Approaches to Credit Risk in the New Basel Capital Accord

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Summary. We discuss the main features of the new Basel Capital Accord (Basel II) concerning the regulatory measurement of Credit Risk. After an overview of the basic ideas in the new accord the determining aspects of the approaches to Credit risk in the new capital accord are surveyed: the standardized approach (STD) as well as the two forms of the internal rating based (IRB) approach - foundation and advanced. We describe the issues of the second consultative document of the new accord and describe how to measure the required capital. Further the fair comment on several features of Basel II and its possible changes in the final version of the accord are illustrated.

1 Introduction

1.1 The History of the Basel Capital Standards

More than a decade has passed since the *Basel Committee on Banking Supervision*[4] (the Committee) introduced its 1988 Capital Accord (the Accord). The major impetus for this Basel I Accord was the concern of the governors of the central banks that the capital – as a "cushion" against losses – of the world's major banks had become dangerously low after persistent erosion through competition.

Since 1988 the business of banking, risk management practices, supervisory approaches and financial markets have undergone significant transformations. Consequently, the Committee released a proposal in June 1999 to replace the old Accord with a more risk-sensitive framework, the *New Basel Capital Accord* (Basel II). After receiving several comments by the industry and research

[4] The Basel Committee on Banking Supervision (BCBS) is a committee of central banks and bank supervisors from the major industrialised countries that meet every three months at the *Bank for International Settlements* (BIS) in Basel.

institutions in January 2001 the second consultative document was published. Again the suggestions were criticized a lot and according to the committee some features will be changed again. Reflecting the comments on the proposal and the results of the ongoing dialogue with the industry worldwide, the Committee will publish a revised version in 2003 with the new corrections. Therefore, the final version of the new Accord was postponed already several times. It is now expected to be implemented in the banking industry in 2006.

1.2 The Basel I Capital Accord

The 1988 Accord[5] requires internationally active banks to hold capital equal to at least 8% of a basket of assets measured in different ways according to their riskiness. The definition of capital is set in two tiers, whereby banks have to hold at least half of its measured capital in the tier one form:

Tier 1: The shareholders' equity and retained earnings.
Tier 2: The additional internal and external resources available to banks.

The Accord created capital requirements for credit risk – i.e. the risk of loss arising from the default by a creditor or a counterparty – in banking assets. A portfolio approach was taken to measure the risk, with assets classified into four risk buckets according to the debtor category. As a result, some assets have no capital requirement whereas other claims do have:

1. Risk Bucket: Generally consisting of claims on OECD[6] governments, has a 0% risk weight.
2. Risk Bucket: Generally consisting of claims on banks incorporated in OECD countries, has a 20% risk weight.
3. Risk Bucket: Generally consisting of residential mortgage claims, has a 50% risk weight.
4. Risk Bucket: Generally consisting of claims on consumers and corporates, has a 100% risk weight.

These *risk weights* multiplied with the respective exposure result in the so-called *risk-weighted assets* (RWA). As shown in the table below, the Accord requires that banks hold at least 8% of the RWA as a capital charge or as a *minimum capital requirement* (MCR) for protection against credit risk.

For instance, claims on banks have a 20% risk weight, which can be translated into a capital charge of 1.6% of the value of the claim. This means, that an exposure of 1 Mio. € is equivalent to RWA of 200.000 € and to MCR of 16.000€ due to the following calculations:

[5] See *Internal Convergence of Capital Measurement and Capital Standards*, BCBS, July 1988.
[6] Organisation for Economic Coordination and Development.

$$\begin{aligned} \text{RWA} &= \text{Exposure} \cdot \text{Risk Weight} \\ &= 1Mio\ € \cdot 20\% \\ &= 200.000€ \end{aligned} \tag{1}$$

$$\begin{aligned} \text{MCR} &= \text{RWA} \cdot \text{Minimum Requirement of } 8\% \\ &= 200.000€ \cdot 8\% \\ &= 16.000€ \end{aligned} \tag{2}$$

