# CREDIT RISK AND REGULATORY CAPITAL

**International Swaps and Derivatives Association**

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## CONTENTS

## EXECUTIVE SUMMARY

**ISDA believes there is an urgent need to reform the credit risk capital regime (see Part A)**

- This has been highlighted by recent advances in risk management methodologies and the growth of the credit derivatives market
- There are numerous significant flaws in the current credit risk capital rules, which have adverse effects on credit pricing, hedging, collateral use and portfolio credit risk management

**ISDA recommends an "Evolutionary Models-Based Approach" as a framework for reform, allowing use of portfolio credit risk models or – as an interim step – simple credit risk models, as an alternative to the current standardised rules (see Part B)**

- This approach would allow capital calculation methods to evolve in line with a bank's improvements in internal risk management practice, so that differentiated risk weighting, term structure, offsets and diversification are incrementally recognised
- An evolutionary approach also would allow a bank to model different asset classes in line with current capabilities and data availability
- We stress it is important to avoid replacing one-size-fits-all standardised rules with a one-size-fits-all models-based alternative
- We propose a number of qualitative standards for the use of models and discuss backtesting, stresstesting and model parameters in some depth
- We discuss data issues related to modelling use in some depth and survey current data availability (see also Annex III)

**ISDA recommends that the standardised capital rules themselves be amended to encourage credit hedging by recognising offsets between short and long credit risk positions (see Part C)**

**This paper includes a quantitative analysis of different credit risk management and modelling techniques, contrasting these to the standardised rules (see Part D)**

**ISDA recommends that the current regulatory capital treatment of collateral be revised, as this is inconsistent and out of step with current market practice (see Part E)**

- We recommend allowing recognition of all forms of collateral, provided that prudent haircuts are applied based on approved internal models
- The lack of a common international framework for collateral use poses prudential concerns and should be addressed

**ISDA calls on the financial industry to encourage the use of improved credit risk management techniques**

- We welcome the recent actions by some industry participants to make publicly available new methodologies for credit risk modelling. We call on others to take similar steps
- We welcome and encourage steps towards enhanced disclosure of credit risk
- We recommend a number of steps to improve credit data quality
- We are launching a credit risk page on our website (www.isda.org) to provide information about credit risk management techniques and links to publicly available modelling techniques and data sources

**ISDA calls on the Basle Committee of Banking Supervision to publish proposals by the end of the year setting out its thinking on the credit risk reform process and invites comments on our proposals from interested parties**

## A. THE NEED FOR REFORM OF THE CREDIT RISK CAPITAL REGIME

ISDA believes it is time for the banking industry and supervisory community to work together to reform the regulatory capital regime for credit risk. When the existing rules were developed in the mid-1980s, they were a bold and welcome step in establishing a common international regulatory capital framework. Now, it is clear that the existing framework is demonstrating severe weaknesses which are distorting, indeed in some cases positively inhibiting, prudent credit allocation and credit risk management.

While the inherent weaknesses of the current regime have been understood for some time, they have recently come to cause fresh problems. The development of more sophisticated credit risk management techniques, such as models which allow bank-wide portfolio management of credit risk, have exposed the inability of the current capital rules to encourage prudent risk diversification or recognise widely varying levels of risk among broad categories of credits. In parallel, while the emergence of the credit derivatives market has provided a new tool to hedge credit risk, the current capital regime at best imperfectly recognises this and in some cases punishes banks for prudent risk management. The blunt rules for collateral similarly inhibit good risk management. Underpinning these problems is a growing realisation that some of the simplifications of the current rules – the broad risk weighting categories and the lack of a term structure of credit risk – have distorted bank lending and allocation decisions, leading to mispricing of risk.

Thus, there is an urgent need to begin a dialogue in the industry and supervisory community concerning reform of the existing regulatory capital rules. ISDA recognises that the process of reform will pose challenging questions for both financial firms and supervisors and will therefore take some time to complete. However, we can see no advantage in postponing this process: the need for reform should be clear to all and to delay at least starting to contemplate change simply means that the problems with the current rules will become much more severe.

This paper is therefore intended to stimulate debate about the shape of any reform of the current capital regime. It sets out (in Part B) ISDA's view that the credit risk capital framework should adopt an "evolutionary" internal models based approach, allowing supervisory recognition of not only full portfolio credit risk models, but also simple models that recognise differences in degrees of risk and term structure. We also describe, in Part C, the elements of a simple, discrete amendment to the standardised rules to recognise offsets between long and short credit risk and outline the elements of a simplified model in Annex IV.

These proposals (and others concerning reform of collateral rules in part) are set out below in greater depth, exploring issues such as the appropriate qualitative standards for credit risk models and the current data issues posed by modelling.[1] Also, in Part D, we provide a quantitative analysis of the different alternative methods described. First, we look at the weaknesses of the current capital regime.

### 1. Weaknesses of the Current Capital Regime

The current credit risk capital regime for banking institutions was established by the 1988 Basle Capital Accord[2], which provided an international supervisory capital standard in this area for G10 countries. The Accord was also subsequently adopted more widely and has become the global benchmark for regulatory credit risk capital standards. Within the European Union, the Capital Accord was first adopted for banks through two directives the Solvency Ratio and Own Funds Directives[3] and was later also applied to investment firms.[4]

The Accord as a whole has evolved in response to market changes and risk management innovation. In January 1996, the Committee published an amendment to the Accord to set market risk capital requirements, including an internal models alternative to the use of standardised rules. This change was based on a division between the banking and trading books of an institution, the former subject to the 1988 Capital Accord and the latter to the new market risk standards.

In the credit risk area, the Accord has also been revised, to allow the recognition of close-out netting for derivatives contracts in 1994 and to both revise and allow partial recognition of

[1] See Annex III.

[2] Committee on Banking Regulations and Supervisory Practices (1988) International Convergence of Capital Measurement and Capital Standards.

[3] 89/647/EEC and 89/299/EEC respectively.

[4] 93/06/EEC.

netting of the "add-ons" for potential future exposure a year later.

These have been welcome changes that have shown the Basle Committee is sensitive to the need to reform the regulatory capital regime to encourage prudent and more sophisticated risk management practice. However, the basic core of the 1988 Capital Accord – the main rules applying to credit risk - have not been revised. It is increasingly clear that these are subject to a number of significant weaknesses. These are described in turn below and then the implications of these flaws are analysed.

### 1.1. Limited Differentiation of Credit Risk

At the heart of the 1988 Capital Accord is a differentiation of credit risks into broad categories. While there are further refinements than this, the basic approach is that OECD government exposures receive no credit risk capital charge, OECD banks and non-OECD governments receive a 1.6% capital charge, mortgages receive a 4% capital charge and other banks and all corporate and other exposures receive an 8% charge.[5]

This framework is designed to provide a simple differentiation between main types of credit risk. However, the weaknesses of this crude split are easy to appreciate.

Most obviously, it is clearly inappropriate to treat all corporate and other exposures as having equal credit risk. This places a loan to a low credit risk corporate with a AAA credit rating on the same par as an exposure to a fragile business with a below investment grade rating, a loan to a small business or a personal unsecured loan to an individual.

Also, the criteria for distinguishing between broad categories is open to challenge: why should an exposure to, say, Turkey (an OECD country with a B1 Moody's credit rating, trading at 350 basis points spread) receive no charge while an exposure to China (a non-OECD country with an A3 credit rating, trading at 100 basis points spread to US Treasuries) receive a higher 1.6% charge? Similarly, it is not obvious that all OECD banks are only 1/5$^{th}$ as risky as non-OECD banks or corporates.

Finally, these broad categories fail to distinguish the relative seniority of the instrument in question. A junior and senior bond held for investment purposes (and therefore in the banking book of an institution) would normally receive the same capital charge despite the fact that recovery rates between the two instruments will differ and therefore the level of risk is distinct. Even the trading book specific risk standardised rules suffer from this same flaw to some degree.

These deficiencies are well know and are inevitable under any standardised rules, which must apply general rules that are easily understood and implemented. However, these weaknesses should not be disregarded. Moreover, the crude nature of the credit risk categories has become more problematic as banks themselves have begun to take a more refined approach to the pricing of credit risk, making finer distinctions between types of exposure than when the Accord was introduced.

### 1.2. Static Measures of Default Risk

Related to the assignment of broad categories of credit risk is the fact that the current rules are based on a static generalised assessment of credit risk. The whole credit risk capital regime is based on the assumption that an 8% of capital requirement is a reasonable protection, on average, for corporate credit risk. From this 8% overall charge, the system of risk weighting is then used to make basic adjustments for the broad categories discussed above.

Firstly, this raises the question as to whether the 8% benchmark appropriately reflects average credit risk. However, even if the quantitative basis for this figure were established a further weakness is clearly that it is a static charge established at one point in time – the mid 1980s – and does not reflect actual, dynamic changes in default risk over time. A modelling approach can avoid this flaw by setting capital charges in relation to actual assessments of default risk which change over time in response to actual overall economic circumstances and the changing risk profile of individual credits. Capital charges therefore reflect evolving reality and are not fixed arbitrarily for all time.

[5] These charges are, respectively, 20,50 and 100% weightings of an 8% capital charge.

### 1.3. No Recognition of Term Structure of Credit Risk

The existing credit risk capital rules also do not provide for a term structure of credit risk. Capital charges are set at the same level regardless of the maturity of a credit exposure. Thus, a drawn loan of one month to a corporate receives the same capital requirement as a drawn loan of one year. However, the risk of default is clearly greater for the longer exposure, as there is a longer opportunity for the credit quality of the loan recipient to migrate downwards. In the case of a bond, for example the one-year default probability of a Baa1 issuer is only 0.06%, but the cumulative five-year default probability is 1.53%[6].

The current rules also provide no distinction between current and forward credit exposures. For example, an immediate credit risk exposure receives the same capital charge as one which arises in, say, two years time. This means that the shape of the forward credit curve is disregarded. This has implications not only for the pricing of risk, but also for assessing the residual risk of a forward position arising from a hedging position involving long and short credit positions of different maturities.

This lack of recognition of the term structure of credit risk is at odds with best internal risk management practice. Many banks will distinguish between the risk arising from different maturities, either through standard rules or through the application of modelling techniques that assess the cumulative default risk of longer exposures by recognising credit migration risk.

### 1.4. Simplified Potential Future Counterparty Risk Calculation

The counterparty risk capital rules for off-balance sheet instruments have, as noted above, been revised over time by the Basle Committee, most notably to allow recognition of close out netting.[7] This is very welcome. However, even so significant weaknesses remain in the standardised approach to potential future exposure (PFE).

Most clearly, the current "add-on" charges for PFE suffer from the same problems as the basic banking book credit risk rules: the charges are based on broad categories that over-simplify the actual risks faced by banks. While the 1995 amendment to the Basle Accord refined these rules to set out a wider range of add-on categories[8] – now interest rates, foreign exchange, equities, precious metals, and other commodities – this is still much less refined than internal risk management practice would dictate for many institutions. It fails, for example, to distinguish between the different levels of risk in different currencies or national markets – the volatility of a Nikkei index position is, for example, greater than that of a Dow Jones index exposure – or between different types of commodities – base metals tend to be less volatile than many energy or soft commodities. Furthermore, applying the add-on charge as a percentage of the notional principal value of the instrument is itself a significant simplification, as it is well accepted that the notional principal size of a transaction can have an inconsistent, and in some cases a widely divergent, relationship to the underlying credit risk.

The rules currently also provide only limited and inexact recognition of the netting of potential future exposure, through the so-called "Net-to-Gross Ratio (NGR) Approach."[9] This may over- or underestimate the exact scope of netting for the PFE of a derivatives portfolio and, while a welcome improvement over the previous gross exposure approach, still falls short of a models-based approach.

The PFE rules generally fail to take account of offsetting positions: where two transactions are diametrically opposed it is clearly impossible to increase the future exposure on both of them at the same time, regardless of whether netting is in place. However, under the existing regime, charges are simply summed.

The interaction of the capital charge for current exposure and potential future exposure should also be noted. The counterparty risk formula provides for a potential future charge even when

[6] Moody's Investor Service, cited in JP Morgan's CreditMetrics Technical Document, p. 58.

[7] Committee on Banking Regulations and Supervisory Practices (1994) Amendment to the Basle Accord of July 1988.

[8] Committee on Banking Regulations and Supervisory Practices (1995) Planned Supplement to the Capital Accord to Incorporate Market Risks.

[9] The approach allows the ratio of net to gross current exposure to be used as an approximation for netting of PFE, but requires that the benefit of such netting be restricted to account for the uncertainty of this approximation.

the current exposure is significantly out-of-the-money. Thus, even though a bank may have a very large *negative* mark to market exposure on a position, the same PFE charge applies as if the position was at the money or deeply in the money. This ignores the fact that the market would have to move considerably to reduce and then eliminate the negative mark to market position before an exposure could arise in the future.

Finally, the counterparty risk rules also suffer from the other general weaknesses of the credit risk capital regime as a whole, such as lack of term structure and portfolio effects.

### 1.5. Limited Recognition of – and Standards for – Collateral Use

The increasing importance of collateralisation of derivatives exposures highlights the need to examine the existing capital rules in this area as well. Currently, the only forms of collateral that are recognised as providing full protection (i.e. eligibility for a 0% risk weighting) are OECD central government securities and cash. Also, as will be discussed further below, there are no internationally agreed standards for the legal and other issues raised by the use of this collateral.

The limited forms of collateral that are recognised as providing protection under the current rules are at odds with market practice and inconsistent with other elements of the capital regime. While OECD government securities and cash are indeed the mostly widely used forms of collateral, they are not the only forms transferred in the market. Other forms such as non-OECD government debt and equities may also be accepted. These are, for example, provided for under the ISDA Credit Support Annex and may be transferred under commercial collateral management services. Also, it is interesting to note that other forms of collateral will be acceptable for monetary policy operations and Real-Time Gross Settlement (RTGS) transfers through TARGET by the future European Central Bank.[10]

The rules also fail to recognise that other forms of collateral may perfectly protect against an underlying risk. For example, in the case of a call option on shares, holding the shares themselves as collateral provides perfect protection against the risk of counterparty default. The current capital rules fail to recognise this.

The rules on collateral are also inconsistent, at least in an EU context: while derivatives may only be collateralised by OECD government securities and cash for capital relief, there is no limit on the forms of collateral that may be recognised under Annex II of the CAD for repo transactions. Also, a pending amendment to the Solvency Ratio Directive will provide for recognition of wider categories of collateral against derivatives, but only where they are held under a clearing house arrangement.

These inconsistent and restrictive rules are clearly ripe for reform. However, the lack of internationally agreed standards for use of collateral should also be noted. There are, for example, complex legal issues raised by the application of collateral agreements during insolvency which touch on the jurisdictions of not only the counterparties but also of the location of the collateral. These mean that the contractual basis for the use of collateral has to be carefully prepared and that the legal position in relevant jurisdictions needs to be assessed. ISDA has, for example, developed standard credit support documentation for use of collateral in conjunction with the ISDA Master Agreement and is currently gathering opinions on collateral issues. We are also publishing a handbook for collateral practitioners. It seems clear that the growing use of collateral therefore also highlights the need to assess the appropriate legal and other standards that should apply in this area.

### 1.6. Constraints on an Integrated View of Credit Risk

Setting aside the lack of recognition of portfolio effects of credit risk for the time being, a significant weakness of the current regime is the extent to which it views credit risk in distinct categories with separate rules. Thus credit risk may, under the current regime, be broadly categorised under three headings: (1) banking book credit risk, (2) trading book specific risk (including default and event risk) and (3) counterparty risk.

These categories reflect the evolution to date of the Basle capital regime. However, for an institution that wishes to take an integrated view of credit risk to a particular name, they can pose an arbitrary distinction that imposes restrictions

[10] TARGET is the Trans-European Automated Real-time Gross settlement Express Transfer. See EMI (1997) The Single Monetary Policy in Stage Three.

on comprehensive risk management. In these cases, an institution may wish to aggregate credit risk from all these sources – loans giving rise to the first category of risk, traded bonds in the second category and swaps exposure in the third – to take an overall view of the exposure and then decide to hedge as appropriate.

### 1.7. Limited Recognition of Offsets

This narrow categorisation of credit risks under the capital rules also relates to the difficulty under the current regime of recognising offsets. Recognition of offsetting long and short risk positions is an accepted feature of other elements of the capital regime but is only permitted under very restrictive circumstances for credit risk.

As a general rule, offsets are usually only recognised where short and long credit risk positions are of identical maturity and relate to exactly the same instrument. Thus, no offsetting is permitted for a 10 year bond hedged by a 9-year credit default option, or for a bond and option of identical maturity, where the underlying position is a senior obligation and the reference asset is a junior obligation. However, in the former case, the hedge is in place for a considerable period, and in the latter, the likely relative recovery rates of the two instruments mean that an acceptable hedge is in place.

These restrictions apply for specific risk offsets under the standardised trading book rules and also for banking book rules in some jurisdictions. Also, even where maturities and instruments do match, it is unclear whether offsetting is permitted for credit derivatives used to hedge counterparty risk exposure. Instead, under these various circumstances, a bank may actually be punished by an additive capital requirement for entering into such a hedge.

These problems have been highlighted by the growing use of credit derivatives.[11] While these instruments provide a tool to hedge credit risk exposure, the current rules only provide limited recognition of the offsetting short credit risk position, if not providing an additive charge.

[11] Q4 1997 OCC US commercial bank call reports indicated outstanding credit derivatives volumes in excess of $90 bn, suggesting to practitioners global volumes of $300 bn or more, growing at a fast rate.

### 1.8. Lack of Recognition of Portfolio Diversification Effects

Under the existing capital regime, the charges applying to individual names are simply summed to provide an overall charge for the institution's credit risk portfolio. This is a significant flaw of the current rules. As is well accepted by modern portfolio theory, risk is significantly reduced by diversification, as the number of names in a portfolio increases and it is increasingly unlikely that losses will be suffered on all positions simultaneously in a portfolio.

This basic principle has now been recognised in the international market risk capital regime through the January 1996 amendment to the Basle Accord. This provides an alternative calculation method (subject to supervisory approval) involving the use of internal Value-at-Risk (VAR) models to calculate capital charges. By allowing recognition of these models, banks are rewarded for diversifying their market risk positions, as the model calculates the overall portfolio capital charge of these positions as a whole, rather than simply summing the charges.

The credit risk capital regime does not provide for use of such modelling techniques. Consequently, the rules provide no encouragement for prudent diversification of credit risk exposures. Thus, the same capital charges would apply if a bank had either a single $100 million credit exposure or one hundred $1 million credit exposures, even though the risk of the former is significantly higher. The following section of this report and the quantitative analysis set out in Part D provides further illustrations of this problem.

