE = \sum_b \sum_{i \in b} EAD_i \, .$$

- s_b = the share of risk grade *b* in total exposure, i.e.

$$s_b = \sum_{i \in b} EAD_i \left/ \sum_b \sum_{i \in b} EAD_i \right. \, .$$

- PD_b = the probability of default within one year associated with grade *b*;

- F_b = the systematic risk sensitivity associated with grade *b*;[30]

- LGD_b = the exposure-weighted average expected loss given default in grade *b*, i.e.

$$LGD_b = \sum_{i \in b} EAD_i \cdot LGD_i \left/ \sum_{i \in b} EAD_i \right. \, .$$

- H_b = the Herfindahl index of exposure concentration within the grade, which is calculated from the exposure sizes for the individual loans (subscripted with *i*) in the grade:

$$H_b = \sum_{i \in b} EAD_i^2 \left/ \left(\sum_{i \in b} EAD_i \right)^2 \right. .$$

450.   The default probability and systematic risk sensitivity for the hypothetical portfolio is calculated as the exposure-share-weighted average of the grade-level PD and *F* in the actual portfolio, i.e.

$$PD_{AG} = \sum_b s_b \cdot PD_b \text{ and } F_{AG} = \sum_b s_b \cdot F_b.$$

451.   Thus, the hypothetical portfolio has the same average default rate as the actual portfolio. The expected LGD for the hypothetical portfolio is a weighted average of the grade-level values, where the weight for a grade is its exposure-share times its probability of default, i.e.

$$LGD_{AG} = \frac{\sum_b s_b \cdot PD_b \cdot LGD_b}{\sum_b s_b \cdot PD_b}.$$

[29] Throughout the derivations, subscript *b* indexes the internal borrower grades, and the notation $i \in b$ refers to borrowers *i* in grade *b*.

[30] i.e. F_b has a relation to the risk weights.

452.   A consequence of the PD and LGD mapping equations, taken together, is that the hypothetical portfolio has the same expected loss rate as the actual portfolio. The final mapping equation gives the number of loans in the hypothetical portfolio as the inverse of a weighted sum of the grade-level Herfindahl indices. The weights are chosen in order that the contribution of undiversified idiosyncratic risk to the volatility of credit losses is the same in the actual and hypothetical portfolios. That is, we choose n^* for the hypothetical portfolio so that the expected conditional variance of loss matches the corresponding quantity in the actual portfolio. The formula in our generalised CreditRisk+™ model is

$$E[Var[L_n \mid X]] = \sum_b \{LGD_b^2 (PD_b \cdot (1 - PD_b) - (PD_b \cdot w_b \cdot \sigma)^2) + PD_b \cdot VLGD_b^2\} H_b S_b^2.$$

453.   The same quantity for the hypothetical homogeneous portfolio is

$$E[Var[L^* \mid X]] = \frac{1}{n^*}(LGD_{AG}^2 (PD_{AG} \cdot (1 - PD_{AG}) - (PD_{AG} \cdot w_{AG} \cdot \sigma)^2) + PD_{AG} \cdot VLGD_{AG}^2).$$

454.   We apply our rule of thumb for VLGD, and use our solution for the CreditRisk+™ factor loading to substitute

$$PD \cdot w \cdot \sigma = F \cdot \frac{\sigma}{X_q - 1}.$$

Given σ=2, the expression σ/(X_q -1) equals 0.182.

455.   Rearranging these equations, we can write $n^* = 1 / H^*$ where H^* is the portfolio's effective Herfindahl index, which, in turn, is defined as

$$H^* = \sum_b A_b H_b s_b^2.$$

The weights A_b in the expression for H^* are given by

$$A_b = \frac{LGD_b^2 \cdot (PD_b \cdot (1 - PD_b) - 0.033 \cdot F_b^2) + 0.25 \cdot PD_b \cdot LGD_b \cdot (1 - LGD_b)}{LGD_{AG}^2 \cdot (PD_{AG} \cdot (1 - PD_{AG}) - 0.033 \cdot F_{AG}^2) + 0.25 \cdot PD_{AG} \cdot LGD_{AG} \cdot (1 - LGD_{AG})}.$$

456.   The β coefficient for the portfolio is calculated as a function of PD_{AG}, LGD_{AG} and F_{AG}. In its exact form, this function depends on solution of the CreditRisk+™ loss distribution. Fortunately, one finds that the function for β is approximately separable, and can be accurately calculated using the following formula:

$$β \approx (0.4 + 1.2 \times LGD_{AG}) \times (0.76 + 1.10 \times PD_{AG}/F_{AG}).$$

For LGD_{AG} in the range from 5% to 95%, PD_{AG} in the range from 0.10% to 15%, and CreditMetrics™ asset-value correlations in the range from 0.1 to 0.3, the relative error in this approximation formula is always less than 1% of the "true" β.