Comparatively, minimum capital requirements for claims on corporates of 1 Mio. € would be:

$$\begin{aligned} \text{MCR} &= \text{RWA} \cdot \text{Minimum Requirement of } 8\% \\ &= 1Mio\ € \cdot 100\% \cdot 8\% \\ &= 80.000€ \end{aligned} \tag{3}$$

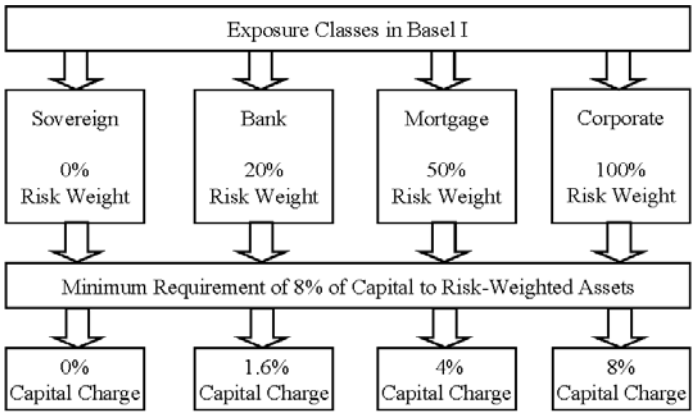

Fig. 1. Exposure classes of Basel I

However, virtually all claims on the non-bank private sector receive the standard 8% capital requirement, but there is also a scale of charges for off-balance sheet exposures through guarantees, bonds, etc. This is the only complex section of the 1988 Accord and requires a two-step approach:

Step 1: Banks convert their off-balance-sheet positions into a credit equivalent amount through a scale of *credit conversion factors* (CCF).
Step 2: These positions are weighted according to the counterparty's risk weight.

The 1988 Accord has been supplemented a number of times, most changes dealing with the treatment of the above mentioned off-balance-sheet activities. A significant amendment was enacted in 1996, when the Committee introduced a measure whereby trading positions – such as bonds or foreign exchange – were removed from the credit risk framework and given explicit capital charges related to the bank's open position in each instrument.

The two principal purposes of the Accord were to ensure an adequate level of capital in the international banking system and to create a "more level playing field" in competitive terms so that banks could no longer build business volume without adequate capital backing. These two objectives have been achieved, so that the Accord was widely recognised and became an accepted world standard during the 1990s.

However, there also have been some less positive features. The regulatory capital requirement has been in conflict with increasingly sophisticated internal measures of economic capital. The simple bucket approach with a flat 8% charge for claims on the private sector has given banks an incentive to move high quality assets off the balance sheet, thus reducing the average quality of bank loan portfolios. In addition, the 1988 Accord does not sufficiently recognise *credit risk mitigation* (CRM) techniques such as collateral and guarantees.[7] These are the principal reasons why the Committee decided to propose a more risk-sensitive framework.

1.3 The Basel II Capital Accord

In June 1999, the initial consultative proposal contained three fundamental innovations, each designed to introduce greater risk sensitivity into the Accord:

1) The current standard should be supplement with two additional "pillars" dealing with supervisory review and market discipline. They should reduce the stress on the quantitative pillar one by providing a more balanced approach to the capital assessment process.
2) Banks with advanced risk management capabilities should be permitted to use their own internal systems for evaluating credit risk – known as "internal ratings" – instead of standardised risk weights for each class of asset.
3) Banks should be allowed to use gradings provided by approved external credit assessment institutions to classify their sovereign claims into five risk buckets and their claims on corporates and banks into three risk buckets.

In addition, there were a number of other proposals like to refine the risk weightings and to introduce a capital charge for other risks. However, the

[7] Credit Risk Mitigation relates to the reduction of credit risk by - for example - taking collaterals, obtaining credit derivatives, guarantees or taking an offsetting position subject to a netting agreement.

basic definition of capital stayed the same. The comments on the June 1999 paper were numerous and reflected the important impact the old Accord has had. Nearly all welcomed the intention to refine the Accord supported by the three pillar approach due to safety and soundness in today's dynamic and complex financial system can be attained only by the combination of effective bank-level management, market discipline and supervision. Nevertheless, many details of the proposal were criticised. In particular, the threshold for the use of internal ratings should not be set so high as to prevent well-managed banks from using them.