## 2. Impact of the Weaknesses of the Current Credit Risk Capital Regime

The weaknesses of the regime described above are not of mere academic interest but have very real implications for banking businesses. They lead to mispricing of credit, inhibit credit risk management and have other adverse consequences with tangible business costs, thereby raising prudential concerns. These provide compelling reasons for the reform of the current capital regime.

However, before enumerating the adverse implications of the current regime, it is perhaps worth noting why regulatory capital requirements are of such importance. It is noted by some observers that regulatory capital

standards should have little impact on banks: institutions should do what is right for risk management purposes regardless of the regulatory capital complications. In these respects, it is argued that the incentive impact of regulatory capital charges is overstated, especially when levels of economic capital are high in the banking industry and some institutions are in fact repurchasing shares.

Indeed, if regulatory capital ratios provided no more than a supervisory tool to reflect minimum prudential capitalisation standards, this might be true. However, the so-called "risk-based" capital charges of the current regime have a significant impact on perceptions of market commentators, including rating agencies and stock analysts. Consequently, these arguments have their merit, but fail to present the whole picture. Financial institutions should – and most are – driven by an objective, internal view of good risk management practice. But the simple fact is that regulatory capital charges do impact on the pricing of individual banking products. For example, mortgage lending is less regulatory capital intensive than corporate lending, so this activity is encouraged by the current capital rules. The rules impact on bank ratings, funding costs and share performance. Also, if regulatory capital charges positively punish the hedging of credit risk by adding to capital requirements, then this activity will be discouraged. The fine margins of banking activity mean that the incremental costs or savings involved with a regulatory capital requirement influences business decisions.

This is even the case when an institution is relatively capital rich, because of the way that banks and other financial institutions manage their business: they look to the risk adjusted return on capital for a particular activity. Thus, even if the institution as a whole is well capitalised it will still reduce activity that has a high regulatory capital costs, because this will affect the return on that activity relative to the actual economic cost.

Finally, while many institutions nevertheless do what they think is right for internal risk management, decisions by the Basle Committee and international regulatory community still sends strong signals to senior bank management. For smaller institutions this may trigger a reassessment of internal risk management practice as changes in international capital rules are shown to point to new best practice. More practically, a regime change may free internal resources to improve risk management standards, much as has been seen in Europe through the implementation of the CAD. Supervisors will certainly be aware of this signalling effect. Indeed, it is a troubling aspect of the current regime that it is, with all its flaws, accepted by some smaller institutions as an acceptable standard for internal risk management practice.

The impact of the weaknesses of the current credit risk capital regime underline these more general observations. While each merits more discussion than space permits in this paper, in summary, these are:

- ***Impact on Credit Risk Pricing***

The current rules presently have a distortive effect on credit risk pricing, as margins do not fully reflect differences between different degrees of default risk, different seniority of instruments or differences in the term of an exposure.

Evidence of this distortive effect can be seen most clearly in the spreads for instruments of similar credit rating, as spreads widen depending on the regulatory risk weighting category that is applied. This effect is well illustrated by considering spreads on 5-year asset swaps and MTNs of various credit ratings for sovereigns, banks and corporates (see Figure 1).

Even though factors such as the relative liquidity of the instruments are influential, it is remarkable to see the extent to which the pricing roughly (and in the case of AAA names almost exactly) reflects the ratio of current regulatory charges for the three issuer types described. This indicates that, at least to some extent, the relative regulatory capital cost of each type of instrument is influencing spreads and distorting the market pricing of credit risk.

This distortion of credit pricing and return on capital can have perverse effects. The relatively high capital requirements for good quality credits squeezes margins to fine levels and means that the risk-adjusted return for this business is lower than would otherwise be the case. This therefore discourages the very high-quality business that banks should be seeking. Conversely, the fact that riskier, higher-return business may be undertaken at the same capital cost provides an incentive to lend to lower quality credits, as the relative return appears more favourable.

**Figure 1: Credit Spreads by Rating and Issuer Type**

| | Sovereign | Bank | Corporate |
|---|---|---|---|
| **AAA** | -2bp | + 2bp | +10bp |
| **AA** | 0 | + 5bp | +15bp |
| **A** | +5bp | +12bp | +22bp |

Spreads on 5-year asset swaps and MTNs over swaps curve (January 1998)
*Source*: Rabobank

- ***Impact on Market Perception***

Regulatory capital ratios play an important part in market perception of a bank relative to its peers: stock analysts, rating agencies, market commentators, investors and the press focus on this ratio as a headline indicator of financial soundness. However, the distortions and weaknesses of the current rules can present a false picture of the relative riskiness of an institution. Two institutions with equal capital ratios can be exposed to very different levels of credit risk, depending on their level of portfolio diversification for example – a factor overlooked under the current regime. The current capital ratios therefore send an inaccurate and distorted signal to market participants, causing perverse influences on a bank's relative funding costs, credit rating and share performance.

- ***Impact on Credit Risk Hedging***

The current limited ability to recognise offsetting short credit risk positions, except in very limited circumstances, is similarly a matter of concern. As currently structured, the rules fail to reward and in some cases actually punish banks for hedging credit exposures. This is clearly counter-prudential as a regulatory disincentive is put in place against reducing excessive concentrations through an offsetting position. For example, under some national rules banks are required to take a capital charge on *both* an underlying credit exposure and the related hedge if there is any maturity or instrument mismatch whatsoever. Thus, capital charges are increased even though the bank has in place at least a partial – and possibly a near perfect – hedge.[12]

- ***Impact on Collateral Management***

The current rules pose impediments to the user of broader forms of collateral and therefore efficient rehypothication of non-OECD government positions. Also, EU rules inappropriately favour repo arrangements over bilateral collateral arrangements for OTC derivatives positions.

- ***Impact on Portfolio Credit Risk Management***

As discussed above, the current credit risk capital rules fail to recognise portfolio diversification. As such, there is no distinction in regulatory capital charges between institutions with concentrated or diversified portfolios. Given the prudential benefits of reducing risk by diversification there is a clear case for providing incentives to develop modelling techniques which measure risk on a portfolio basis, as has been permitted in the market risk capital rules.

All these points are underpinned by the fact that there is a need to ensure greater convergence between the regulatory capital regime and best

[12] The importance of recognising offsets is discussed in more depth in section C of this paper. Also, worked examples of the impact of different approaches to offsets on capital requirements are set out in ISDA's commentary on Commission Bancaire credit derivatives proposals, available on the credit risk page of our website (www.isda.org).

practice in internal risk management. This has been the underlying philosophy governing the reform of the market risk capital rules and applies equally to credit risk. Forcing banks to maintain a flawed standardised credit risk capital calculation methodology in addition to their own more sophisticated internal risk management systems is a significant and unnecessary diversion of resources. It also means that supervisors are removed from the way in which management actually runs its business: the focus is on ensuring compliance with an out-dated set of standard rules, rather than ensuring that internal risk management practices are robust and actually followed.

ISDA therefore believes that there is a compelling case for the reform of the current credit risk capital regime. There is widespread concern in the industry over the weaknesses in the current regime, concerns which we know are shared by many in the supervisory community. Thus, the time is ripe to start thinking about the way ahead. The next section of this report therefore outlines our initial thinking concerning the shape of any reformed credit risk capital rules, with subsequent sections examining detailed implementation questions.

## B. AN EVOLUTIONARY MODELS-BASED APPROACH TO CREDIT RISK CAPITAL

### 1. Overview

ISDA is proposing that a more sophisticated approach to calculating credit risk capital requirements be permitted as an alternative to the current standardised credit risk capital rules. As with the approach to market risk capital, we believe this alternative should be based on supervisory recognition of sound internal credit risk management techniques, including internal portfolio credit risk models. By ensuring a closer link between internal risk management and prudential standards, the supervisor is able to assess the safety and soundness of a firm by looking at the way it actually manages its risk on a day-to-day basis – not merely its narrow compliance with out-dated and inaccurate standardised rules. The benefits of such market-based regulation have been widely recognised in the reform of the market risk capital regime.

In order to allow the alternative capital rules to be truly based on internal risk management practice, we cannot stress too strongly the importance of avoiding replacing a one-size-fits-all set of standard rules with a one-size-fits-all models-based alternative. This is particularly important in the area of credit risk, where the very basic approach of the current rules means that there is a much wider gap between the accuracy of the standardised rules and full portfolio models-based approaches than was the case with market risk. Between these two poles is a spectrum of credit risk management techniques which are more advanced than the current standardised approach but fall short of a full portfolio approach, such as application of actual default and recovery rates, analysis of the term structure of credit risk and recognition of offsets.

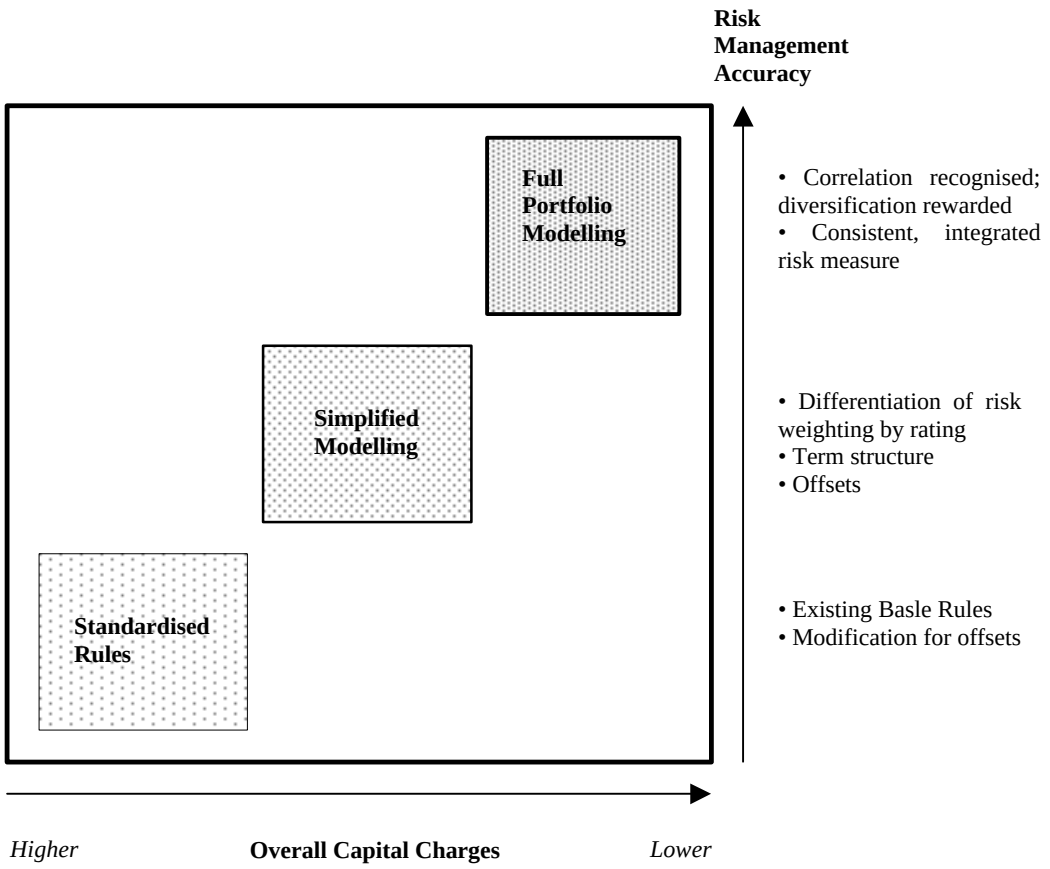
In order to cater for these alternatives to the standard rules which fall short of full portfolio credit risk modelling - and in recognition of the fact that many banks will not be able to adopt portfolio models for some time - ISDA believes that within the framework of an internal models alternative there should be scope to employ "simplified models." These would be roughly analogous to the pre-processing models that are permitted as an interim alternative between standard market risk capital rules and internal models under the January 1996 supplement to the Basle Capital Accord. In the credit risk context, these would address differentiated credit risk and term structure, without recognising portfolio effects, and would be subject to the normal qualitative models approval procedure. We have described the elements of a possible simplified model in summary below and in detail in annex IV.

We are therefore proposing an "evolutionary models based-approach" to credit risk capital, whereby the regime would consist broadly of three alternatives or tiers: standardised rules, simplified models and portfolio credit risk models (see Figure 2 below). This emphasises that there is a spectrum of modelling techniques that should be permitted as an alternative to the current rules.

An evolutionary approach means that firms have the opportunity to develop more sophisticated risk management techniques that are suited to their level of sophistication and type of business, and are not compelled to jump in one leap to a full portfolio analysis of credit risk. An evolutionary approach also recognises that even firms with sophisticated credit risk modelling techniques may be constrained in the extent to which these can be applied to all asset classes subject to credit risk. Due to data constraints and the additional modelling complexity of some risks (e.g. counterparty risk or the optionality of some banking book credit instruments), firms are likely to move to credit risk modelling on an incremental, asset-class-by-asset-class, approach (See Figure 3 and the discussion in section 2.1. below). Any reformed capital rules need to cater to this evolutionary process taking place within each bank, avoiding any arbitrary restrictions on modelling and instead assessing the appropriate scope of a model on a case-by-case basis as part of the model recognition process.

The development of an "evolutionary models-based approach" leaves open the question of whether or not the standardised capital rules themselves should be amended to address the problems discussed in the previous section of this paper. We believe that this approach makes wholesale reform of the standardised rules less necessary, as the possibility of employing simplified models provides an alternative calculation method short of full portfolio credit risk modelling for those banks that are not yet in a position to employ these models. We do not therefore propose full-scale revisions to the standardised rules.

**Figure 2: An Evolutionary Models-Based Approach to Credit Risk Capital**




Note: The intended overall calibration of capital charges is shown here; for particular low credit quality portfolios, model approaches could lead to higher charges.

However, we note that the above framework could also accommodate comprehensively revised standardised rules as a baseline and ISDA believes there is one discrete area of the standardised rules where we do propose an amendment: *the treatment of offsets*. The ability to recognise the offset between a short and long position should be a basic element of the regulatory capital regime, even under the standardised rules. However, while offsetting positions are recognised for interest rate risk, equity risk, foreign exchange risk and commodities risk, this is not so for credit risk. Here, offsets are only, at best, imperfectly recognised.

It should be noted that there is a further step in the spectrum of alternatives permitted under the "evolutionary models-based approach" which should be considered. *A pre-commitment approach* to credit risk could also be contemplated, which allows banks to pre-commit credit risk regulatory capital over a specified period, subject to possible penalties in case of under-commitment. This would allow the most direct link between internal risk management practice and regulatory standards. We would therefore ask the supervisory community to consider this alternative.

## 2. Allowing Recognition of More Sophisticated Credit Risk Management Techniques

### 2.1. Recognition of Simplified Credit Risk Models

As discussed above, there is a range of credit risk management techniques, which fall short of full recognition of portfolio diversification, which

are nevertheless significant improvements upon the standardised approach. ISDA believes there should be scope for supervisory recognition of these techniques as an alternative to the standardised calculation methodology

We believe that these interim approaches should be made available in the form of a simplified model. While less sophisticated than a portfolio model, this would have the advantage of being less complicated to implement and being less demanding in terms of data requirements. As a result, it will be attractive to some institutions as an interim measure.

To illustrate the sort of simplified modelling techniques that could be accommodated under the credit risk capital rules, ISDA has outlined a possible methodology that could be applied by firms. This takes a risk bucketing approach combined with a use of credit ratings to introduce term structure and more differentiated risk weightings into the capital rules, and would be applied for both default and spread risk. This methodology is described in more detail in Annex IV and also features as one of the methodologies subject to quantitative analysis in Part E of this paper. As with other models, this would require supervisory approval following a qualitative assessment.

It should be emphasised that this method is merely illustrative of a simplified model that could be developed by an institution. It is there to show that there are internal credit risk management approaches which could be implemented that improve upon the standardised rules without taking a full portfolio modelling approach. This illustration is not proposed as some form of revamped standardised credit risk rules: as we have argued above, it is better to let such regulatory capital rules relate first and foremost to internal risk management processes and even this technique would need to be adapted by individual firms. Indeed, the importance of internal credit ratings under a simplified model underlines the fact that even the methodology proposed here would need to be adapted for each bank and involve a supervisory recognition process.

## 2.2. Recognition of Portfolio Credit Risk Modelling

### 2.2.1. Advantages of Portfolio Credit Risk Modelling

A portfolio approach to credit risk management is the most important alternative to the current standardised capital rules that should be made available to financial institutions. Portfolio credit risk modelling shares the same advantages of portfolio market risk modelling that have already been recognised by the international supervisory community. These include:

***a. The ability to take an integrated view of credit risk across a financial institution***

A modelling approach provides a comprehensive measure of risk across a firm, measuring credit risk regardless of where it arises – traditional lending activity, bond and equity trading or explicit credit trading through credit derivatives. By providing a common measure of credit risk, management is able to make judgements about the relative risk and return of different types of activity. Also, a common yardstick is provided to allow trade-offs between risk tenor, exposure size and collateral protection to be made. Thus the relative risk of a 1-year $10 million loan, a 10-year $1 million bond and a 10-year partly collateralised swap with $10 million positive mark-to-market can be made. This is a significant improvement over the current standardised rules for credit risk, which treat each form of risk in a separate category, subject to disparate rules.

***b. The ability to assess concentration and diversification***

By taking a portfolio approach, a credit risk model recognises the risks of concentrated exposures to a single name or names that are highly correlated and – conversely – the benefits of diversification. By incorporating this feature into the regulatory capital regime, firms would be rewarded for diversifying their credit positions and avoiding undue concentrations to single names. The current regulatory capital requirements for individual names provides no incentive for prudent portfolio risk management. For example, a single $100 million loan and one hundred $1 million loans to names of equal credit worthiness presently attract the same capital, even though the risk of the latter portfolio is demonstrably lower than that of the former.

*c. Taking a dynamic view of credit risk, based on actual default and recovery rates for individual names*

The current capital rules are based on a static view of credit risk – a fixed capital charge based on a mid-1980s analysis of average credit risk. In contrast, a models approach is based on actual default and recovery rates of the actual positions in a bank's portfolio.

### 2.2.2. Overview of Portfolio Credit Risk Modelling

Recent years have seen important innovations in portfolio credit risk modelling techniques and the publication of different modelling approaches. In addition, banks and other firms have also been applying more sophisticated portfolio modelling internally for risk management purposes. Annex V of this paper provides a high-level overview of the basic components of portfolio credit risk modelling and also discusses the added complications of counterparty risk modelling. Detailed descriptions of individual modelling techniques will be available via ISDA's credit risk page on our website (www.isda.org) and are not reproduced here.

The overview in Annex V shows that these different methodologies share important common features and all have the goal of establishing a distribution of possible credit losses in order to achieve the basic underlying objective of a portfolio assessment of credit risk.