457.   We now return to our earlier assumption that baseline IRB risk weights are calibrated to CreditMetrics™ under infinite granularity. In fact, while risk weights are proportional to the asymptotic VaR in CreditMetrics™, they are scaled in order to ensure that a commercial loan of PD 0.7025%, LGD of 50% and maturity of three years has risk-weight of 100. This calibrated assumes implicitly that roughly 4% of baseline capital is intended to cover the effect of granularity in a typical large bank portfolio. To be consistent with this

calibration, we need to rescale the gross granularity adjustment and then net out 4% of baseline non-retail risk-weighted assets. By rescaling β, we arrive at the following formula for the *granularity scaling factor*

$$GSF = (0.6 + 1.8 \times LGD_{AG}) \times (9.5 + 13.75 \times PD_{AG}/F_{AG}).$$

The granularity adjustment to risk-weighted assets is calculated as the difference between (a) total non-retail exposure times GSF/n^*, and (b) 4% of total non-retail baseline risk-weighted assets.

Chapter 9: Implementation Issues

458.   This section addresses three issues related to implementation of the IRB approach. The first relates to relaxing certain minimum requirements for the foundation IRB approach during a transition period. The second issue concerns the timely adoption of the IRB approach across all exposures in the banking book. The third issue concerns the advanced IRB approach only and deals with a timely rollout of a bank's own estimates of LGD and EAD, and the adoption of the advanced treatment of guarantees and credit derivatives.

I.   Transitional Arrangements

459.   The Committee believes that adherence to a fully-developed set of minimum requirements (outlined above) is essential to ensuring the integrity, reliability, consistency, and accuracy of both internal rating systems and PD data for each grade. Adherence to these requirements is, therefore, essential to ensure that internal measures are appropriate for use as the basis for a regulatory capital charge for credit risk. In the Committee's view, to achieve this goal, the minimum requirements for the IRB framework should be rigorous, and not developed on the basis of a target set or number of banks that should be eligible for the IRB approach.

460.   The Committee acknowledges that full and immediate adherence to certain minimum requirements may not be possible for banks with otherwise well-managed and sophisticated credit risk management systems at the time of implementation of the new Accord. Therefore, the Committee is considering that supervisors could, as a matter of national discretion, accept partial satisfaction of a very limited set of specific minimum requirements over the course of a specified transition period. Adherence to all minimum requirements not specifically identified would be necessary from the outset in order for a bank to be eligible for the IRB approach. During this transition period, a bank would be required to demonstrate steady progress towards compliance with the full set of minimum requirements by the end of the transition period.

461.   For corporate, bank and sovereign exposures, the Committee proposes to relax the requirement that irrespective of whether a bank is using external, internal, or pooled data sources, or a combination of the three, for its estimation of probability of default (PD), the length of the underlying historical observation period used must be at least 5 years. As such, a bank must have a minimum of 2 years of data by the time of implementation (i.e. in 2004); this requirement will increase by one year for each subsequent year of transition.

462.   For corporate, sovereign, bank, and retail exposures, the requirement that banks must adhere to the minimum requirements set out in The New Basel Capital Accord for a period of 3 years may also be relaxed during the transition period. A bank will need to meet this requirement by the conclusion of the transition period.

463.   For retail exposures, the Committee proposes to relax the requirement that irrespective of whether a bank is using external, internal, or pooled data sources, or a combination of the three, for its estimation of loss characteristics (PD and LGD, or expected loss (EL), as well as EAD) the length of the underlying historical observation period used must be at least 5 years, will also be subject to transition.

464.   Banks being in supervisory approved transition should disclose this periodically, at least with the same minimum frequency as for other core disclosures under Pillar 3 (see *The*

New Basel Capital Accord, and the Supporting Document *Pillar 3: Market Discipline*). Such a disclosure should include: the specific minimum requirements to which the transition applies, the areas and the degree of missing compliance, and finally the progress made towards compliance with the full set of minimum requirements.