The 1988 Accord focussed on the total amount of bank capital, which is vital in reducing the risk of bank insolvency and the potential cost of a bank's failure for depositors. Building on this, the new framework intends to improve safety and soundness in the financial system by placing more emphasis on banks' own internal control and management, the supervisory review process and the market discipline. Although the new framework's focus is primarily on internationally active banks, its underlying principles are suitable for application to banks of varying levels of complexity and sophistication, so that the new framework can be adhered by all significant banks within a certain period of time.

Table 1. Rationale for a new accord

Basel I Accord	**Basel II Accord**
Focus on a single risk measure	Emphasis on banks' own internal methodologies, supervisory review and market discipline
One size fits all	Flexibility, menu of approaches, incentives for better risk management
Broad brush structure	More risk sensitive

The 1988 Accord provided essentially only one option for measuring the appropriate capital of banks, although the way to measure, manage and mitigate risks differs from bank to bank. In 1996 an amendment was introduced which focussed on trading risks and allowed some banks for the first time to use their own systems to measure their market risks.

The new framework provides a spectrum of approaches from simple to advanced methodologies for the measurement of both credit risk and operational risk in determining capital levels. Therefore – due to the less prescriptive guidelines of the new Accord – capital requirements should be more in line with underlying risks and allow banks to manage their businesses more efficiently.

2 The Structure of the New Accord

The new Accord consists of three mutually reinforcing pillars, which together contribute to safety and soundness in the financial system. The Committee stresses the need for a rigorous application of all three pillars and plans to achieve the effective implementation of all aspects of the Accord.

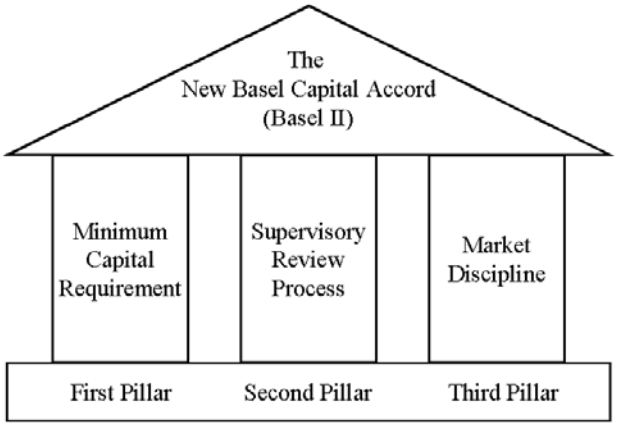

Fig. 2. The three pillars of the new accord

2.1 Minimum Capital Requirement

The first pillar sets out the MCR and defines the minimum ratio of capital to RWA. Therefore, it is necessary to know how the total capital is adequately measured by banks. The new framework maintains both the current definition of the total capital and the minimum requirement of at least 8% of the bank's capital to RWA:[8]

$$\text{Capital Ratio} = \frac{\text{Total Capital}}{\text{Credit Risk} + \text{Market Risk} + \text{Operational Risk}} \tag{4}$$

As you can see in formula 4, the calculation of the denominator of the capital ratio is dependent on three different forms of risk: Credit -, market - and operational risk. The credit risk measurement methods are more elaborate than those in the current Accord whereas the market risk measure remains unchanged. Nevertheless, the new framework proposes for the first time a measure for operational risk.

[8] To ensure that risks within the entire banking group are considered, the revised Accord is extended on a consolidated basis to holding companies of banking groups.

Credit Risk

For the measurement of credit risk two principal options are proposed and will be discussed later on. The first option is the *standardised* (STD) approach[9] and the second the *internal ratings-based* (IRB) approach[10] from which two variants exist, a foundation and an advanced IRB approach. The use of the IRB approach is subject to an approval by the supervisors, based on standards established by the Committee.