This is important because of concerns about the lack of a "standard approach" to credit risk modelling. While there are indeed differences in credit risk modelling techniques, the common elements should assuage supervisory concerns. Indeed, as noted above, ISDA is troubled by the suggestion that a standard credit risk modelling technique be established if this means prescribing particular methods for, say calculating changes in default rates, or assessing the impact of macro-economic effects. Such standardisation is to be strenuously resisted, as diversity in modelling techniques provides scope for intellectual competition and therefore improvement in risk management methods, as well as allowing institutions to adopt whichever particular model is best suited to its type of business. Furthermore, such a requirement for standardisation is at odds with the current approach to the use of internal models to calculate market risk capital. Here, the supervisory community has accepted that firms themselves may choose between the use of historical simulation, variance-covariance and Monte Carlo modelling techniques and should have scope to propose individually tailored methods to calculate non-linear risk. It would be inappropriate to hold credit risk modelling to a different standard and demand greater conformity.

However, in light of potential supervisory concern regarding the differences in modelling approaches, we have conducted quantitative work whereby both JP Morgan's CreditMetrics model, CSFP's CreditRisk+ model and other models have been used to analyse the same test portfolio. This is set out in section D below.

### 2.2.3. Encouraging Wider Use of Credit Risk Modelling

As noted above, a number of both financial and non-financial firms have recently published credit risk modelling techniques, including JP Morgan, CSFP, KMV Corporation and McKinsey and Company. ISDA welcomes the publication of these modelling methodologies and supports the development and application of portfolio risk management techniques for credit risk. We would encourage other firms to follow the lead by these institutions and publish information about their credit risk management techniques as a way of encouraging an informed debate in this area. As a contribution to this process ISDA is setting up an internet page on its website to provide information about credit risk modelling techniques and to provide links to publicly available models and information published by others. We are ready to add further information and links as other firms come forward with details of their risk management approaches.

The use of portfolio modelling techniques for credit risk disclosure is also to be welcomed and we similarly would encourage such disclosure as a means of promoting greater awareness of more sophisticated credit risk management methodologies.

## 3. Application of an Evolutionary Models-Based Approach

Now that the basic elements of an evolutionary models-based approach to credit risk capital have been established, it is important to consider some of the more practical questions about applying this framework to any individual bank.

### 3.1. Scope and Relation to Standardised Rules

ISDA recognises that any reform proposals must be made in the context of the standardised rules on credit risk capital already in place for banks internationally (and for investment firms in the EU). As noted above (and further discussed below), we are not proposing now that these be wholly abandoned or radically modified, only that a limited amendment be made to recognise offsets.

As a result, in line with the current internal models-based approach, firms would apply to their national supervisory authority to waive all or part of the standardised rules and apply their internal risk management methods.[13] As noted above, these could be discrete modifications to the standardised rules in particular areas via simplified models or the use of a full portfolio credit risk model.

This then raises the question as to the scope of any application of internal risk management approaches. We believe that there should be considerable flexibility on this point to recognise different possible approaches by different firms. Firms should be permitted to apply an alternative calculation approach on a partial basis, covering just a single book or part of that book, as well as across an institution as a whole. A portfolio credit risk approach should be able to be applied to any of:

- Trading book default risk and spread risk
- Counterparty risk across the institution
- Banking book credit risk
- All or part of the above

Given the different risk management issues posed by the different areas of activity, it is appropriate that there be flexibility to develop more sophisticated credit risk management techniques on an incremental basis, rather than compelling an institution to make the dramatic leap to fully integrated credit risk modelling, even if this is the ultimate desired objective. This is consistent with the current partial models approach permitted under the market risk capital regime and, to a limited extent, is already recognised for credit risk, as the Basle Committee has recognised specific risk models and the possibility of event risk models within the trading book.

We also stress the importance of allowing a partial models approach within any of the broad categories discussed above. For example, an institution may start by modelling event and default risk for all trading book positions but only some banking book positions, such as the larger corporate names where data issues are less problematic. Thus, there should be scope to extend modelling on an asset class-by-asset class basis, in light of the modelling complexity and data requirements of each type of asset.

Figure 3 below summarises the main asset classes that could be envisaged and the basic data and modelling considerations raised by each.[14] In line with an evolutionary approach to reform, banks should be allowed to apply to model different asset classes on an incremental basis depending on their individual modelling capacity and the exact data availability of a particular category of assets (e.g., corporate loans in a particular market). This should be permitted, so long as clear categories of banking book positions are included within the model consistently, to prevent regulatory arbitrage between the standardised and models approaches.

### 3.2. Type of Credit Risk Assessed and Accounting Issues

The issue of scope directly raises the question as to the type of credit risk to be assessed and modelled. Within the mark-to-market trading book environment, it is generally accepted that both default risk and spread risk need to be captured, as a bank is exposed to both the risk of significant loss due to default of an instrument and also of adverse daily P&L effects due to changes in spread.

The situation in the banking book is less straightforward. Here, clearly, there is a need to protect against risk of default. However, even though the banking or loan book traditionally relies on an accrual accounting environment (because the loan is due to be held to maturity), we believe it is also appropriate to require spread risk to be assessed if credit risk modelling is employed. This is because in the supervisory framework it is most prudent to take account of gradual deterioration in credit quality which could presage default and indeed which, if sufficiently severe, would lead to a reserve even

[13] See below for discussion of review process and qualitative standards.

[14] See annex III for a detailed discussion of data availability.

**Figure 3: Possible Asset Classes for Credit Risk Modelling**

| Asset class | Comments |
|---|---|
| • Traded debt & equity | • Good public data<br>• Credit risk already covered under specific risk modelling rules |
| • Traded loans | • Good public data |
| • Large corporate loans | • Good to patchy public data<br>• Good internal data |
| • Mid-market loans | • Patchy to no public data<br>• Variable internal data |
| • Homogenous retail (mortgages, car loans, credit cards, etc) | • Good aggregate data<br>• Top-down (behavioural/actuarial) modelling |
| • Counterparty risk | • Good data<br>• More complex modelling |

under an accruals environment. Also, as a supervisory objective is to minimise the impact on depositors (and the potential call on the public purse) in the case of the failure of an institution, it is appropriate to assess the changing value of the loan book and ensure that more capital is available for those banks with an impaired loan book.

However, in order to assess spread risk it is essential that positions are fair valued, even in the traditional banking/loan book. This then allows a periodic assessment of the changing credit quality of a position to be measured and employed in a model. The exact method and frequency of fair valuing will vary depending on the exact instrument type in the banking book. For example, in the case of traded loans, daily fair values may be established from actual prices. However, for the bulk of loans, directly observable fair values may not be available and approximations of fair value may be made less frequently, such as weekly, monthly or quarterly, by reference to other instruments. While not as accurate as use of daily fair values, this still provides an acceptable basis for modelling, as these instruments are intended to be held to maturity. Also, even periodic fair valuing and modelling are clearly a significant advance on disregarding banking book spread risk entirely.

It is, however, vital to stress that this fair valuing process can be an internal risk management calculation as well as a formal fair value accounting exercise for the statutory accounts. ISDA strongly believes that it is important to avoid a slavish link between formal accounting rules and supervisory capital standards, as the two have clearly different purposes. Indeed, this is already recognised under the current supervisory capital framework. For example, as the Bank of England's CAD implementation rules state, "Some positions may be marked-to-

market for internal purposes or to meet the requirements of statutory accounts, but nevertheless fail to meet trading book criteria."[15]

We are therefore proposing that banks only be permitted to employ credit risk models for those positions which are fair valued, either for the statutory accounts or for internal risk management purposes. It should be noted that this has implications for the calculation of the eligible regulatory capital base. In particular, our proposed approach means that the regulatory capital base must also reflect fair value adjustment, even if the statutory accounts do not. Thus, an institution wishing to adopt a models-based approach when using fair values calculated for internal risk management purposes alone would need to adjust its reserves (for regulatory capital purposes) by the difference between book value and fair value. An institution which already fully reflected fair value in the statutory accounts would require no such adjustment.

Thus, the key criterion for credit risk modelling eligibility would be whether a position was fair valued for either internal or accounting purposes. Any position so eligible and in fact modelled would then fall outside the scope of the existing banking book/trading book divide, as the credit risk model should be applied in a consistent manner for all positions.[16] Any positions that did not fulfil this test or were not modelled would remain subject to the current banking book/trading book distinction, with the former positions subject to the existing standardised credit risk capital rules.

The current criteria for this split are, however, themselves in need of reform, at least in an EU context. Basically, three tests are presently applied: (a) Is the position a financial instrument?[17] (b) Is the position held with trading intent? and (c) Is the position marked-to-market/fair valued? We object to the first leg of this test, where it is based on an inflexible and fixed definition. Such a definition is quickly out of date, as the ability of financial institutions to trade previously banking book instruments makes distinctions based on instrument names inappropriate. The current Basle framework avoids this problem as it does not include a prescriptive definition of financial instrument. However, the existence of such a definition within EU legislation is a source of difficulty within the capital regime and should be eliminated.

### 3.3. Qualitative Assessment and Data Issues

By using the current standardised capital rules as the "default" rules and requiring firms to apply for the use of alternative calculation methods based on internal risk management techniques, national supervisors will have to engage in a system of qualitative assessment of proposed models. This is closely in line with the internal models-based approach for market risk capital. However, an evolutionary models-based approach would involve not just assessment of full portfolio credit risk models but also of simpler models.

This will clearly put greater burdens on supervisory authorities and require further scope for judgement across a wider range of institutions than under the market risk capital regime. This will likely have resource and training implications for supervisors. However, these should not be grounds for avoiding a reform of the credit risk capital regime.

Also, it needs to be emphasised again that a more qualitative, case-by-case approach has crucial prudential benefits, as it allows closer links between the supervisory process and internal risk management. Firms are no longer assessed on their ability to fill out forms based on out-moded standardised rules, but on their actual risk management competence. For the part of the supervisors, a more intimate assessment of internal risk management practice provides a much more complete picture of an institution and an ability to make better judgements comparing different firms. Thus, by widening the scope of firms able to employ their internal risk management systems for capital purposes, supervisors get an opportunity to improve their ability to assess risk in a wider range of institutions and not only the most sophisticated firms that employ VAR models for market risk capital calculations.

As to the substance of the qualitative approval process, we have below proposed various qualitative standards that could be considered by supervisory authorities. These will be familiar from the context of market risk modelling, but

[15] S&S/1995/2 Ch. 1 §12.

[16] See discussion of holding periods below.

[17] Article 2 (5) of the EU Capital Adequacy Directive defines a financial instrument as the instruments listed in Section B of the Annex of the EU Investment Services Directive, which in turn provides a limited and prescriptive list which does not, for example, include traded loans.

we have discussed some of the particular questions relating to their application to a credit risk management framework. In particular we have looked at the subject of backtesting and stress testing in some detail, as these are particularly crucial controls in the supervisory context.

In addition to these qualitative standards, supervisors will need to be convinced that any model employed for credit risk modelling is based on robust data. This is a key issue for both the industry and supervisory community. ISDA acknowledges that data on default, recovery rates and correlation is not currently available for all credits and that, overall, data quality and comprehensiveness are, at present, not as robust for credit risk as for market risk.

Given the importance of the data issue, Annex III of this paper considers data issues in some detail and provides a survey of current data sources for credit risk purposes. There are two key conclusions to make from this analysis: firstly, that the data picture is by no means as poor as commonly believed and that there is certainly the capacity to model credit risk in a number of markets and industries at present, but, secondly, for comprehensive credit risk modelling to be acceptable across all areas of a financial firm's possible activity, further improvements are needed.

The development of qualitative standards raises the question as to whether quantitative standards for credit risk modelling are appropriate. We are concerned that the promulgation of quantitative standards means that firms are inhibited from truly applying internal risk management methods for supervisory purposes and instead are forced to develop a regulatory variant of their internal approach. This cuts against the basic goal of ensuring closer links between internal risk management methods and the supervisory framework and, equally important, may constrain the ability of a firm to adapt its model in the light of innovations in risk management and its particular business. Also, given a robust qualitative review process, there is no need for quantitative standards to meet prudential objectives concerning overall minimum capital requirements: a supervisor would have to be thoroughly satisfied on this point before approval were given. Thus in the discussion below of qualitative standards we have consciously avoided proposing any quantitative criteria

### 3.4. Calibration and Consistency of Capital Charges and Impact on Systemic Capital Levels

An evolutionary models-based approach without prescriptive quantitative standards poses questions as to how to ensure consistent capital charges between institutions and, also, an appropriate calibration of risk charges depending on the sophistication of the internal risk management practice employed.

It is clearly important that there is careful calibration of the relative capital charges calculated using the standardised rules, a simplified model (such as discussed above) and a full portfolio credit risk model. Relative capital charges should decrease (for the same portfolio of risks) as an institution moves along this spectrum of more sophisticated credit risk management. Indeed, even within the application of portfolio models, different firms may use more or less sophisticated methods, with more or less robust data sources, which argues for a differentiation of capital charges.

As our quantitative analysis shows below, there is in fact an appropriate broad calibration of the capital charges resulting from standardised, simplified model and portfolio model approaches. Thus, we feel that there is no need to adjust the output of these different methods by, for example, applying a scaling factor to one or more of the methods.

However, there is a need to differentiate capital charges between different portfolio models to take account of their relative sophistication and the relative quality of the data used. While we accept the need to ensure that capital charges vary to reflect these differences, we strongly feel that employing scaling factors is inappropriate. A scaling factor simply adjusts the existing output of the model (by multiplying an already partially exact number). Instead, we strongly advise that as part of their qualitative assessment, the supervisor address any concerns regarding the calibration of capital charges by varying input parameters. For example, if the supervisor finds that data is insufficiently granular or macroeconomic effects have not been sufficiently assessed, adjustments could be made to the relevant volatilities, default probabilities or recovery rates employed. These are more robust means of introducing conservatism into the resulting capital charge, as they can be used to pinpoint and address specific areas of weakness. Also, higher confidence intervals or

longer observation periods may be employed as more general controls, which are preferable to the use of scaling factors.

With such calibration of relative charges, there should be rough parity between capital requirements of different institutions in the case of similar risk and similar calculation methods. However, the differences that do remain are not, in our view, justification for ignoring the case for reform or imposing prescriptive quantitative standards. The fact is that different institutions have different risk profiles and employ different internal risk management techniques. The search for a level playing field in capital adequacy charges that is as smooth as a billiard table is ultimately futile. Indeed, trying to assess different firms together under standardised rules is positively misleading, as assigning the same capital ratio to two different firms provides a signal to investors and other market participants that the two institutions are equally risky when it is by no means certain that this is the case.

Instead of searching for absolute consistency of capital charges, in our view it is instead more important to ensure greater consistency of supervisory assessment techniques. This is not something that should rely on prescriptive quantitative standards, but on fully developed qualitative guidelines and, above all, information and skill sharing between supervisors. Global firms currently experience inconsistent supervisory standards between different legal entities in the assessment of internal risk management modelling techniques. Moreover, there is considerable overlap and duplication in supervision as local and consolidated supervisors all wish to assess a model that applies across the group as a whole. Both these considerations argue for closer co-ordination of model-approval processes and greater reliance on fellow supervisors. Achieving this and ensuring greater consistency in capital charges between similar institutions requires much closer links between supervisors.[18]

Finally, it should be noted that throughout this paper we have emphasised the importance of reforming the credit risk capital regime to more accurately reflect the *relative* differences in credit risk by allowing greater variations in capital charges than under the standardised rules. The goal here is to correct the deficiencies of the current regime which treat firms equally regardless of whether they are lending to more or less risky corporates or have a more or less diversified credit risk portfolio. We have not commented on or argued for an overall reduction in *absolute* capital levels for the banking industry. It is for central banks and supervisory authorities themselves to take a view on this macroeconomic question and to consider the impact of reformed capital rules on the overall stock of capital in the banking system and how this would be managed. We have also not discussed the implications of reform for other types of risk. Instead, we would simply emphasise that the *relative* balance of capital requirements is in urgent need of reform to better reflect different levels of credit risk in different firms.

## 4. Qualitative Standards for an Evolutionary Models-Based Approach

In order to provide supervisors with a clear picture of the supervisory standards considered applicable in the process of assessing internal credit risk management techniques, this section provides a number of proposed qualitative standards. These are developed in the context of a full portfolio credit risk model and would need to be adjusted accordingly for less sophisticated techniques.

### 4.1. High-Level Qualitative Controls

Drawing from the current standards for market risk,[19] we propose the following standards, as a basis for further discussion:

- The bank should have an independent risk control unit that is responsible for the design and implementation of the bank's credit risk management systems. The unit should produce and analyse periodic reports on the output of the bank's credit risk measurement model, including an evaluation of the relationship between credit risk exposure and credit limits. This unit must be independent from business units and should report directly to the senior management of the bank.
- The bank must clearly designate those credit portfolios within the bank to which a models-based approach is being applied. These

[18] While this is a subject for separate consideration, possibilities here include regular secondments between supervisors, a common staff college for front-line supervisors and model teams, and peer group assessment of supervisory standards.

[19] Committee on Banking Regulations and Supervisory Practices (1994) Risk Management Guidelines for Derivatives.

portfolios must be identified separately in the official books and records of the bank. The rationale for portfolio designation (such as commonality of risk factors among the individual portfolio positions and/or geographic characteristics) must be documented and approved by senior management and reviewed and approved by the bank's external auditors.