465.   The Committee is not proposing a "transition" period for adherence to any of the minimum requirements for the elements of the advanced internal ratings based approach to corporate, bank, and sovereign exposures. Adherence to all applicable minimum requirements from the outset is necessary given the increased reliance of banks' internal assessments and the greater risk sensitivity of these approaches.

II.   Adoption of the IRB Approach Across all Exposures

466.   The Committee seeks to ensure that minimum capital requirements continue to provide prudential coverage and to prevent so called "cherry-picking" opportunities during the transition from partial coverage to full implementation of IRB across group companies.

467.   If IRB is adopted only partially there is the risk that a bank could minimise the impact of more risk sensitive capital requirements by the following means:

- Adopting an IRB approach only to segments of a business that are "low risk" for example only to highly rated credits);

- Adopting an IRB approach to only legal entities with lower risk portfolios or to those that have a minor share of single name concentrations (the rest being booked primarily at group companies that are not subject to IRB); and

- Using guarantees, credit derivatives and the like to transfer high-risk exposures from an entity using IRB to an entity using the standardised approach on selected exposures.

468.   The question the Committee faces becomes how to accommodate the roll-out of the IRB framework across the consolidated group of companies without allowing banks to game the capital framework in any combination of the above mentioned ways.

469.   To address these concerns, the Committee proposes that a banking group that has met the requisite minimum requirements and is on the IRB approach for some of its exposures must adopt the IRB approach across all exposures and significant business units (groups, subsidiaries, and branches) within a reasonably short period of time. Banks must agree to an aggressive, articulated rollout plan with the home supervisor. Additionally, within the rollout period, no capital relief would be granted for intra-group transactions between the IRB bank and a business unit on the standardised approach. This treatment includes asset sales or cross guarantees.

470.   The Committee recognises the challenge of adopting IRB across the banking group, and as such proposes that some exposures in non-significant business units that are immaterial in terms of size and perceived risk profile may be exempt from the above rule, subject to national discretion. Capital requirements for such operations will be determined according to the standardised approach. Under such circumstances, national supervisors will consider whether a bank should hold more capital through the implementation of Pillar 2. Consistent with the above proposal, no capital relief would be granted for intra-group transactions between an IRB bank and a business unit on the standardised approach. This would again include asset sales or cross guarantees.

III.   Adoption of Elements of the Advanced Approach for IRB

471.   The Committee has developed proposals for three elements of the advanced approach: LGD, EAD, and guarantees and credit derivatives. Each of these is associated with a specific set of minimum requirements. In this respect, the Committee considered whether banks could adopt the proposed advanced treatment for some risk drivers, for example LGD alone, but not others. In discussing this issue, the Committee considered a range of approaches.

472.   The Committee recognised that each factor (LGD, EAD, and the substitution ceiling treatment for guarantees and credit derivatives) comes with its own minimum requirements. As such, at one end of the range, a bank could be allowed to adopt the advanced treatment of each element once it has met the requirements for that element. This approach would be consistent with the philosophy that the requirements for the advanced approach relate solely to the risk factor for which banks are providing an internal estimate. One concern raised by such an approach is a bank's potential ability to cherry-pick the rules by moving to the advanced approach for one risk driver but remaining on the standardised approach for another. At the other end of the range, the Committee considered requiring a bank to meet all the requirements for own estimates of LGD, EAD, and the substitution ceiling approach in order to adopt the advanced treatment of these components. This approach would address the concern over cherry-picking. Concern was, however, expressed that it might pose too high a hurdle and hence a disincentive for banks to improve their risk management practices and to adopt the advanced treatment of these elements.

473.   The Committee concluded that a blended approach would capture the best elements of both. As such, when a bank has met the requirements for any of these elements, the advanced treatment of this element would apply. The Committee is proposing that a bank would initially be allowed to move the advanced approach for any of the elements. However, once a bank adopts the advanced treatment for one risk element, supervisors would expect the bank to move to the advanced approach for the other risk factors within a reasonably short period of time, subject to the bank's ability to demonstrate that they meet the requisite requirements. To support this, the bank would need to agree to an aggressive implementation plan with its supervisor.