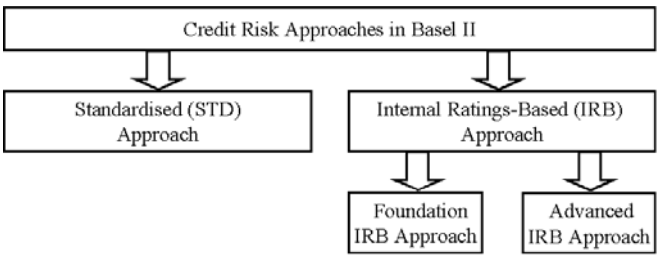

Fig. 3. Credit risk approaches in Basel II

The STD Approach: This approach is conceptually the same as the present Accord, but it is more risk sensitive. The bank allocates a risk weight to each of its assets and off-balance-sheet positions and produces a sum of RWA values. A risk weight of 100% means that an exposure is included in the calculation of RWA at its full value, which translates into a capital charge equal to 8% of that value. Similarly, a risk weight of 20% results in a capital charge of 1.6% (i.e. 20% of 8%). Individual risk weights currently depend on the broad category of borrower which are sovereigns, banks and corporates. Under the new Accord, the risk weights are refined by the reference to a rating provided by an *external credit assessment institution* (ECAI), such as rating agencies. For example, for corporate lending, the existing Accord provides only one risk weight category of 100%, the new Accord provides four categories: 20%, 50%, 100% and 150%.

The IRB Approach: Under this approach, banks are allowed to use their internal estimates of borrower creditworthiness to assess credit risk in their portfolios, subject to strict methodological and disclosure standards. Distinct analytical frameworks are provided for different types of loan exposures whose loss characteristics are different. Under the IRB approach, banks estimate each borrower's creditworthiness and translate the results into estimates of a potential future loss amount, which forms the basis of MCR. The framework allows on the one hand a foundation method and

[9] See section 3: *The STD Approach to Credit Risk.*
[10] See section 4: *The IRB Approach to Credit Risk.*

on the other hand more advanced methodologies for corporate, sovereign and bank exposures. In the foundation methodology, banks estimate the probability of default associated with each borrower, and the supervisors supply the other inputs. In the advanced methodology, a bank with a sufficiently developed internal capital allocation process is permitted to supply other necessary inputs as well. Under both IRB approaches, the range of risk weights are far more diverse than those in the STD approach, resulting in greater risk sensitivity.

Market Risk

The 1988 Accord set a capital requirement simply in terms of credit risk – the principal risk for banks – though the overall capital requirement (the 8% minimum ratio) was intended to cover other risks as well. In 1996, market risk exposures – i.e the risk of losses in trading positions when prices move adversely – were removed and given separate capital charges. The menu of approaches to measure market risk in the revised framework stays unchanged and contains beside a standardised approach an internal model approach.

Operational Risk

In its attempt to introduce a greater credit risk sensitivity, the Committee has cooperated with the industry to develop a suitable capital charge for operational risk. Operational risk is the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events like the risk of loss from computer failures. Many major banks presently allocate 20% or more of their internal capital to operational risk. The work on operational risk is in a developmental stage, but three different approaches of increasing sophistication have been identified:

1) The basic indicator approach utilises one indicator of operational risk for a bank's total activity.
2) The standardised approach specifies different indicators for different business lines.
3) The internal measurement approach requires banks to utilise their internal loss data in the estimation of required capital.

As a result, the Committee expects operational risk on average to constitute approximately 20% of the overall capital requirements under the new framework.

Overall Capital

Concerning the overall capital, the Committee's goal remains to neither raise nor to lower the aggregate regulatory capital – inclusive of operational risk

– for internationally active banks using the STD approach. With regard to the IRB approach, the ultimate goal is to ensure that the regulatory capital requirement is sufficient to address underlying risks and contains incentives for banks to migrate from the STD to the IRB approach.

Furthermore, the new framework introduces more risk sensitive approaches to the treatment of CRM – a range of techniques whereby a bank can partially protect itself against a counterparty default – and asset securitisation – the packaging of assets or obligations into securities for sale to third parties – under both the STD and the IRB approach.