- The independent risk control unit should conduct a regular model validation program including, if possible, an ex-post comparison of the risk measure generated by the model against changes in portfolio value, as well as hypothetical changes based on static positions. Where backtesting is not possible, other forms of validation should be employed. (See below for a further discussion of backtesting)
- A routine and rigorous programme of stress-testing should be in place as a supplement to the risk analysis based on the output of the bank's credit risk measurement model (see below for a further discussion). The results of stress testing should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors. Where stress tests reveal particular vulnerability to a given set of circumstances which directors feel are unacceptable, prompt steps should be taken to manage those risks appropriately (e.g., by hedging against that outcome or reducing the size of the bank's exposures).
- Boards of directors and senior management should be actively involved in the risk control process and must regard credit risk control as an essential aspect of the business to which significant resources need to be devoted. In this regard, the reports prepared by the independent control unit must be reviewed by a level of management with sufficient seniority and authority to enforce both reductions of positions taken by individual credit managers and traders and reductions in the bank's overall credit risk exposure.
- The bank's internal credit risk management model must be closely integrated into the day-to-day risk management process of the bank, as a supplement to single borrower risk limits. Its output should accordingly be an integral part of the process of planning, monitoring and controlling the banks credit risk profile.
- The credit risk measurement system should be used in conjunction with internal credit exposure limits, including but not limited to single borrower limits, industry concentration limits and country risk limits. In this regard, credit exposure limits should be related to the bank's credit risk measurement model in a manner that is consistent over time and is well understood by both individual credit managers and traders and senior management.
- Banks should have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operation of the credit risk management system. The bank's credit risk measurement system must be well documented, for example, through a risk management manual that describes the basic principles of the credit risk measurement system and that provides an explanation of the empirical techniques used to measure credit risk.
- An independent review of the credit risk measurement system should be carried out regularly in the bank's own internal auditing process. The review should include both the activities of the credit management and trading units and of the independent risk control unit. A review of the overall credit risk management process should take place at regular intervals (ideally not less than once a year) and should specify at a minimum:

  - The adequacy of documentation of the credit risk management system and process
  - The organisation of the risk control unit
  - The integration of credit risk measures into day-to-day credit risk measurement
  - The approval process for credit pricing, credit exposure measurement and valuation systems used by front and back-office personnel
  - The validation of any significant changes in the credit risk measurement process
  - The scope of risks (e.g., credit spread risk, default risk, recovery rate risk and default risk) captured by the credit risk measurement model
  - The integrity of the management information system
  - The accuracy and completeness of position data, including methodologies for converting different forms of credit exposure into common units of measurement
  - The verification of the consistency, timeliness and reliability of data sources, both internal and external, used to run internal models, including the independence of such data sources
  - The accuracy and timeliness of volatility and correlation assumptions, including the methodologies and data source used to make such assumptions
  - The accuracy of valuation and risk transformation calculations

- The verification of the model's accuracy through back-testing

As a supplement to these qualitative standards, and in order to spur a debate about the implications of credit risk modelling for large exposure/large lender rules, we also propose the following general principles concerning **large exposures**:

- A bank should have internal controls which limit exposures to individual entities (including consolidated groups) to levels agreed by senior management
- The principles of measurement should be consistent between the measure of exposure to individual entities and the institution's credit risk model[20]
- If supervisors wish to retain reporting requirements for exposures over a certain level and absolute maximum levels of exposure to any individual entity, these should be agreed with individual institutions based on the bank's own internal measurement standards and at levels commensurate with it's business, resources and internal controls
- It is not appropriate to impose any further caps on large exposures (such as the aggregate 800% of capital base for exposures over 10% of capital base[21]). An internal risk model should accurately reflect concentrations of risk and generate higher risk (and capital requirements) for more concentrated portfolios. An institution which can demonstrate the effectiveness of its model in this regard should therefore not be subject to further regulatory caps
- It is, however, incumbent on banks to consider concentrations in their portfolios and to impose appropriate qualitative and quantitative controls

[20] The measurement will not necessarily be the same: the potential future exposure on OTC derivatives which is included in the portfolio measure may legitimately be measured to a different level of confidence from that which is included in the individual counterparty exposure measure; exposures which are contingent on two credit events should not be double counted in the portfolio measure but may legitimately be considered in relation to *both* underlying entities in the individual counterparty exposure measure.

[21] As required in EU law under the Large Exposures Directive (92/121/EEC, as amended)

### 4.2. Backtesting

#### 4.2.1. Validation

The validation of a credit risk model is an important aspect of the control framework and has several components, including:

- Showing that the model takes into account all material sources of risk
- Confirming that the model's mathematical methods are analytically robust
- Demonstrating that the data and parameters used to estimate the expected and the unexpected loss (at some specified confidence level) have a solid empirical basis
- Showing that the ex-ante estimation of expected and unexpected losses is consistent with the ex-post experience, i.e. backtesting

#### 4.2.2. Backtesting a Credit Risk Model

While backtesting a VAR market risk model is relatively straightforward, backtesting a credit risk model is very much more difficult.

VAR is normally calculated as the potential economic loss in a static trading portfolio, ascertained at some high confidence level, assuming the portfolio were subject to an instantaneous N-day shock in market rates. A VAR model can be backtested by comparing the ex-ante one-day VAR with the ex-post one-day actual change in P&L, for a statistically sufficient number of days, such as a year.

In contrast to the short-term horizon typical of VAR calculations, credit risk models normally estimate the probability distribution of credit loss over a long time horizon, such as one year. Backtesting a model's fitness to estimate the unexpected credit loss that could occur over a year, at a high confidence level, is therefore extremely difficult:

- A statistically meaningful test of the ability to estimate the worst case loss that could occur over one year at the 99% confidence level would take an impractical number years of backtesting
- Even if one could devise more efficient backtests, it would still be necessary to perform backtests through several credit cycles to obtain sufficient statistics

#### 4.2.3. Compensating Controls

Even if a full backtest is not feasible, there are other ways of validating a credit risk model. The

other validation steps noted above provide important controls, and stress testing is very important (see below). Also, the following compensating controls may be employed:

- ***Historical backtest***

An historical backtest is a comparison of the capital that would have been calculated to the historic loss that would have occurred for a hypothetical portfolio over some past time interval. The hypothetical portfolio could either be randomly created by simulation or have been an actual loan portfolio of the bank at some past date. The historic loss in value could be ascertained from the defaults (and loss, given default) that actually occurred during the period and the loss in portfolio value that would have occurred from the historic changes in credit spreads and changes in credit ratings during the period. By choosing a severe economic downturn as a historic period, the robustness of the capital calculation could be tested

- ***Parameters***

A credit risk model's simulation of potential economic loss will depend on many parameters, such as the probability of default, given a risk rating, or the expected loss, given default

A model can be made more robust by taking into account the instability of the parameters it uses for simulation. For example, instead of using only an expected loss, given default, a credit model could use historical data to estimate the probability distribution of loss, given default and could draw from that probability distribution in its simulation.

Alternatively, a model could use parameters that are dependent on a particular economic scenario. A first step in a simulation would be a draw from a probability distribution of potential economic scenarios over the coming year. Corresponding to the economic scenario that is drawn would be a set of parameters used for simulation.

- ***Capital buffers***

Some additional controls that could be taken include identifying the uncertainty in capital corresponding to the uncertainty in the parameters used in simulation. An additional amount of capital could be allocated as compensation for the uncertainty in parameters. This analysis would depend on the sensitivity of the calculated capital to changes in the parameters and the degree of uncertainty in the parameters.

Finally, it should be noted that the use of fair values for modelling – as we propose – also provides an important control, as the gradual deterioration in credit quality of the banking book is recognised and big shocks, as par values move to impaired values on default, are avoided.

### 4.3. Stresstesting

In light of the difficulties of backtesting, stress testing provides an especially important control and allows firms to assess the impact of possible extreme "fat-tail" events. The types of credit risk stress tests that may be employed are in principle similar to those used for market risk. In addition to being employed by banks, these are routinely used by credit rating agencies when assessing asset-backed transactions.

In the credit risk context stress testing will, in the first instance, involve assessing the impact of extreme credit events on the current portfolio of positions. Specifically, a significant (say, two category) downward shift in credit ratings may be assumed across a portfolio, or recovery rates may be arbitrarily adjusted downward by a significant amount, and changes to correlations may be assessed. In terms of assessing spread risk, shocks to credit spreads – in terms of both widening and narrowing – should also be undertaken. These changes may be applied individually or in combination, for individual names, portfolios of names or across the whole credit book.

Also as is the case with market risk stress testing, firms will also need to assess the particular scenario (whether an individual event or combination of events) that would be especially damaging to its current portfolio.

Also similar to market risk, historical scenario stress testing may be considered, as experience about past credit crises with particular sectors or about losses at extreme points of the credit cycle can be assessed.

As an added complication, however, firms may also wish to assess the impact of market risk shocks on the credit portfolio. This is especially important in terms of the counterparty risk portfolio, as the possibility of extreme market moves needs to be considered in light of the implications for the size of the exposure.

### 4.4. Holding Period/Risk Management Horizon

As noted above, we believe it would be inappropriate to prescribe quantitative standards for the use of credit risk models, as it is preferable that the models employed for regulatory capital purposes reflect the internal risk management approach of an institution. We believe this applies equally in the case of holding periods employed. Indeed, changing liquidity in the credit risk markets will likely lead to adjustments in holding periods. The fact that supervisory recognition must be provided after a qualitative assessment provides a sufficient prudential control to ensure that an acceptable holding period has been employed.

While practices will vary, we anticipate that a one-year holding period is likely to be a commonly used standard. We note that such a holding period could be appropriately applied to both banking book-type instruments, such as loans held to maturity, and trading book-type instruments, such as traded loans, in spite of the differences in the typical length of time which these instruments are held by an institution. This is for a number of reasons. Firstly, there is an overarching advantage in terms of employing a common holding period for all instruments, in terms of simplicity of the modelling process and measuring risk on a consistent basis. In the case of trading book instruments, where there is rapid turnover in the book and much greater ease in terms of ability to dispose of instruments (as reflected in the current ten day market risk holding period), the one year holding period is clearly a conservative one. However, default data is not normally provided for shorter periods and in some cases this data is significantly less meaningful when scaled down by the square root of time.

In contrast, banking book instruments such as loans will be typically held for longer than one year. However, a factor in assessing a holding period for risk management and regulatory capital purposes is the period of time which an institution can suffer adverse events before taking corrective action. In other words, there is in essence an upper limit on the holding period that may be employed for regulatory capital purposes relating to the minimum time which an institution can replenish its capital by going to the market. This may be reasonably considered to be a period of one year. Finally, in addition to the conservatism generate by using a one-year standard for trading book instruments, it should be recalled that additional protection is provided in the case of banking book instruments because spread risk is also being modelled and protected against with capital.

We note that the quantitative work conducted in section D below employs a one-year holding period.

### 4.5. Observation Period

Observation periods are also an area where quantitative standards should be avoided. As a general principle, it is accepted that data should be provided for a full credit cycle, which may be in the range of 5-10 years.

### 4.6. Confidence Interval

A range of confidence intervals may be employed with credit risk models, depending on the risk appetite of the bank in question. It may be anticipated that confidence intervals such as 99% or higher may be employed under any regulatory capital regime. It should be recalled that the non-lognormal distribution of credit losses necessitates assigning a percentage confidence interval, rather than one expressed as standard deviations from the mean.

## C. RECOGNITION OF OFFSETS UNDER THE STANDARDISED RULES

ISDA believes it is crucial that the current regulatory capital regime is reformed to recognise that long and short credit risk positions (including credit derivatives) can be considered together for capital purposes. Recognition of offsetting long and short risk positions is an accepted feature of other elements of the regulatory capital regime and needs to be extended to the treatment of credit risk. This is essential in order to encourage prudent credit risk management by hedging long credit risk exposures.

Existing credit risk capital rules, however, only permit offsets in very limited circumstances: positions may be fully offset - or matched - if they are of identical maturity and relate to exactly the same instrument. Otherwise offsets are not permitted. This can have perverse effects. For example, take a credit derivative in the trading book based on a particular reference asset that hedges a slightly different underlying asset (whether loan or bond) or hedges swap counterparty risk exposure. Under current rules, this hedge is not recognised: in regulatory terminology, the specific risk from the credit derivative cannot be offset against banking book credit risk (from a loan), trading book specific risk (from the slightly different bond) or counterparty risk (from a swap).

This not only inhibits prudent risk management, but actually provides a disincentive to hedge positions, as using a credit derivative to hedge a position may create an *additional* capital charge, rather than reducing the capital requirement to reflect the hedge. A bank is therefore actually punished for hedging its long credit exposure. (We would note that while the Bank of England imposes this double capital charge - perhaps out of its interpretation of the relevant EU directives - the Federal Reserve only usually imposes a capital charge on the largest of the two positions. This is a welcome improvement on the Bank's approach, but still falls short of appropriate recognition of offsets. Also, in cases where one of the positions is a loan or counterparty risk exposure, it seems possible that the double charge would apply.)

In addition to the restriction on offsets in the cases of differences in instrument type (but where the underlying credit exposure is still to the same entity), offsets are also restricted in the case of maturity mismatches even where the instruments are identical. Thus, no offset of capital charges is permitted in the case of a 10-year bond hedged by a 9-year credit default option with the exact same bond as reference asset. Certainly, full credit protection is not provided, but conversely there is a hedge in place for a considerable period, which the current regulatory capital rules do not recognise to any degree. In contrast, for non-credit risk elements of the capital rules such as interest rate risk, partial offsets are permitted even when there is only a partial maturity match.

The regulatory capital rules therefore need to be reformed to recognise offsetting positions in the case of instrument mismatches and in the case of maturity mismatches.

### 1. A Models-Based Approach to Offsets

For sophisticated institutions that have developed specific risk, or more broadly, credit risk models, an internal-models based approach to the recognition of offsets is, in our view, the most appropriate way forward. For example, models may be developed which can recognise the correlation of payouts between different instruments. Also, in the case of maturity mismatches, a model can identify the "backend" credit risk caused by the mismatch, expressed as a forward credit exposure (e.g., the net cost of extending the hedge when it expires).

The Basle Committee's recent announcement on specific risk modelling provides an immediate means to make progress on this issue. Full recognition of specific risk models (i.e., without recourse to the 50% standardised floor) will allow significant scope to recognise offsets in the case of maturity and instrument mismatches. We therefore welcome the Basle Committee's recent revisions to the 1996 market risk capital rules.

However, even recognition of specific risk modelling will still have limitations given that it is to be adopted within a framework that still distinguishes between banking and trading books and between specific and counterparty risk. Thus, the action by the Basle Committee would not, as far as we are aware, provide scope for offsets between loans and credit derivatives or between counterparty risk and credit derivatives.

## 2. Standardised Rules for Offsets: Introduction

In addition to a models-based approach for offsets, we also believe it is important to develop standardised rules in this area. This is important for two reasons. First, as noted above, it is unlikely that the action by the Basle Committee on specific risk modelling allows the full range of instrument offset issues that need to be resolved. Second, not all institutions have yet developed sufficient risk management expertise to employ a modelling approach. However, it is important that offsets are still permitted to some degree for these institutions in order to reward prudent credit risk management. In particular, end-user institutions may not yet have modelling capacity but will wish to employ credit derivatives to manage credit exposure arising from loans, bonds held in trading books or swaps portfolios. It is important that the Basle rules provide a means to reward such prudent hedging activity and not in fact punish it.

We strongly believe that an amendment of standardised rules should be developed as a matter of urgency. We would thus encourage the development of standardised rules to tackle both instrument and maturity mismatches. These standardised rules must be simple and understandable. They should also tend to produce more conservative results than a modelling approach, in order to encourage modelling and avoid perverse incentives in the calibration of the two sets of rules. We set out below our proposals for standardised rules in these two areas. We recognise, in addressing the question of maturity mismatches, that this is really a piecemeal attempt to reform a fundamental flaw of the 1988 Accord - the lack of term structure for credit risk.

## 3. Standardised Rules for Offsets: Maturity Mismatches

In our view, a simplified approach to maturity mismatches needs to approximate and give credit for the extent of hedging provided by a short credit risk position in relation to an underlying long credit risk position. In this respect, we believe that the most straightforward approach would be to adopt a “straight line” or sliding scale method. Under this method, offsets would be allowed to the extent that the maturity of the hedge covers the underlying. For example, a 10-year bond hedged by a 9-year credit default option on that bond would be treated as 90% offset. We note that further quantitative work will be necessary to test how these results compare to a modelled approach to maturity mismatches in order to ensure proper calibration between the two methodologies and, if necessary, to adjust the level of offset allowed in the standardised approach.

In terms of applying these rules, in the case of the long credit risk position arising in the trading book, the position would (i) be reduced by the appropriate percentage under the sliding scale and (ii) subject to standardised specific risk charges at the residual maturity of the unhedged portion of the instrument. In the case of the long credit risk position arising in the banking book, after applying step (i), the residual position would be subject to standard risk weighted capital charges.

This approach does not address whether the residual exposure is a back-end or front-end risk or, in the case of the former, how soon this arises. Ideally, the credit risk capital regime needs to address these maturity related-issues via accounting for term structure. However, our proposals are designed as a simple and discrete amendment to the current approach, which itself already does not account for these factors. While suffering from the weaknesses of the existing regime, this modification is nevertheless a significant improvement and therefore should not be dismissed because it shares characteristics of the current capital rules. We would add that we recognise the need to ensure that such a simple offset rule is relatively conservative, in order to account for these weaknesses, and to allow proper calibration in relation to specific risk models.

## 4. Standardised Rules for Offsets: Instrument Mismatches

Amendments to the standardised rules are needed to tackle a number of basic problems:

- Where long and short credit risk positions (whether cash positions or credit derivatives) arise from bonds of the same issuer, but of different seniority
- Where long and short credit positions (whether cash or credit derivatives) arise from different instruments of the same borrower (e.g., loans vs. bonds)
- Where the underlying credit exposure arises from counterparty risk
- Where a banking book asset is hedged by a trading book instrument

Proposed changes to standardised rules for each are set out below.

Where bonds are issued by the same issuer but of differing seniority, we propose that a simple rule be employed to permit full offsets in any case where the seniority of short position is less than (or equal) that of the underlying long position. In the event of default by the issuer, the holder of the underlying bond will receive a greater recovery rate on the more senior debt (e.g. 50% of £100 million principal), while also receiving a credit event payment amount equal to the full principal amount reduced by the lower recovery rate on the more junior debt (e.g. £100 million reduced by 25% recovery), thereby ensuring full protection (in this case £50 million recovery on the underlying and £75 million payout on the hedge). This is similar to the standard adopted by the US banking agencies in their rules for recognition of credit derivatives as banking book guarantees. In this proposal, we are simply applying the same principle to instruments held in the trading book. (We would note that this proposed revision to the Basle rules and EU legislation would apply to cash instruments as well as credit derivatives, in order to limit distortions between markets.)

Where the underlying is a loan and the credit derivative hedge is referenced to that same loan, there is a clear case for permitting full offsets, as the default events and payout levels will be identical. In this case, the fact that the underlying is a loan means that the transaction would be governed by banking book rules. As we have argued elsewhere,[22] we believe these should be adapted to provide a derivatives capital adequacy approach, rather than that for guarantees. Thus, in this case the short credit risk from the credit derivative would offset the long credit risk on the loan, leaving a remaining counterparty risk charge to the provider of the credit derivative.

What about offsets if one leg of the transaction is a loan or loan-referenced credit derivative and the other is a bond or bond-reference credit derivative, where the loan recipient and bond issuer are the same entity? In this case, we believe that the above seniority rule described above should apply. This, again, provides a simple and consistent rule. If banking book rules are adapted as suggested, the capital treatment would be identical regardless of whether banking or trading book rules apply, and if the structure in effect straddles both books: the long and short credit risk would be offset, leaving a counterparty risk charge.

Finally, the question of credit risk arising from counterparty risk exposure being hedged by a credit derivative needs to be considered. Again, we believe that the simple seniority rule set out above should apply. In this case, swap claims are typically treated pari-passu as senior unsecured debt in insolvency. Thus, there should be scope to offset underlying counterparty exposures arising from swaps books, with credit derivatives referenced to assets that are of equal or more junior seniority.

We should note that in all these cases we have focused on the question of payout levels when determining offsets. Of course, it is also important that the transaction is structured in such a manner that a default on the underlying also triggers a credit event payment on the hedge. We recognise that this test will not be met in all cases, but the approach to credit derivatives documentation (such as envisaged in ISDA's newly published credit swap confirm) has been to ensure that as wide a range of triggers apply as possible so that there are few limits on the ability of a hedge to be effective.

[22] See ISDA's comments to the Commission Bancaire's credit derivative proposals.

## D. QUANTITATIVE ANALYSIS OF MODELLING AND OFFSETS PROPOSALS

This section provides quantitative analysis of the evolutionary models-based approach described in the previous parts of this report. The purpose of this is to provide the supervisory community and others with tangible examples of the flaws of the current credit risk capital rules in assessing various aspects of credit risk and the benefits of our alternatives proposed above. This analysis is also designed to give readers an idea of the relative performance of the various different calculation methods that have been discussed, in order to assess whether a proper incentive structure would be created and the different methods are properly calibrated in relation to each other.

Specifically, this section assesses the regulatory capital requirements that would apply under the following calculation methods or models:

- The current standardised rules
- The simplified calculation model described above and in annex IV
- CreditMetrics, using both a 1 year holding period and 99% confidence interval
- CreditRisk+, using the same parameters
- Two proprietary models of ISDA members, using the same parameters

To assess the different calculation methods, we look at three portfolios, each with a total exposure of $66.3 billion:

- Portfolio A: A high credit quality diversified (500 name) portfolio
- Portfolio B: A low credit quality diversified (500 name) portfolio
- Portfolio C: A high credit quality concentrated (100 name) portfolio

These portfolios consist solely of 1-year drawn term loans (so that counterparty risk modelling does not arise). Credit ratings, default rates (for 1.1.81 to 31.12.96 from Standard & Poors) and default rate volatilities were provided. Exposures are of equal size for all names in a portfolio.

We show both 0% and, more realistically, 50% recovery rates for the portfolios, with 0% recovery uncertainty also assumed.

Given the sensitivity of modelling results to correlation analysis, we also show the performance of the credit risk models assessed both in terms of a modelled correlation (or the application of default volatilities under CreditRisk+), but also with correlation set to zero.

We would be happy to discuss these testing results with supervisors in greater depth and to answer any questions regarding assumptions and parameters used apart from those specified here.

### 1. Impact of Diversification and Concentration

While the application of the current standardised rules means that capital charges are equal for all three test portfolios, the use of portfolio modelling highlights the important benefits of diversification.

This is illustrated in Figure 4 by contrasting the results for portfolios A and C. In all cases, the modelled charges differentiate between the two portfolios, recognising that the relative concentration of portfolio C makes it riskier even though overall credit quality is the same between the two portfolios. All three models reflect this impact in roughly the same manner.

In contrast, the simplified model, like the standardised rules, cannot distinguish portfolio effects.

### 2. Impact of Differences in Credit Quality

Again, the current standardised rules fail to account for differences in credit quality between the portfolios, as all of the loan exposures are assumed to be to corporates, all of which would receive a 100% weighting regardless of credit rating or quality.

In contrast, the credit risk models and the simplified model differentiate charges in light of credit quality, as can be seen in Figure 4. This can be seen by contrasting the charges for portfolios A and B. Here, diversification/ concentration is equal, but credit quality is lower in the latter portfolio. This is reflected by the significantly higher capital charges produced by all three portfolio models. Also, the simplified model – through its basic credit rating buckets – also recognises this effect to some extent.

### 3. Calibration of Test Results

The test results may also be assessed in terms of:

- The performance of the portfolio models relative to each other;

- The performance of the portfolio models relative to the standardised rules; and
- The performance of the simplified model, relative to both portfolio modelling and the standardised rules.

The portfolio models tested generally showed consistent results across the three portfolios. This is the case both where correlation is assessed individually and where it is assumed at zero. Consistency is strongest for the latter, as correlation will have a strong impact on test results. However, even with correlation assessed, the three models recognise diversification and credit quality in a consistent manner, as the ratio of charges for the three portfolios is similar.

In relation to the standardised rules, the portfolio test results adjusted for 50% recovery were very close in the case of portfolio B. However, the portfolio models strongly reward the higher credit quality of portfolios A and C relative to the standardised rules, and also further reward the greater diversification of portfolio A relative to C.

The simplified model produces results that roughly lie within the standardised and portfolio model results. This was an explicit aim of the calibration of the simplified model parameters, and further adjustments to the proposed weightings or offset disallowances could be contemplated after further testing.[23] However, the parameters used here allow the simplified model to provide recognition of differentiated credit quality in contrast to the current rules, without discouraging firms from developing full portfolio models, as these are rewarded for recognising diversification effects.

These results illustrate the important benefits that portfolio credit risk modelling has over both the current standardised rules and any simplified modelling approach: that is, the recognition of portfolio diversification effects. They also demonstrate the weaknesses of the current rules in assessing differences in credit quality, a deficiency that even the simplified model proposed here would address. Also, while the scope of the testing exercise was very limited, the results nevertheless point to a broad consistency between model portfolio model approaches.

It is recognised that supervisors may wish the industry to undertake further quantitative work to further examine these conclusions and to assess other issues, and may wish to see test results for other portfolio types.[24] ISDA would be pleased to discuss and help organise such follow-up work with the supervisory community.

[23] For example, to examine performance of maturity and offset recognition.

[24] For instance, limited time prevented an analysis of offsetting long and short positions and it may be useful to assess model results for different asset classes. Also, it may be informative to use individual default and volatility rates, rather than common parameters.

**Figure 4: Comparison of Capital Calculation Methodologies**

**Correlation assessed, zero recovery (millions USD)**

| | *Capital charge* | | |
|---|---|---|---|
| | **Portfolio A** | **Portfolio B** | **Portfolio C** |
| **Current standardised rules*** | 5,304 | 5,304 | 5,304 |
| **Simplified model** | 1,407 | 5,351 | 1,407 |
| **CreditMetrics** | 2,264 | 11,436 | 2,941 |
| **CreditRisk+** | 1,638 | 10,000 | 2,574 |
| **SBC ACRA** | 1,373 | 9,654 | 2,366 |

**Correlation assessed, 50% recovery, zero recovery uncertainty (millions USD)**

| | *Capital charge* | | |
|---|---|---|---|
| | **Portfolio A** | **Portfolio B** | **Portfolio C** |
| **Current standardised rules*** | 5,304 | 5,304 | 5,304 |
| **Simplified model** | 1,407 | 5,351 | 1,407 |
| **CreditMetrics** | 1,132 | 5,718 | 1,471 |
| **CreditRisk+** | 819 | 5,000 | 1,287 |
| **SBC ACRA** | 686 | 4,827 | 1,183 |

**Zero correlation, zero recovery (millions USD)**

| | *Capital charge* | | |
|---|---|---|---|
| | **Portfolio A** | **Portfolio B** | **Portfolio C** |
| **Current standardised rules*** | 5,304 | 5,304 | 5,304 |
| **Simplified model** | 1,407 | 5,351 | 1,407 |
| **CreditMetrics** | 777 | 1,989 | 2,093 |
| **CreditRisk+** | 789 | 2,074 | 2,020 |
| **SBC ACRA** | 767 | 1,907 | 1,967 |
| **Internal Model A** | 724 | 1,756 | 1,906 |

* Same charges would arise if modified to recognise offsets, as no short positions included.

## E. REFORM OF THE CAPITAL TREATMENT OF COLLATERAL

The previous sections of this report have focused on the need to reform the core elements of the existing credit risk regulatory capital regime. However, the manner in which collateral may be recognised as reducing any such capital charges is also urgently in need of reform.

ISDA has a strong interest in the capital regime as well as in the legal and other standards governing collateral. The Association publishes standard collateral-use documentation and user guides for both pledge and title transfer arrangements for a number of jurisdictions. We are also currently in the process of obtaining opinions on the enforceability of this documentation for a wide range of countries. Also, coincident with the issue of this report, ISDA is publishing a handbook on collateral management. This discusses the uses of collateral and the legal, documentation, practical, operational and other aspects raised. This section therefore does not discuss these considerations at any length, but focuses primarily on the capital adequacy framework. A copy of ISDA's collateral handbook will be available on the credit risk page of our website (www.isda.org).

In essence, we see two legs to the reform process for collateral. Firstly, we believe that the current scope for capital relief via use of collateral is too restrictive and inconsistent; this needs to be updated to allow additional forms of collateral and to take advantage of new modelling techniques. Secondly, we are concerned by the lack of a uniform regulatory and supervisory framework for the use of collateral. The use of collateral raises important legal, operational and risk management questions which need to be resolved before a firm can be confident that it has put protection in place; we therefore propose that firms ensure they have in place appropriate internal collateral management policies (ICMPs) which address these issues. Finally, we also call on legislators and supervisors to take steps to address these legal risks involving collateral use.

### 1. Reform of the Eligible Collateral Rules

While part A of this report mentioned a number of the flaws of the current eligible collateral rules it is useful to consider these now in greater depth, putting aside legal issues for the time being.

At present collateral may be used to reduce the risk weighting of an exposure to that of the issuer of the collateral in question. Thus, only zone A government securities (essentially securities issued by OECD governments) and cash may be employed as collateral to achieve a reduction of an exposure to a 0% risk weighting. In the case of non-OECD government debt, for instance, the risk weighting is simply reduced to 20%.

This approach is at odds with current market practice regarding the use of collateral. At present, a wider range of collateral is used than simply OECD government instruments to provide full protection on an exposure – provided that appropriate prudential haircuts are made for the collateral received. Thus, so long as sufficiently conservative haircuts are made, any form of collateral may be accepted. ISDA's Credit Support Annex, for example, provides for this approach. However, the capital regime will discourage this by providing at best limited and imperfect capital relief with non-OECD assets. Where these assets are not readily available, this discourages collateralisation. Also, the current rules fail to recognise the advantages of exactly matching the form of collateral with the underlying risk. Thus, a covered call on a share provides maximum protection.

The current regulatory capital rules on collateral are also inconsistent. While the rules for applying collateral to OTC derivatives and other credit exposures are as set out above, under EU law there are more generous standards for repo transactions and for the calculation of large exposures: Annex II of the Capital Adequacy Directive imposes no limit on the forms of security/collateral that may be delivered as part of a repo or similar transaction, while article 4 paragraph 7(o) of the Large Exposures Directive allows equities and other forms of typically non-eligible collateral to be used to reduce large exposures. Also, the Solvency Ratio Directive is being amended to provide greater scope for recognising typically non-eligible forms of collateral against OTC derivatives, but only under clearing arrangements.

ISDA therefore sees a need to update the regulatory capital rules applying to collateral to bring them into line with market practice and to provide a more consistent supervisory framework. In summary, we propose that the regulatory capital rules for collateral be reformed to provide scope for the application of a wider range of collateral types to provide full relief

from regulatory capital charges, so long as appropriate haircuts are made based on approved modelling techniques.

Firms would first of all calculate their counterparty exposure under either the standardised method (determining current and potential future exposure) or under an approved alternative method in line with the evolutionary models-based approach. Full capital relief would then be provided to any part of that exposure which was covered by any form of collateral, so long as that collateral had received a prudential haircut in line with an approved internal model. This model would need to assess the market and credit risk of the collateral in question to determine the appropriate haircuts and would be approved as part of the assessment process for overall credit risk models, subject to the same qualitative standards discussed in section C above. In addition to the legal standards set out below, the firm would also have to monitor exposure and collateral levels on a daily basis and have the right to call collateral daily. Finally, the firm would also have to ensure that it took account of the potential correlation of credit risk between the underlying exposure and the issuer of the collateral in question.[25]

**2. Uniform Supervisory Standards for Collateral Recognition**

At present there is no common international legal framework governing the use of collateral for regulatory capital purposes. Some national supervisors do have very limited standards, but many firms themselves set more rigorous internal controls in light of the issues raised by collateral use. These are various. For example, it is important that collateral is properly documented, perfectible and enforceable in all relevant jurisdictions. In the case of collateral, this not only means the jurisdictions of the counterparties involved, but also of the location of the collateral. The detailed legal issues involved with the use of collateral are discussed in more depth in ISDA's collateral handbook mentioned above.

ISDA has developed standard documentation for using collateral under a number of jurisdictions – the Credit Support Annex. This allows collateral to be taken to reduce counterparty risk exposures arising from transactions entered into under the ISDA Master Agreement. We have started an opinion-gathering process in a limited number of jurisdictions to supplement this process. We would be happy to discuss the results of this exercise with supervisors when it is complete.

In the absence of uniform regulatory standards concerning capital recognition, it is possible that some firms are accepting collateral without an appropriate internal risk management framework in place. This clearly exposes the firm to legal and credit risk and, if the collateral is being used to reduce regulatory capital, means that an inaccurate picture of the risk profile of an institution is potentially being provided to the supervisory community and the market. Moreover, even if the firm wishes to implement internal control procedures, there is no internationally acceptable minimum standard in place. Finally, for those firms that do go to the sometimes considerable expense of putting in place proper legal and other controls for collateral use, they are treated on an equal footing with less well managed firms that are not addressing the potential legal and credit risks.

In light of these considerations, ISDA believes it would be appropriate to establish a common international framework for the recognition of collateral for capital purposes. We therefore propose that banks ensure they have in place appropriate internal collateral management policies (ICMPs), which are subject to supervisory review. We believe that this approach would require banks to focus on the important legal, operational and risk management issues raised by collateral use. We believe that our suggested ICMP approach is in keeping with the underlying philosophy of reform of the regulatory capital regime – that is, greater reliance on internal management's assessment of risk.

This reform would reward those firms that employ best practice in this area, while providing tangible capital incentives for others to address the potential legal and other issues associated with collateral use.

**3. Need for Action by National Legislators and Supervisory Authorities**

While somewhat out of the terms of reference of this paper, ISDA would like to take the opportunity to note the importance of action by national legislative and supervisory authorities to tackle the legal risks posed by collateral use. The complexities and difficulties raised could in

[25] See ISDA's collateral handbook for a more complete discussion of the importance of correlation in a number of cases.

many instances be resolved through appropriate changes to national law.

We therefore recommend that Basle members and other supervisory authorities conduct an assessment of their local jurisdiction and as necessary work with legislators to ensure that:

- There is no risk of recharacterisation of title transfer arrangements into a pledge arrangement
- Pledge arrangements are simple mechanically and not easy to challenge
- There are clear rules for enforceability of security interests, avoiding stay periods, voidable preferences, fraudulent conveyances and other issues that weaken a pledge or security interest approach
- That conflict of laws considerations (given multiple jurisdictions usually involved) do not threaten enforceability

We also note that legal issues are minimised by greater consistency in legal approaches. We recognise that this is difficult to achieve but note that the welcome progress made in the EU Payment Finality Directive could be extended into this area to try to achieve greater harmonisation with the European Union.

## ANNEX I: ABOUT ISDA

The International Swaps and Derivatives Association (ISDA) is the leading global trade association representing participants in the privately negotiated derivatives industry, a business which includes interest rate, currency, commodity and equity swaps, as well as such related products as caps, collars, floors and swaptions. ISDA was chartered in 1985, and today numbers over 340 members from around the world. These members include most of the world's major institutions who deal in, as well as leading end-users of, privately negotiated derivatives.

### ISDA's Mission

The Association's primary purpose is to encourage the prudent and efficient development of the privately negotiated derivatives business by:

- Promoting practices conducive to the efficient conduct of the business, including the development and maintenance of derivatives documentation
- Promoting the development of sound risk management practices
- Fostering high standards of commercial conduct
- Advancing international public understanding of the business
- Educating members and others on legislative, regulatory, legal, documentation, accounting, tax, operational, technological and other issues affecting them
- Creating a forum for the analysis and discussion of, and representing the common interest of its members, on these issues and developments

### ISDA's Activities

ISDA works to support its mission in a number of ways. Outlined below is a summary of its activities:

***Regulatory and Legislative Affairs***: ISDA takes a leading role in formulating and advocating the industry's position on crucial regulatory and legislative issues affecting both dealers in and users of privately negotiated derivatives. Its activities include working with regulators and legislators to responsibly address policy concerns arising from the evolution of the business. As part of its mission, ISDA officials frequently meet with policymakers in the world's financial centers, testify to public regulatory and legislative forums, and prepare and provide position papers on and responses to regulatory and legislative initiatives.

***Risk Management:*** ISDA works to develop and improve risk management practices and policies among its members and among derivative industry participants in general. The Association, for example, has played a prominent role in the development of capital guidelines for market and credit risk by the Basle Committee on Banking Supervision. ISDA was a strong and early advocate of the use of internal models, and was a principal driver behind the Basle Committee's recognition of netting, in calculating capital requirements for financial institutions. The Association is currently working with policymakers and supervisors to develop capital guidelines for credit derivatives and collateral arrangements.

***Documentation***: The ISDA Master Agreement, the authoritative contract widely used by industry participants, represents a milestone achievement because it has established international contractual standards governing privately negotiated derivatives transactions that reduce legal uncertainty and allow for reduction of credit risk through netting of contractual obligations. As the business has developed and grown, ISDA has expanded and updated the Master Agreement and its supporting documents, a process which continues today. (A list of ISDA documentation publications is attached for your review.)

***Netting:*** Ensuring the enforceability of the netting provisions of the ISDA Master Agreement has been, and remains, a key initiative, because of its importance in reducing the credit risk arising from the business. The Association's work in this area has resulted in a series of laws being passed in various countries that ensure legal certainty in those nations. Since its original request for opinions from the G-10 countries in 1987 that only addressed the enforceability of certain provisions of the 1987 ISDA Master Agreement, ISDA has expanded the number of countries solicited to 31. The scope of the opinions now includes the enforceability of the termination, bilateral close-out netting and multibranch netting provisions of the 1987 and 1992 Master Agreements and also asks counsel to review whether the inclusion of additional derivatives transactions, such as credit derivatives and bullion transactions affects the legal opinions being rendered.

These opinions are now updated annually to comply with requests from various central banks. ISDA continues to expand its efforts related to the

enforceability of netting provisions in emerging market jurisdictions, working with the relevant legislative and regulatory representatives. ISDA has also begun a project to solicit legal opinions on the enforceability of the recently released ISDA Credit Support Documents in various jurisdictions.

***Accounting, Disclosure and Tax***: The Association's efforts on tax, accounting and disclosure issues include maintaining a close working relationship with industry policymakers (such as FASB and IASC), as well as with the appropriate regulatory bodies. ISDA formulates position papers, responds to official and industry initiatives, and works to ensure that the views of its members are adequately represented in regulatory and industry guidelines.