2.2 The Second Pillar – Supervisory Review Process

The supervisory review pillar requires supervisors to undertake a qualitative review of their bank's capital allocation techniques and compliance with relevant standards.[11] Supervisors have to ensure that each bank has sound internal processes to assess the adequacy of its capital based on a thorough evaluation of its risks. The new framework stresses the importance of bank management developing an internal capital assessment process and setting targets for capital that are commensurate with the bank's particular risk profile and control environment. Thus, supervisors are responsible for evaluating how well banks are assessing their capital adequacy needs relative to their risks. This internal process is – where it is appropriate – subject to supervisory review and intervention.

2.3 The Third Pillar – Market Discipline

The third pillar aims to bolster market discipline through enhanced disclosure requirements by banks which facilitate market discipline.[12] Effective disclosure is essential to ensure that market participants do better understand banks' risk profiles and the adequacy of their capital positions. The new framework sets out disclosure requirements and recommendations in several areas, including the way a bank calculates its capital adequacy and risk assessment methods. The core set of disclosure recommendations applies to all banks with more detailed requirements for supervisory recognition of internal methodologies for credit risk, CRM techniques and asset securitisation.

3 The STD Approach to Credit Risk

This section describes the STD approach to credit risk in the banking book which is the simplest of the three broad approaches to credit risk and is not based on banks' internal rating systems like the other two approaches.[13]

[11] See *Consultative Document*, BCBS, January 2001.
[12] See *Consultative Document*, BCBS, January 2001.
[13] See section 4: *The IRB Approach to Credit Risk*.

Compared to the present Accord, the STD approach aligns regulatory capital requirements more closely with the key elements of banking risk by introducing a wider differentiation of risk weights and a wider recognition of CRM techniques, while avoiding excessive complexity. Accordingly, the STD approach produces capital ratios more in line with the actual economic risks that banks are facing. This should improve the incentives for banks to enhance their risk management and measurement capabilities and reduce the incentives for regulatory capital arbitrage. In this review we will concentrate on the most discussed feature - the assignment of risk weights for sovereigns, banks and corporates.

3.1 Risk Weights in the STD Approach

Along the lines of the proposals in the consultative paper to the new capital adequacy framework,[14] the RWA in the STD approach continue to be calculated as the product of the amount of exposures and supervisory determined risk weights:

$$RWA = E \cdot r \tag{5}$$

where: E is the value of the exposure
r is the risk weight of the exposure

As in the current Accord, the risk weights are determined by the category – sovereigns, banks and corporates – of the borrower. However, there is no distinction on the risk weighting depending on whether the country is a member of the OECD. Instead the risk weights for exposures depend on external credit assessments like e.g. rating agencies.

3.2 Risk Weights for Sovereigns and for Banks

Despite the concerns regarding the use of external credit assessments – especially credit ratings – the old Accord (with the 0% risk weight for all sovereigns) was replaced by an approach that relies on sovereign assessments of eligible ECAI. Following the notation,[15] the risk weights of sovereigns and their central banks are as follows:

The assessments used should generally be in respect of the sovereign's long-term rating for domestic and foreign currency obligations. At national

[14] See *A New Capital Adequacy Framework*, BCBS, June 1999.
[15] The notation follows the methodology used by Standards & Poor's as an example only.

Table 2. Risk weights of sovereigns – option 1

Rating	Risk Weights
AAA to AA-	0%
A+ to A-	20%
BBB+ to BBB-	50%
BB+ to B-	100%
Below B-	150%
Unrated	100%

discretion, a lower risk weight[16] may be applied to banks' exposures to the sovereign or central bank of incorporation denominated in domestic currency and funded in that currency.[17]

To address at least in part the concern expressed over the use of credit ratings and to supplement private sector ratings for sovereign exposures, there is also the possibility of using country risk ratings assigned to sovereigns by *export credit agencies* (ECA). The key advantage of using publicly available ECA risk scores for sovereigns is that they are available for a far larger number of sovereigns than private ECAI ratings. Banks may then choose to use the risk scores produced by an ECA recognised by their supervisor. As detailed in the below table, each of these ECA risk scores corresponds to a specific risk weight category.[18]

Table 3. Risk weights of sovereigns – option 2

Risk Scores	Risk Weights
1	0%
2	20%
3	50%
4 to 6	100%
7	150%

[16] The Committee is no longer requiring adherence to the International Monetary Fund's Special Data Dissemination Standards, the Basel Committee's Core Principles for Effective Banking Supervision or the International Organisation of Securities Commissions' Objectives and Principles of Securities Regulation as preconditions for preferential risk weights.