***Market Practice Advisory Service***: To resolve disputes involving questions of market practice in the privately negotiated derivatives business, ISDA established the Market Practice Advisory Service. The Service, which will not address issues of fact or law, is intended to provide guidance to ISDA members and offer an informal alternative to formal arbitration or litigation. The Service will confidentially answer inquiries from two parties by identifying customary market practice in response to an agreed statement of facts.

***Market Survey***: ISDA publishes survey data on the levels of activity in and the amounts outstanding for swaps and related derivatives. Included is an analysis of activity and growth by product, currency, location, and type of counterparty.

***Conferences and Seminars:*** ISDA conducts international and regional conferences on important industry issues for derivatives providers and users throughout Europe, Asia and the Americas. Public policymakers, academicians, industry specialists and corporate and governmental users of derivatives typically participate in these events. Some conferences, such as the Association's Annual General Meeting (in March) and Member Updates (September/October) are open only to members.

**ISDA's Members**

The Association's membership includes leading providers and users of privately negotiated derivatives, as well as professional service providers, consulting firms and others active in the business. ISDA's three membership categories are:

***Primary Members***: Over 180 institutions who deal in privately negotiated derivatives comprise the Association's primary membership category. Included are virtually all of the world's major international investment, merchant and commercial banks.

***Associate Members***: Professional service providers who participate or are interested in the privately negotiated derivatives business, such as law, accounting and consulting firms, are eligible for ISDA associate membership.

***Subscriber Members***: Corporations, government agencies and enterprises, investment management firms and others who utilise privately negotiated derivatives to better manage risk form ISDA's subscriber membership category.

A special category of subscriber membership is available to financial institutions who use derivatives primarily for risk hedging or asset/liability management and who are subject to BIS capital guidelines or similar capital regimes in non-BIS countries. Membership for such institutions provides them with access to ISDA's netting opinions, a key credit-risk reduction tool.

**ISDA's Structure**

ISDA's board of directors, which is drawn from and elected annually by its primary members, set the Association's strategy and policies. The board, in turn, annually elects its officers, who include a chairman, one or more vice chairmen, a treasurer and a secretary.

ISDA's executive director functions as its chief executive officer and is responsible for implementing the policies of the board and managing the affairs of the Association and its full-time staff. Headquartered in New York City, ISDA also has an office in London and is represented in Tokyo by its legal counsel. ISDA's SouthEast Asia and Hong Kong Regional Committee, which is co-chaired by industry executives in Singapore and Hong Kong, provides the Association with representation in that area.

## List of ISDA members

### *ISDA Primary Members*

Abbey National Financial Products
ABN-AMRO Bank, N.V.
ABSA Bank Ltd.
AIG Financial Products Corp.
Allied Irish Banks, plc
Asahi Bank, Ltd.
ASLK-CGER Bank N.V. S.A.
Australia and New Zealand Banking Group, Ltd.
Bacob Bank s.c.
Baden-Wurttembergische Bank AG
Banca Commerciale Italiana
Banca CRT- Cassa di Risparmio di Torino
Banca del Gottardo
Banca di Napoli
Banca di Roma S.p.A.
Banca Nazionale del Lavoro
Banco Bilbao Vizcaya, S.A.
Banco Central Hispanoamericano, S.A.
Banco de Negocios Argentaria, S.A.
Banco Espanol de Credito, S.A. (BANESTO)
Banco Espirito Santo e Comercial de Lisboa, S.A.
Banco Exterior de Espana, S.A.
Banco Santander
Bank Austria AG
Bank Brussels Lambert
Bank Labouchere N.V.
Bank of America
Bank of Boston
Bank of Ireland Group Treasury Limited
Bank of Montreal
Bank of New York
Bank of Nova Scotia
Bank of Scotland Treasury Services plc
Bank of Tokyo-Mitsubishi, Ltd.
Bankers Trust Company
Bankgesellschaft Berlin AG
Banque CPR
Banque Nationale de Paris
Banque Paribas
Barclays de Zoete Wedd Ltd.
Bayerische Hypotheken und Wechsel Bank AG
Bayerische Landesbank Girozentrale
Bayerische Vereinsbank AG
Bear, Stearns & Co. Inc.
BFG Bank, AG
BHF Bank (Berliner Handels-und Frankfurter)
Caisse Centrale des Banque Populaires
Caisse des Depots et Consignations
Caixa Geral de Depositos, SA.
Caja de Ahorros Y Monte de Piedad de Madrid
CARIPLO - Cassa di Risparmio delle Provincio
CEDEF Capital Services SA
CERA Bank C.V.
Charterhouse Bank
Chase Manhattan Bank
Christiania Bank
CIBC World Markets
Citibank, N.A.
Cofiri SIM S.p.A.
Commerzbank AG
Commonwealth Bank of Australia
Compagnie Financiere de CIC et de L'Union Europeene
Confederacion Espanola de Caja de Ahorros
Credit Agricole Indosuez
Credit Commercial de France
Credit Communal de Belgique
Credit Lyonnais
Credit Suisse Financial Products
Creditanstalt-Bankverein
Credito Italiano S.p.A.
Dai-Ichi Kangyo Bank, Ltd.
Daiwa Bank, Ltd.

Daiwa Europe Bank Plc
Den Danske Bank
Den Norske Bank ASA (DnB)
Deutsche Morgan Grenfell
DG Bank Deutsche Genossenschaftsbank
Die Erste Osterreichische Spar-Casse Bank AG
DKB Financial Products, Inc.
Donaldson Lufkin & Jenrette
Dresdner Bank AG
Elf Trading S.A.
Enron Corporation
Euro Brokers Capital Markets Inc.
FINACOR
First Marathon Bank GmbH
First National Bank of Chicago
First Union National Bank
Fuji Bank Ltd.
Fuji Capital Markets Corp.
General Re Financial Products Corp.
Generale Bank
GiroCredit Bank AG der Sparkassen
Goldman Sachs & Co.
Halifax plc
Hambros Bank Ltd.
Hamburgische Landesbank Gironzentrale
HSBC Midland
IBJ International Limited
IKB Deutsche Industriebank AG
IMI SIGECO Societe Intermed. Mobiliare S.p.A.
Industrial Bank of Japan, Limited
ING Bank
ING Baring Financial Products
Intercapital Brokers Ltd.
Investec Bank Limited
Istituto Bancario San Paolo di Torino
J. Henry Schroder & Co. Limited
J.P. Morgan Securities Ltd.
Joyo Bank, Ltd.
Kredietbank N.V.
Landesbank Hessen - Thueringen Girozentrale
Landesbank Rheinland-Pfalz Girozentrale
Landesbank Schleswig-Holstein Girozentrale
Landesgirokasse offentliche Bank und Landessparkasse
Lehman Brothers
Lloyds Bank Plc
Long-Term Credit Bank of Japan
MeesPierson, N.V.
Mellon Bank, N.A.
Merita Bank Ltd
Merrill Lynch & Co., Inc.
Mitsubishi Trust and Banking Corp.
Mitsui Trust & Banking Co. Ltd.
Morgan Stanley & Co. Inc.
National Australia Bank Limited
National Bank of Canada
National Bank of Greece
Nationale Investeringsbank N.V.
NationsBank
NatWest Capital Markets Limited
New Japan Securities Co., Ltd.
Nikko Securities Co., Ltd.
Nippon Credit Bank Ltd.
Nomura Capital Services Inc.
Nordbanken
Norddeutsche Landesbank Girozentrale
Norinchukin Bank
Polish Development Bank
Prebon Yamane USA Inc.
Prudential Global Funding Inc.
Rabobank Nederland
Raiffeisen Zentralbank Austria AG
Rand Merchant Bank Limited
Republic National Bank of New York
Robert Fleming & Co. Limited
Rossiysky Kredit Bank

Royal Bank of Canada

Royal Bank of Scotland plc

Sakura Bank Limited

Sakura Global Capital

Sal. Oppenheim jr. & Cie KGaA

Salomon Smith Barney Holdings Inc.

Sanwa Bank Limited

Sanwa Financial Products

Saudi International Bank

SBC Warburg Dillion Read

Shoko Chukin Bank

Skandinaviska Enskilda Banken

Societe Generale

Standard Chartered Bank

Standard Corporate and Merchant Bank

Sudwestdeutsche Genossenschafts-Zentralbank AG (SGZ Ban

Sudwestdeutsche Landesbank

Sumitomo Bank Capital Markets, Inc.

Sumitomo Bank Ltd.

Sumitomo Trust and Banking Co., Ltd.

Suntrust Capital Markets, Inc.

Svenska Handelsbanken (Handelsbanken Markets)

SwedBank

Swiss Re Financial Products

Tokai Bank Ltd.

Tokyo-Mitsubishi International Plc

Toronto Dominion Bank

Toyo Trust and Banking Company, Limtied

Tradition-Berisford LP

Trinkaus & Burkhardt KGaA

Unibank A/S

Union Bank of Switzerland

Westdeutsche Genossenschafts-Zentralbank eG

Westdeutsche Landesbank Girozentrale

Westpac Banking Corporation

Yamaichi Securities Co., Ltd.

Yasuda Trust & Banking Co., Ltd.

Zurich Capital Markets

**Total Primary Members: 185**

***ISDA Associate Members***

Allen & Overy
Arthur Andersen & Co.
Baker & McKenzie
Blake, Cassels/Lavery de Billy
Bloomberg Financial Markets
Brown & Wood
C-ATS Software Inc.
Cadwalader, Wickersham & Taft
Capital Market Risk Advisors, Inc.
Cedel
Chicago Mercantile Exchange
Cleary, Gottleib, Steen & Hamilton
Clifford Chance
Coopers & Lybrand
Coudert Freres
Davis Polk & Wardwell
De Brauw Blackstone Westbroek
Debevoise & Plimpton
Deloitte & Touche
Dewey Ballantine
DIAGRAM
Documentum
EDS - Electronic Data Systems
Ernst & Young LLP
Euroclear
Exchange Clearing House Limited
Field Fisher Waterhouse
Finnish Bankers Association
FNX Limited
Freshfields
Fried, Frank, Harris, Shriver and Jacobson
Front Capital Systems AB
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ITS Trading Systems Limited
Jones, Day, Reavis & Pogue
KPMG Peat Marwick LLP
Latham & Watkins
Lee & Li
Liffe (London Int'l Fin. Futures & Options)
Linklaters & Paines
Login S.A.
Lombard Risk Systems Ltd.
London Clearing House Ltd.
Longview International
Lovell White Durrant
M A T I F
Mayer, Brown & Platt
McMillan Binch
Milbank, Tweed, Hadley & McCloy
Mitsui, Yasuda, Wani & Maeda
Monis Software
Moody's Investors Service, Inc.
Morgan, Lewis & Bockius
Nauta Dutilh
Norton Rose
Ogilvy Renault
Osler, Hoskin & Harcourt
Price Waterhouse
Principia Partners
Punder, Volhard, Weber & Axster
Renaissance Software, Inc.
Reuters
Richards & O'Neil
Rogers & Wells
Rolfe & Nolan

S.W.I.F.T. sc
Schiff Hardin & Waite
Shearman & Sterling
Sidley & Austin
Simmons & Simmons
Simpson Thacher & Bartlett
Skadden, Arps, Slate, Meagher & Flom
Slaughter and May
SNS Systems Inc.
Standard & Poor's
Stikeman, Elliott
Stroock & Stroock & Lavan
Sullivan & Cromwell
Summit Systems Inc.
SunGard Capital Markets Inc.
Telerate Systems Inc./Dow Jones
Tory Tory DesLauriers & Binnington
Watson, Farley & Williams
Weil Gotshal & Manges
White & Case
Wilde Sapte

**Total Associate Members: 94**

***ISDA Subscriber Members***

A/S Eksportfinans

AB Svensk Exportkredit

ABB Capital B.V.

American Express Company

American Honda Finance Corporation

Arab-Malaysian Merchant Bank Berhad

B. Metzler seel Sohn & Co. KGaA

Banc One Funds Management Company

Bank Nederlandse Gemeenten, nv

British Petroleum Company p.l.c.

Caisse Centrale Desjardins

Caisse Centrale Du Credit Immobilier de France

Cargill Financial Services Corporation

Council of Europe Social Development Fund

DePfa Bank (Deutsche Pfandbrief-Hypotheken)

Deutsche Bau- und Bodenbank

Deutsche Girozentrale - Deutsche Kommunalbank

Dow Chemical Company

DSL Bank, Deutsche Siedlungs-und Landesrentenbank

El Paso Energy Marketing Company

Electricite de France

Eskom

EUROFIMA

European Bank for Reconstruction & Development

European Investment Bank

Federal Home Loan Bank of Atlanta

Federal Home Loan Bank of Chicago

Federal Home Loan Bank of Pittsburgh

Federal Home Loan Mortgage Corporation

Finnish Export Credit Ltd.

Ford Motor Credit Company

General Electric Capital Corporation

Hydro-Quebec

IBM International Treasury Services Company

Int'l Bank for Reconstruction (World Bank)

Intel Corporation

John Nuveen & Co. Incorporated

Kingdom of Denmark

Kingdom of Sweden

Kreditanstalt Fur Wiederaufbau

Landeskreditbank Baden-Wuerttemberg (L-Bank)

Landwirtschaftliche Rentenbank

McDonald's Corporation

Ministere des Finances (Quebec)

Mobil Oil Corporation

New Zealand Debt Management Office

Nordic Investment Bank

Ontario Financing Authority

Ontario Hydro

Oresundskonsortiet

S.A. IPPA N.V.

Scoular Company

Siemens Aktiengesellschaft

Stichting Pensioenfonds ABP

Student Loan Marketing Association

Swedish National Housing Finance Corp.

Tachyon Partners

Tiger Management Corporation

Tokio Marine and Fire Insurance Co., Ltd.

TOTAL

Transnet Limited

Vitol S.A., Inc.

**Total Subscribers Members: 62**

**Total ISDA Members: 341**

## ANNEX II: MEMBERS OF THE ISDA CREDIT RISK STUDY GROUP

The Credit Risk Study Group was established by ISDA's Board of Directors in July 1997 to conduct an analysis of the current credit risk regulatory capital regime, to propose reforms and to conduct necessary quantitative work on this subject. In conducting its work, the group drew on the resources of the firms of its members and the existing work of other ISDA Committees and Working Groups (particularly the Risk Management and Accounting Committees and the Credit Derivatives Task Force), and consulted with a number of other firms from across the ISDA membership. The Group reported in early 1998, at which time the Board of Directors decided to publish its recommendations as a discussion paper for the ISDA membership at large, other market participants and the supervisory community.

**Members of the Group**

| | |
|---|---|
| Brian Murtagh | Bankers Trust |
| Robert Reoch | Bank of America |
| Shaun Rai | CIBC Wood Gundy |
| Evan Picoult | Citibank |
| Jay Newberry | Citibank |
| June Corpuz | Credit Suisse Financial Products |
| Matthew Elderfield | ISDA |
| Michael Clarke | JP Morgan |
| Blythe Masters | JP Morgan |
| Andrew Austin | Nomura |
| Marjolein Sol | Rabobank |
| Jan Cobley | SBC Warburg |
| Mark Wallace | SBC Warburg |

## ANNEX III: DATA ISSUES IN THE USE OF CREDIT RISK MODELS

A credit risk model – as with any other statistical model – depends crucially on the quality of the data that is employed. For market risk models, data quality is not a problem for most markets, given the wide range of information on equity, bond and foreign exchange price movements and therefore volatility for most markets. However, in the case of credit risk modelling, both data requirements are more demanding and the quality of data is more uneven. This annex looks at the data requirements of credit risk models in some detail, surveys current available data sources and considers ways of improving data sources in the future.

### 1. Data Requirements and Sources

Credit risk models require a number of data inputs. As discussed in the main text and in Annex V, full portfolio credit risk models need data on default probabilities, recovery rates, transition probabilities, default correlation and default volatility, depending on the particular modelling method employed. Also, for spread/specific risk models, information on credit spreads is required.

This information is available from a number of possible sources. These include observable bond and loan prices and therefore credit spreads, observable equity prices in order to calculate default correlations, and historical default data from credit rating agencies or internal or pooled sources. The next section surveys current data availability in these various areas.

The more granular and specific the information, the more powerful the modelling that may be achieved. However, this does not mean that models will only work with the most granular data: it is possible to provide calculations of credit risk with relatively high-level data on variables like the default rate. While not perfect, these methods would certainly be an advancement upon the standardised credit risk calculation method; indeed, the current standardised risk weights and capital levels are based on extremely blunt averages of default and recovery rates. With this in mind, the spectrum of data detail that can be considered is as follows:

- Name Specific: spread, event history
- Industry Specific: spread (by rating), event history (by rating)
- Country Specific: spread (by rating), event history (by rating)
- Rating Specific: spread, event history

### 2. Data Availability

In light of the above, ISDA conducted an informal survey of credit data availability. This is set out in Figure 5.

Our survey is by no means comprehensive and simply covers some of the main vendors of data needed for credit risk modelling. It reveals a number of vendors or pooling arrangements providing information for both spread and default data for varying periods and different degrees of granularity. In terms of the hierarchy of data quality and detail described above, a number of specific markets have daily name-specific spread and default information. Others do not reach this level, but are sufficient for modelling subject to due care. Also, the period of time covered in many cases would meet the requirement to include a credit cycle. However, data are generally only available for major names (and do not extend into the mid-market) and is generally better for the US than elsewhere.

As noted above, this survey is not comprehensive[26] and relates to public sources of credit risk data. It is important to remember that banks will of course also have internal credit risk data available. Banks will likely have default data and internal grading information for loans for varying maturities and, depending on the level of sophistication of the risk management and provisioning policies, perhaps also spread data on some loans. This internal information can be employed for modelling. Also, there are already some projects to pool loan data in the US and some informal discussions about projects in Europe. Internal data are therefore an important resource, which banks themselves are keen to develop.

Thus, in conclusion, while data scope and granularity is uneven and is perhaps weaker outside the US, there are sufficient data to employ credit risk modelling techniques immediately for at least some markets and sectors. Also, it is clear from this survey that there are a number of data pooling and publication projects underway that point to imminent improvements in data availability.

[26] The survey will be included on our credit risk website page and updated in the light of new information.

This has a number of implications for the regulatory capital framework. First, it is clear that there is at present sufficient data for some sectors to allow immediate movement to an evolutionary models-based approach. Second, it is evident that at least some of the projects noted above will have led to better data availability by the time any reformed capital rules are finalised by the Basle Committee on Banking Supervision (and then subsequently adopted into EU law). It would be inappropriate to wait for these developments to take place before starting the process of reform. Indeed, reform of the capital regime providing scope to use models only in those cases where robust data is in place would provide a strong incentive to tackle any remaining areas of concern.

The different data requirements of models and the general link between the granularity of data and accuracy of a model also means that this should be a key area of review in any qualitative supervisory assessment of a model, both at the time of application and on an on-going basis. Supervisors will have to be satisfied that adequate data sources are in place for the modelling technique employed. This assessment will need to relate not just to the initial hurdle of model approval, but also in assessing the relative accuracy of different models applied by different firms. Thus, in a case where data are adequate for modelling, but are at a relatively high-level and less granular than that employed by another firm, it may be appropriate to impose compensating controls. This provides the supervisory community with an important qualitative prudential control to assess data quality.

### 3. Encouraging Improvements in Data Quality

While current data quality is sufficient to permit modelling to begin, and improvements are already underway, ISDA believes that more can be done in this area to promote better credit risk management for both internal and regulatory capital purposes. We are therefore taking or recommending the following steps:

- We are including information on credit data availability on our credit risk web page, providing links to databases where available. We are ready to add information from other sources, as this becomes available.
- We plan to host a “Data Summit”, bringing together the key credit risk data providers identified in our survey in order to discuss the industry’s requirements for improved data quality and prospects for greater availability and publication of data.
- We call on market participants and others to take steps to improve availability of data on credit risk. In particular, we encourage banks to take steps towards data pooling and invite comment as to whether ISDA should play a role in such an exercise. We also call on members of the Basle Committee to publish any relevant data collected from supervisory returns or other statistics. We recognise that this raises questions of confidentiality but believe that these can be overcome.

**Figure 5: Credit Risk Data Sources**

| | Spread Data | | | | Default Data | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **By** | **Granularity** | **Period** | **Comments** | **By** | **Granularity** | **Period** | **Comments** | **Transition** | **Recovery** |
| **Banque de France** | N/A | | | | Credit ratings, determined by Bank of France, for 1.6 million names (restricted availability) | | | | | |
| **Bloomberg** | Name<br>Rating | Daily<br>Daily | 1985 → | Generic data is available only for all outstanding bonds. 3rd party supplier data available. | Default data available via 3rd party vendors | | | | Via 3rd Party Vendors | |
| **Bridge** | Name<br>Industry<br>Rating<br>Region | Daily<br>Daily<br>Daily<br>Daily | 1992 → | US Taxable Fixed Income Securities. Outstanding and mature bonds | Name<br>Industry<br>Rating<br>Region | Daily<br>Daily<br>Daily<br>Daily | 1992 → | | Upgrade & Downgrade by CUSIP | N/A |
| **Datastream** | Name<br>Rating | Daily<br>Daily | ? → | Information on 80,000 fixed income instruments in 32 markets | N/A | | | | | |
| **Edward I. Altman Study**[27] | N/A | | | | Industry<br>Rating | Yearly<br>Yearly | 1971 → | Cumulative Default data on US issuers by Rating and Year of Issuance | N/A | Average Recovery by Rating |
| **ISMA** | Name<br>Industry<br>Rating<br>Region | Daily<br>Daily<br>Daily<br>Daily | 1986 → | Information kept for Eurobonds. Easiest access through Bloomberg | N/A | | | | | |
| **KMV** | N/A | | | | Name<br>Industry<br>Rating<br>Region | Monthly<br>Monthly<br>Monthly<br>Monthly | 5 Years | Proprietary Expected Default Frequency (EDF) predictions | N/A | |

[27] Altman, Edward I., and Vellore Kishore (1996) Special Report on Defaults and Returns on High Yield Bonds: Analysis Through 1995, *New York University Salomon Center Working Paper Series*, S-96-2.

| | Spread Data | | | | Default Data | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **By** | **Granularity** | **Period** | **Comments** | **By** | **Granularity** | **Period** | **Comments** | **Transition** | **Recovery** |
| **Loan Marketing Association** | Name | Monthly | 1997→ | Indicative bids and offers on over a 100 Euromarket loans spanning 29 countries (only available for LMA members who participated in survey) | N/A | | | | | |
| **Loan Pricing Corporation** | Name<br>Industry<br>Rating<br>Region | Weekly<br>Weekly<br>Weekly<br>Weekly | 1990 → | US data based on the last 3-5 transactions for each ratings' category | Name<br>Industry<br>Rating<br>Region | Daily<br>Daily<br>Daily<br>Daily | 1993 → | US Historical loss history collected from superregional banks to community banks by Industry, Region and Rating | N/A | Amount recovered after Default |
| **Moody's Corporate Bond Default Database** | N/A | | | | Name<br>Industry<br>Rating<br>Region | Daily<br><br>Yearly | 1970 → | Yearly summaries available | By Name since 1970.<br>By Rating since 1970 | Amount recovered after Default |
| **Robert Morris Associates** | N/A | | | | Industry | Quarterly | | US corporate loan information. Only available to RMA members. | N/A | Average recovery by Industry |
| **S&P** | Rating | Weekly | 1996 → | Yields by ratings for Industrials and Utilities | Industry<br>Rating<br>Region | Weekly<br>Weekly<br>Weekly | 1981 → | Summaries of US names available on CD ROM | Available with Default Data | Recovery by Seniority |

## ANNEX IV: A SIMPLIFIED CREDIT RISK MODEL

This annex outlines a possible simplified modelling approach to credit risk. As noted in the main text, this is designed as an interim step between standardised rules and full portfolio credit risk modelling. ISDA believes that the proposed approach fits best into the internal modelling context, rather than as a template for new standardised rules, because features of the model would be adapted for individual institutions. Indeed, the mapping of internal ratings into the model would involve a link with internal credit risk management, which would need to be assessed as part of a recognition process. More generally, as discussed in the main text, a flexible approach which permits evolution of modelling capability brings with it a more intimate, qualitative form of supervision that benefits both the individual bank and the financial system.

In summary, this simplified model has two main features:

- A more refined assessment of credit risk through the use of external and internal credit ratings to determine risk weights
- Maturity bucketing of credit risk, in order to establish a term structure, differentiate spot and forward credit risk, and capture both long and short credit risk in order to reward offsets

The simplified model is therefore an important advance on the current standardised credit risk rules.[28] However, it would still suffer significant weaknesses, most notably the lack of recognition of correlation and portfolio diversification, but also in the need to make simplifying assumptions about offsets in some cases and in the use of static parameters to assign risk weights. Nevertheless, the ability to differentiate risk weightings, to capture term structure and reward hedging are all important advances over the standardised rules that make the simplified model an appropriate interim step for banks that are unable to develop full portfolio credit risk models.

[28] Although it is conceptually similar to the existing methodology for calculating general interest rate risk or commodity risk under standardised market risk rules.

### 1. Elements of the Simplified Model

#### 1.1. Scope and Overview of Model

The simplified model rests on a distinction between spread and credit risk, with separate charges applied to each depending on whether a position is long or short, its maturity and the rating of the name involved. The model could be employed in either the trading or banking book, using either accrual or fair values. All types of credit exposure would be covered. Using the simplified model to apply capital charges for credit risk would involve four basic steps, as summarised in Figure 6. The elements of each of those steps are discussed below.

#### 1.2. Application of Credit Ratings

As Figure 7 shows, it is proposed that three rating classes be employed: AAA/AA, A/BBB and below BBB. These have been chosen for simplicity. However, the approach could be modified to provide even greater refinement of ratings.

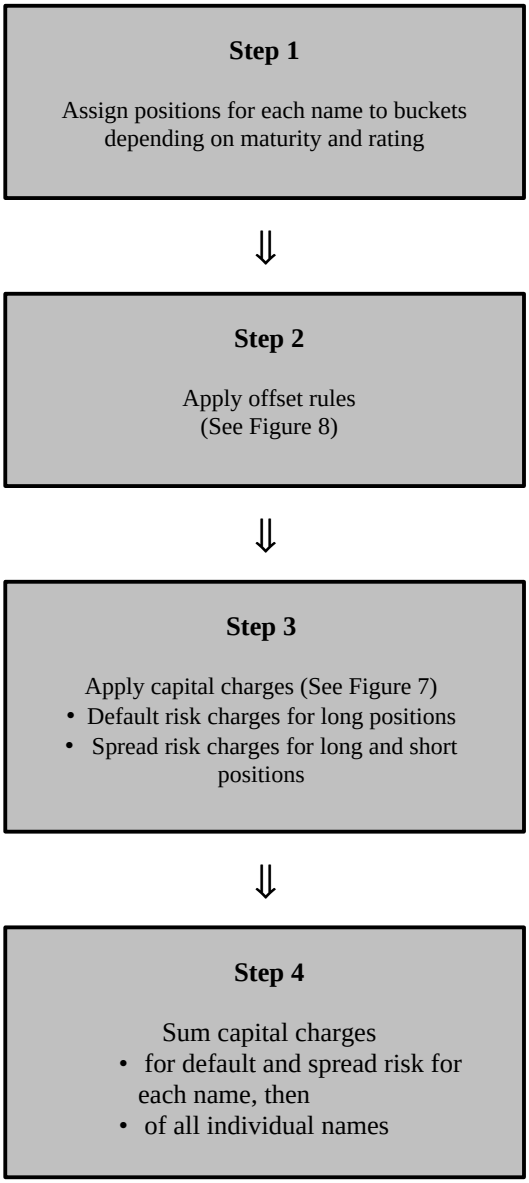
As an alternative to publicly available ratings, banks could employ internal ratings, which would be mapped into one of the three categories. Care would be required in this process, to ensure consistency of incorporating recovery rates between internal and external ratings.

#### 1.3. Spread and Default Charges

Spread charges would apply to both long and short positions, to reflect both risk of up- and down-grading and general market movements in the price of credit risk.

Positions would be assigned to a relevant bucket depending on maturity and all relevant spread risk charges for the life of the maturity would be summed. Thus, a long 6-year position would be charged the sum of the spread risk requirements for five annual time buckets at the 0-5 year spread risk rate and one annual bucket at the 5-10 year rate. In contrast, a forward 6 year position which starts in 1 year's time would be assigned four annual charges at the 0-5 year rate and two annual charges at the 5-10 year rate.

**Figure 6: Simplified Model Overview**



Long spread risk charges are set to reflect convergence of spreads in the longer term, as higher rated instruments see spreads widen and lower rated instruments see spreads tighten. This reflects the fact that low graded assets have a tendency for up-grading: if they survive over time, they effectively have nowhere to go but up, with the reverse true for high graded assets. A cap on charges is provided to avoid infinite charges for perpetuals.

Charges for short positions reflect the risk of credit spread tightening. Consequently charges are lower for higher rated assets where spreads are already low. A natural upper boundary for this is the present value of the credit spread, as this represents the maximum loss possible on a short position. This also provides a cap for perpetuals. (A cap could also be set more simply – but arbitrarily – by setting an upper limit on the number of annual short position charges that apply.)

Default risk arises only on long positions and is applied for any position, which falls in the first year. However, as noted above, charges apply to forward positions.

See the example set out below and Figure 7 for the proposed schedule of charges.

### 1.4. Offset Rules

There is no need for special rules governing offsets in cases of maturity mismatches, as full offsetting would be permitted between long and short positions within the same time band. However, it is important to devise other simple offset rules; these are summarised in Figure 8 and are conceptually similar to the disallowance factors employed under the general interest rate risk calculation methodology for market risk.

The rules summarised in Figure 8 only provide full offsets if long and short positions are of the same seniority, currency and instrument. Otherwise, the extent of offsetting is restricted by the factors specified. These factors are rough estimates and could be adjusted in the light of experience gained through testing of portfolios.

Most of the offset rules are clear. However, it should be noted that in the cases of an instrument mismatch, offsets are only recognised if the instruments are tradable or netting is enforceable. Also, seniority offset rules vary. A full offset is provided in the case of the long position being more senior than the short position (as this is effective; see discussion in section C). Otherwise offset is restricted to take account of the incomplete nature of the protection.

### 1.5. Correlation Assumptions

Conservative assumptions are made regarding correlations. First, long and short positions in different time bucketing in a single credit in different maturity bands cannot be offset, assuming a worst case, negative correlation (-1). Second, long and short positions in different credits are simply added up, assuming a worst case positive correlation (+1). Any portfolio benefit of less than unitary correlation has therefore been ignored.

### 1.6. Choice of Model Parameters

We stress the importance of distinguishing between the simplified modelling *methodology* outlined here, and the suggested *parameters.* The latter could be adjusted in the light of testing experience, but are set roughly based on default probabilities, with adjustments made to ensure proper calibration with respect to the standardised rules and full portfolio credit risk modelling.

## 2. Example

The attached example shows how the simplified model operates in practice. As discussed in section D, the model was applied to the three test portfolios used to compare modelling results.

**Figure 7: Simplified Model Parameters**

**Default risk charge *per period* for long positions with an exposure within 1 year**

| Class | AAA/AA | A/BBB | <BBB |
|---|---|---|---|
| **Spot** | 0.00% | 0.33% | 4.00% |
| **1d-1m** | 0.00% | 0.27% | 3.20% |
| **1m-3m** | 0.00% | 0.20% | 2.40% |
| **3m-6m** | 0.00% | 0.13% | 1.60% |
| **6m-1y** | 0.00% | 0.07% | 0.80% |
| Sum of charges for 1 year position | | 1.00% | 12.00% |

**Spread charge *per annum* for long positions**

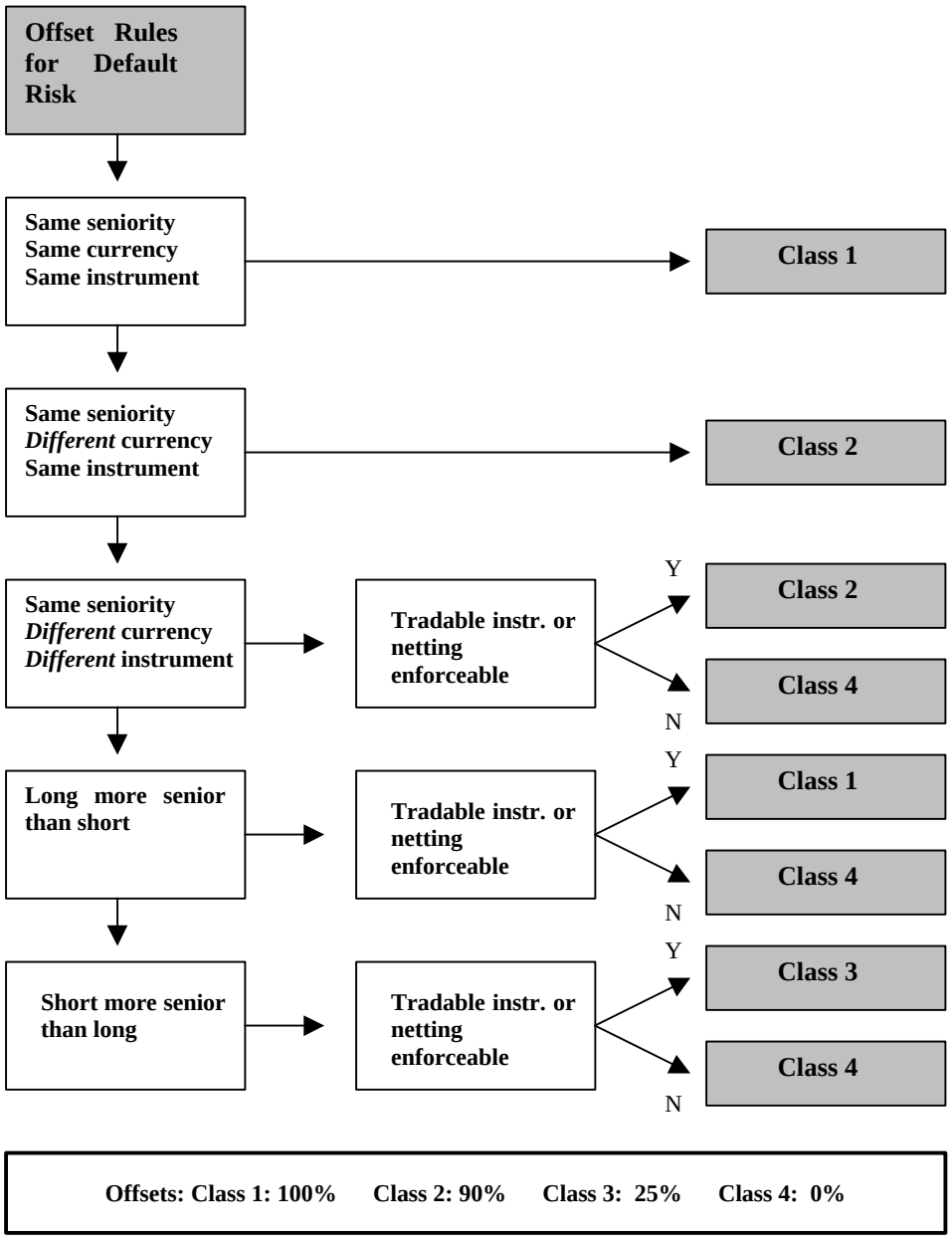
| Class | AAA/AA | A/BBB | <BBB |
|---|---|---|---|
| **0-5y** | 0.15% | 0.30% | 0.75% |
| **5y-10y** | 0.10% | 0.20% | 0.50% |
| **10-15y** | 0.05% | 0.10% | 0.25% |
| **15>** | 0% | 0% | 0% |

**Spread charge *per annum* for short positions**

| Class | AAA/AA | A/BBB | <BBB |
|---|---|---|---|
| **>=spot** | 0.05% | 0.15% | 0.15% |

Max (calculated charge, present value of credit spread) to be applied for short positions

**Figure 8: Simplified Model Offset Rules**



## Simplified Model Example

### Example portfolio

| Long/ short | Credit | Instr. | Seniority | Rating | Start date | End date | Amount | Currency | Code |
|---|---|---|---|---|---|---|---|---|---|
| Long | xxx | Bond | Sen. unsec. | A | 10/3/1998 | 17/1/2008 | 100 | USD | xxx1 |
| Long | xxx | Bond | Sen. unsec. | A | 18/4/2002 | 25/2/2012 | 50 | USD | xxx2 |
| Short | xxx | Bond | Junior | BBB | 10/3/1998 | 10/3/1999 | 25 | USD | xxx3 |
| Short | xxx | Cds *) | Sen. unsec. | A | 12/2/2003 | 12/2/2018 | 50 | USD | xxx4 |
| Short | xxx | Cds *) | Sen. unsec. | A | 10/3/1998 | 24/4/1998 | 20 | USD | xxx5 |