[17] This is to say that banks also have liabilities denominated in the domestic currency.

[18] The Bank for International Settlements, the International Monetary Fund, the European Central Bank and the European Community receive the lowest risk weight applicable to sovereigns and central banks.

Further there are two options for deciding the risk weights on exposures to banks, but national supervisors have to apply one option to all banks in their jurisdiction. As a general rule for both options, no claim on an unrated bank may receive a risk weight less than that applied to its sovereign of incorporation.

Under the first option – as shown in table 4 – all banks incorporated in a given country are assigned a risk weight one category less favourable than that assigned to claims on the sovereign of incorporation. Therefore, the Committee left the fixed 20 % risk weight of the old Accord for all bank claims. However, for claims to banks in sovereigns rated BB+ to B- and to banks in unrated countries the risk weight is capped at 100%, except for banks incorporated in countries rated below B-, where the risk weight is capped at 150%.

Table 4. Risk weights of banks – option 1

Rating	Sovereign Risk Weights	Bank Risk Weights
AAA to AA-	0%	20%
A+ to A-	20%	50%
BBB+ to BBB-	50%	100%
BB+ to B-	100%	100%
Below B-	150%	150%
Unrated	100%	100%

The second option bases the risk weighting on the external credit assessment of the bank itself. Under this option, a preferential risk weight that is one category more favourable than the risk weight shown in table 5 is applied to all claims with an original maturity[19] of three months or less, subject to a "floor" of 20%. This treatment is available to both – rated and unrated bank claims – but not to banks risk weighted at 150%.

Table 5. Risk weights of banks – option 2

Rating	Risk Weights	Short-Term Claim Risk Weights
AAA to AA-	20%	20%
A+ to A-	50%	20%
BBB+ to BBB-	50%	20%
BB+ to B-	100%	50%
Below B-	150%	150%
Unrated	50%	20%

[19] Supervisors should ensure that claims with an original maturity under three months which are expected to be rolled over – i.e. where the effective maturity is longer than three months – do not qualify for this preferential treatment.

In order to maintain liquidity in local inter-bank markets, there are proposals to extend the preferential treatment of domestic government exposures to domestic short-term inter-bank exposures. Accordingly, when the national supervisor has chosen to apply the preferential treatment for claims on the sovereign as described above, it can also assign – under both options – a risk weight that is one category less favourable than that assigned to claims on the sovereign of incorporation – subject to a floor of 20% – to bank claims of an original maturity of three months or less denominated and funded in the domestic currency.

3.3 Risk Weights for Corporates

The maybe most-discussed feature of the new Basel Capital Accord is the assignment of different risk weights on corporate claims. Table 6 illustrates the risk weighting of rated corporate claims according to the second consultive document in 2001, including claims on insurance companies. As a general rule, no claim on an unrated corporate may be given a risk weight preferential to that assigned to its sovereign of incorporation and the standard risk weight for unrated claims on corporates is 100%. As with the case of exposure to banks, there is no sovereign floor, recognising that there are legitimate cases where a corporate can have a higher assessment than the sovereign assessment of its home country.

Table 6. Risk weights of corporates

Rating	Risk Weights
AAA to AA-	20%
A+ to A-	50%
BBB+ to BB-	100%
Below BB-	150%
Unrated	100%

Assigning 100% risk weights to unrated companies is questionable and therefore, still discussed. Obviously, if the risk weighting of unrated exposures is lower than that for low-rated exposures, borrowers with a low rating have an incentive to give up their solicited rating. Therefore, there is a risk of *adverse selection*: For example, if many low-rated corporates give up their ratings, the quality of the average unrated borrower deteriorate to the extent that a 100% risk weight no longer offers sufficient protection against credit risk. As a consequence, it is indispensable to balance awareness of this incentive with consideration of the fact that in many countries corporates and banks do not need to acquire a rating in order to fund their activities. For this reason the assignment of 100% risk weight to unrated companies is still discussed and

subject to possible changes. However, the fact that a borrower is not rated does not signal low credit quality. In balancing these conflicting considerations, a 100% risk weight to unrated corporates was assigned. This is the same risk weighting that all corporate exposures receive under the present Accord in order to do not cause an unwarranted increase in the costs of funding for small and medium-sized businesses, which in most countries are a primary source of job creation and of economic growth. However, in countries with higher default rates, national authorities may increase the standard risk weight for unrated claims where they judge that a higher risk weight is warranted by their overall default experience.

3.4 Maturity

Although maturity is a relevant factor in the assessment of credit risk, it is difficult to pursue greater precision in differentiating among the maturities of claims within the STD approach given the broad-brush nature of the counterparty risk weighting. The STD approach is designed to be suitable for application by banks of varying degrees of size and sophistication. However, the costs of increasing the complexity of the STD approach are relatively high. In general, the benefits of improved risk-sensitivity would be outweighed by the costs of greater complexity. Despite its improved risk sensitivity, the new STD approach remains intentionally simple and broad-brush. Therefore, a maturity dimension is not incorporated throughout the STD approach in contrast to the IRB approach. As set out above, the only maturity elements which are included are the distinction between short and long-term commitments, lendings and the use of short-term assessments as it is discussed below.

3.5 Credit Risk Mitigation

Credit Risk Mitigation (CRM) relates to the reduction of credit risk by – for example – taking collateral, obtaining credit derivatives or guarantees or taking an offsetting position subject to a netting agreement.

The current Basel I Accord recognises only collateral instruments and guarantees deemed to be identifiably of the very highest quality. This led to an "all-or-nothing" approach to credit risk mitigants: Some forms were recognised while others were not. Since 1988, the markets for the transfer of credit risk have become more liquid and complex and thus, the number of suppliers of credit protection has increased. New products such as credit derivatives have allowed banks to unbundle their credit risks in order to sell those risks that they do not wish to retain. These innovations result in greater liquidity in itself, reduce the transaction costs of intermediating between borrowers and lenders and also encourage a more efficient allocation of risks in the financial system. In designing a new framework for CRM, three main aims were pursued:

- Improving incentives for banks to manage credit risk in an effective manner.
- Offering an approach that may be adopted by a wide range of banks.
- Relating capital treatments to the economic effects of different CRM techniques and greater consistency in the treatment of different forms of CRM.

The revised approach allows a wider range of credit risk mitigants to be recognised for regulatory capital purposes and depart from the "all-or-nothing" approach. It also offers a choice of approaches that allow different banks to strike different balances between simplicity and risk-sensitivity. As a result, there are three broad treatments to CRM depending on which credit risk approach is used by the banks. However, the treatment of CRM in the STD and in the foundation IRB approach is very similar. While CRM techniques generally reduce credit risk, they do not fully eliminate it. In such transactions, banks – often for good business reasons – leave some residual risks unhedged. Therefore, three forms of residual risk are explicitly addressed: Asset-, maturity- and currency mismatch. As a consequence the determination of CRM numbers offers a lot of options and is too manifold to be described in this review paper. For a detailed description we therefore refer to *Credit Risk mitigation in the Standardised Approach* in *The Standardised Approach to Credit Risk* of the Basel committee on Banking Supervision.

4 The IRB Approach to Credit Risk

4.1 Key Elements and Risk Components of the IRB Approach

In this section we will give an overview of the Internal Ratings-Based Approach (IRB Approach) to capital requirements for credit risk by the Basle Committee on Banking Supervision. The approach relies - in opposite to the Standardised Approach described above heavily upon a bank's internal assessment of its counterparties and exposures. Since the most discussed topic were the risk weights for corporate exposures we will concentrate on this feature of the new Capital Accord in the IRB approach. The assignment of risk weights to banks and sovereign exposures are very similar and based mainly on the same function as calculating the risk weights for corporate exposures.