*) Cds = credit default swap

### Parameters

| | | | | 1.00% | 12.00% |
|---|---|---|---|---|---|
| **Default risk** | | | **AAA/AA** | **A/BBB** | **<BBB** |
| Spot | 10/3/1998 | 10/3/1998 | 0.00% | 0.33% | 4.00% |
| 1d-1m | 10/3/1998 | 10/4/1998 | 0.00% | 0.27% | 3.20% |
| 1m-3m | 10/4/1998 | 10/6/1998 | 0.00% | 0.20% | 2.40% |
| 3m-6m | 10/8/1998 | 10/9/1998 | 0.00% | 0.13% | 1.60% |
| 6m-1y | 10/9/1998 | 10/3/1998 | 0.00% | 0.07% | 0.80% |

| **Spread long** | | | **AAA/AA** | **A/BBB** | **<BBB** | |
|---|---|---|---|---|---|---|
| 0-5y | 10/3/1998 | 10/3/2003 | 0.15% | 0.30% | 0.75% | p.a. |
| 5y-10y | 10/3/2003 | 10/3/2008 | 0.10% | 0.20% | 0.50% | p.a. |
| 10y-15y | 10/3/2008 | 10/3/2013 | 0.05% | 0.10% | 0.25% | p.a. |
| >15y | 10/3/2013 | > | 0.00% | 0.00% | 0.00% | p.a. |

| **Spread short*)** | | | **AAA/AA** | **A/BBB** | **<BBB** | |
|---|---|---|---|---|---|---|
| >=spot | 10/3/1998 | > | 0.05% | 0.15% | 0.50% | p.a. |

*) Capped by present value credit spread

### Offset rules

| Default | Parameter |
|---|---|
| Class 1 | 1 |
| Class 2 | 0.9 |
| Class 3 | 0.25 |
| Class 4 | 0 |

| Credit | xxx | | | |
|---|---|---|---|---|
| Class 1 | xx1/xx3 | xx2/xx3 | | |
| Class 2 | xx1/xx4 | xx2/xx4 | xx1/xx5 | xx2/xx5 |
| Class 3 | | | | |
| Class 4 | | | | |

| Default | Parameter |
|---|---|
| Class 1 | 1 |
| Class 2 | 0.9 |
| Class 3 | 0.675 |

| Credit | xxx | | | |
|---|---|---|---|---|
| Class 1 | | | | |
| Class 2 | xx1/xx4 | xx2/xx4 | xx1/xx5 | xx2/xx5 |
| Class 3 | xx1/xx3 | xx2/xx3 | | |

**Time buckets for credit xxx**

| Period | | xx1 | xx2 | xx3 | xx4 | xx5 |
|---|---|---|---|---|---|---|
| 10/3/1998 | 24/4/1998 | 100 | | -25 | | -20 |
| 24/4/1998 | 10/3/1999 | 100 | | -25 | | |
| 10/3/1999 | 18/4/2002 | 100 | | | | |
| 18/4/2002 | 12/2/2003 | 100 | 50 | | | |
| 12/2/2003 | 17/1/2008 | 100 | 50 | | -50 | |
| 17/1/2008 | 25/2/2012 | | 50 | | -50 | |
| 25/2/2012 | 12/2/2018 | | | | -50 | |
| 12/2/2018 | > | | | | | |

**Default exposure**

| Period | | xx1 |
|---|---|---|
| 10/3/1998 | 24/4/1998 | 57 |
| 24/4/1998 | 10/3/1999 | 75 |

e.g. 57 = 100 – 25 -.9*20

e.g. 0.068 = 57*.12%

| L-spr. risk | Charge xxx | A/BBB | Exposure | Charge |
|---|---|---|---|---|
| 10/3/1998 | 10/3/1998 | 0.33% | 57 | 0.190 |
| 10/3/1998 | 10/4/1998 | 0.27% | 57 | 0.152 |
| 10/4/1998 | 24/4/1998 | 0.20% | 57 | 0.028 |
| 24/4/1998 | 10/6/1998 | 0.20% | 75 | 0.118 |
| 10/6/1998 | 10/9/1998 | 0.13% | 75 | 0.100 |
| 10/9/1998 | 10/3/1999 | 0.07% | 75 | 0.050 |

e.g. 83.125 = 100 – 25*.675

**Long Spread Exposure**

| Period | | xx1 | xx2 |
|---|---|---|---|
| 10/3/1998 | 24/4/1998 | 65.125 | |
| 24/4/1998 | 10/3/1999 | 83.125 | |
| 10/3/1999 | 18/4/2002 | 100 | |
| 18/4/2002 | 12/2/2003 | 100 | 50 |
| 12/2/2003 | 17/1/2008 | 55 | 50 |
| 17/1/2008 | 25/2/2012 | | 5 |
| 25/2/2012 | 12/2/2018 | | |
| 12/2/2018 | > | | |

| L-spr. risk | Charge xxx | A/BBB | Exposure | Charge |
|---|---|---|---|---|
| 10/3/1998 | 24/4/1998 | 0.30% | 65.125 | 0.024 |
| 24/4/1998 | 10/3/1999 | 0.30% | 83.125 | 0.219 |
| 10/3/1999 | 18/4/2002 | 0.30% | 100 | 0.933 |
| 18/4/2002 | 12/2/2003 | 0.30% | 150 | 0.370 |
| 12/2/2003 | 10/3/2003 | 0.30% | 105 | 0.022 |
| 10/3/2003 | 17/1/2008 | 0.20% | 105 | 1.021 |
| 17/1/2008 | 10/3/2008 | 0.20% | 5 | 0.001 |
| 10/3/2008 | 25/2/2012 | 0.10% | 5 | 0.020 |

**Short Spread Exposure**

| Period | | xx3 | xx4 | xx5 |
|---|---|---|---|---|
| 10/3/1998 | 24/4/1998 | 8.125 | | 2 |
| 24/4/1998 | 10/3/1999 | 8.125 | | |
| 10/3/1999 | 18/4/2002 | | | |
| 18/4/2002 | 12/2/2003 | | | |
| 12/2/2003 | 17/1/2008 | | 5 | |
| 17/1/2008 | 25/2/2012 | | 5 | |
| 25/2/2012 | 12/2/2018 | | 50 | |
| 12/2/2018 | > | | | |

| L-spr. risk | Charge xxx | A/BBB | Exposure | Charge |
|---|---|---|---|---|
| 10/3/1998 | 24/4/1998 | 0.15% | 10.125 | 0.002 |
| 24/4/1998 | 10/3/1999 | 0.15% | 8.125 | 0.011 |
| 10/3/1999 | 12/2/2003 | 0.15% | 0 | 0.000 |
| 12/2/2003 | 25/2/2012 | 0.15% | 5 | 0.068 |
| 25/2/2012 | 12/2/2018 | 0.15% | 50 | 0.448 |

e.g. 8.125 = 25*(1-.675

**Total capital charge: 3.772**

## ANNEX V: OVERVIEW OF PORTFOLIO CREDIT RISK MODELLING

This annex provides a high-level overview of the basic elements in portfolio credit risk modelling. Details of individual modelling techniques are available via ISDA's credit risk page on our website. Also, a good recent overview of credit risk modelling techniques (and the supervisory issues they raise) is to be found in a recent paper by members of the staff of the Board of Governors of the Federal Reserve System.[29]

The basic types of credit risk measurement systems are outlined in Figure 9. Under a "top-down" approach, firms look at risk in aggregate by asset class. Aggregate data for the whole asset class is employed to assess the average risk of any individual position using a number of techniques.[30] These methods are typically used for assessing risk in large, relatively homogenous asset classes, e.g. credit card portfolios, and in some cases share common characteristics with those used to model mortgage-backed securities. While useful, weaknesses include the difficulty of assessing the marginal risk of an individual position and of using comparative peer group data which does not reflect differences in portfolio credit quality.

The focus of this overview – and the basis of the modelling techniques most recently made public – is the "bottom-up" approach. This looks at the risk of individual positions and then takes account of portfolio diversification effects. Figure 9 also outlines the basic building blocks of this approach.

### 1. Basic Steps of Portfolio Credit Risk Modelling

The "bottom-up" approach allows the model user to calculate a distribution of probable credit losses for the current portfolio of credit risks. This then permits the institution to determine necessary provisions for expected loss. Also, by the application of a confidence interval related to tolerance for risk, the firm can assign economic and, as is proposed here, regulatory capital for unexpected loss, plus set in place other management controls, such as stress testing, for possible tail events. Figure 10 provides an example of this.

All the techniques noted above recognise the clearly skewed nature of the distribution. This is an important difference with market risk modelling, where lognormal distribution of price volatility is often assumed.

The detailed methods for calculating this distribution vary between models, but the basic steps are similar. To simplify, these are:

1. Measure the current level of credit exposure within the firm's existing portfolio (see main text for more discussion of accounting issues).

2. Establish the default and recovery rates of the individual names in this portfolio (typically, assigned by internal or external rating).

3. Calculate the possible changes in the probability of default for individual positions over a prescribed holding period. Different techniques are available for this, including application of default volatilities or use of credit rating transition matrices and analysis of correlation, both based on information gathered over a prescribed observation period.

4. Application of a prescribed confidence interval to establish the estimated level of unexpected loss due to credit risk.

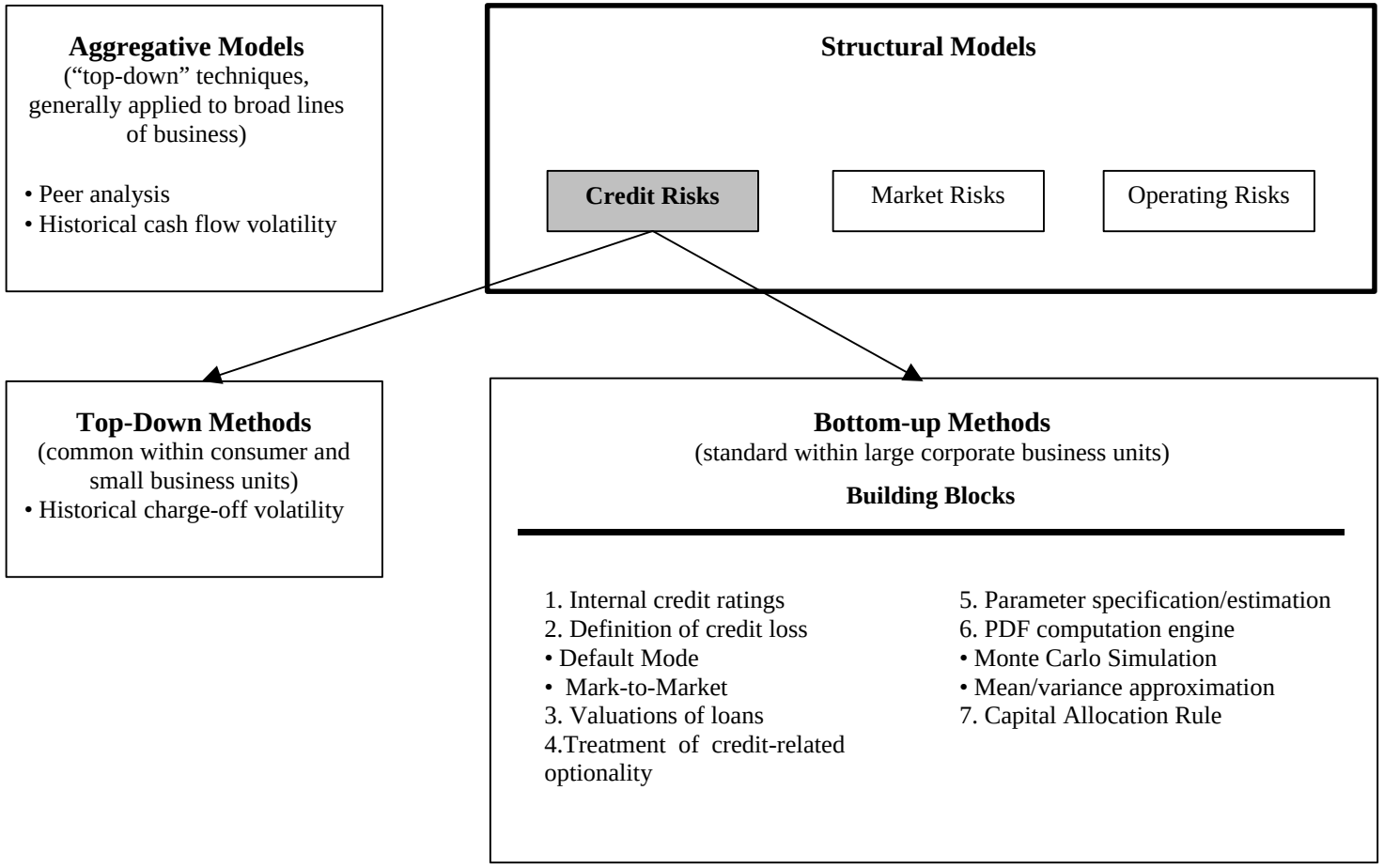
As with all models, the assumptions underlying the model should be reviewed regularly and subject to stress testing. Such techniques can provide a means to assess the impact of broad macro-economic factors on credit risk, e.g. by increasing default and reducing recovery rates in line with observation of changes during past credit cycles. Also, techniques are emerging which incorporate these effects more directly into the modelling process.[31]

[29] Jones & Mingo (1998) Industry Practices in Credit Risk Modeling and Internal Capital Allocations: Implications for a Models-based Regulatory Capital Standard, paper presented at the Federal Reserve Bank of New York, 26-27 February.

[30] See Jones & Mingo (1998) pp 9-10

[31] Wilson, Thomas C. (1997) Credit Portfolio Risk (I), *Risk Magazine*, October; and Wilson, Thomas C. (1997) Credit Portfolio Risk (II), *Risk Magazine*, November.

**Figure 9 Overview of Risk Measurement Systems**




Note: Figure extracted from Jones & Mingo (1998) Industry Practices in Credit Risk Modelling and Internal Capital Allocations

## 2. Counterparty Risk Modelling

Modelling counterparty risk introduces further complications. While the current exposure of a position may be assessed by identifying the mark-to-market value of a position and applying the above modelling techniques to assess the probability of loss, assessing potential future counterparty exposure (PFE) requires further work. This is for a number of reasons:

- PFE will vary as changes in relevant market rates (e.g., interest rates, levels of equity indices, etc) effect the value of the portfolio of deals with any individual counterparty
- PFE will change over time as deals mature and roll off
- PFE may correlate with counterparty default likelihood

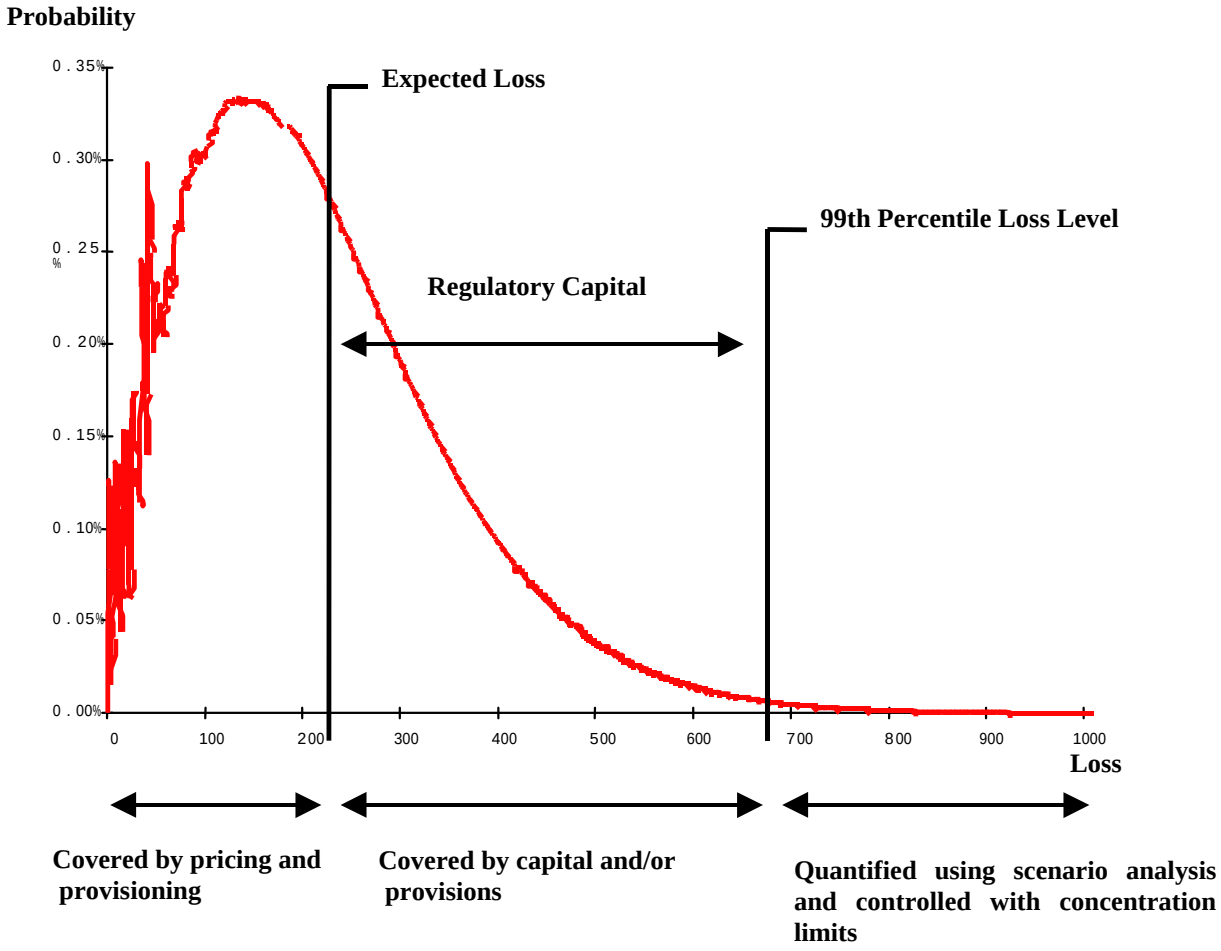
Also, as with current exposure, PFE will be affected by the extent to which legally enforceable netting and collateral arrangements are in place.

Thus, counterparty risk modelling involves establishing a distribution of possible losses that not only looks at default and recovery rates of individual names and combinations of names, but also at the volatility of the size of the underlying exposure at each point in time over the maturity of the portfolio. Figure 11 outlines the basic elements of this process.[32]

It may be appreciated that this approach is demanding to implement and maintain and is computationally intensive. Thus, while firms may be working towards such an approach, it is more typical to employ standard tables which approximate the volatility of the different market factors which drive a portfolio. This therefore allows an approximation of the volatility of the size of the exposure, which is then subject to credit risk modelling techniques. This is similar to the Basle add-ons approach, except that more sophisticated firms will have many more market factors assessed (e.g., by national market, not just risk class) than is the case under the Basle add-on matrix.

[32] See also: Evan Picoult (1995) Measuring Pre-Settlement Credit Risk on a Portfolio Basis.

**Figure 10: Regulatory Capital for Credit Risk**




*Source*: CSFP

**Figure 11: Elements of Counterparty Risk Modelling**