According to the consultative document, the IRB approach has five key elements:

- A classification of exposures by broad exposure type.
- For each exposure class, certain risk components which a bank must provide, using standardized parameters or its internal estimates.
- A risk-weight function which provides risk weights (and hence capital requirements) for given sets of these components.
- A set of minimum requirements that a bank must meet in order to be eligible for IRB treatment for that exposure.

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

The capital charge for exposures within each of the three exposure classes depends on a set of four risk components (inputs) which are provided either through the application of standardised supervisory rules (foundation methodology) or internal assessments (advanced methodology), subject to supervisory minimum requirements.

Probability of Default (PD)

All banks – whether using the foundation or the advanced methodology – have to provide an internal estimate of the PD associated with the borrowers in each borrower grade. Each estimate of PD has to represent a conservative view of a long-run average PD for the grade in question and has to be grounded in historical experience and empirical evidence. The preparation of the estimates, the risk management processes and the rating assignments that lay behind them, have to reflect full compliance with supervisory minimum requirements to qualify for the IRB recognition.

Loss Given Default (LGD)

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

The LGD value can be determined in two ways: In the first way – respectively under the foundation methodology – LGD is estimated through the application of standard supervisory rules. The differentiated levels of LGD are based upon the characteristics of the underlying transaction, including the presence and the type of collateral. The starting point is a value of 50% for most unsecured transactions whereas a higher value of 70% is applied to subordinated exposures, but the percentage can be scaled to the degree to which the transaction is secured. If there is a transaction with financial collateral, a haircut methodology adapted from the STD approach is used.[20] In the advanced methodology, LGD – which is applied to each exposure – is determined by the banks themselves. Thus, banks using internal LGD estimates for capital purposes are able to differentiate LGD values on the basis of a wider set of transaction and borrower characteristics.

Exposure at Default (EAD)

As with LGD, EAD is also facility-specific. Under the foundation methodology, EAD is estimated through the use of standard supervisory rules and is

[20] A separate set of LGD values is applied to transactions with real estate collateral.

determined by the banks themselves in the advanced methodology. In most cases, EAD is equal to the nominal amount of the facility but for certain facilities – e.g. those with undrawn commitments – it includes an estimate of future lending prior to default.

Maturity (M)

Where maturity is treated as an explicit risk component like in the advanced approach, banks are expected to provide supervisors with the effective contractual maturity of their exposures. Where there is no explicit adjustment for maturity, a standard supervisory approach is presented for linking effective contractual maturity to capital requirements.

4.2 Risk Weights for Corporate Exposures

After introducing the entering risk components we will now investigate how the risk weights for corporate exposures are calculated in the IRB approach.

Formula for RWA

The derivation of risk weights is dependent on the estimates of PD, LGD and M that are attached to any exposures. Where there is no explicit maturity dimension in the foundation approach, corporate exposures receive a risk weight (RW_C) that depends on PD and LGD after recognizing any credit enhancements from collateral, guarantees or credit derivatives. The average maturity of all exposures is assumed to be three years, RW_C is expressed as a function of PD and LGD[21] according to the formula below:[22]

$$RW_C = min\left[\frac{LGD}{50} \cdot BRW_C(PD)\ ;\ 12.50 \cdot LGD\right] \tag{6}$$

where: RW_C is the risk weight associated with given PD and LGD
$BRW_C(PD)$ is the corporate benchmark risk weight associated with a given PD

In the advanced approach – or where there is an explicit maturity dimension in the foundation approach – for an exposure with an effective maturity

[21] PD, LGD and EAD are expressed as whole numbers rather than decimals. The only exception are the benchmark risk weight and maturity slope calculations.

[22] The cap is to ensure that no risk weight can be more penal than the effect of deducting from capital the exposure's expected loss in the event of default.

M different from three years, an asset's *maturity-adjusted* risk weight is calculated by scaling up or down the BRW_C for a hypothetical three-year loan having the same PD and LGD. Thus, RW_C in the advanced approach is expressed as a function of PD, LGD and M according to the following formula:

$$RW_C = min\left[\frac{LGD}{50} \cdot BRW_C(PD) \cdot \big(1 + b\,(PD) \cdot (M-3)\big)\;; 12.50 \cdot LGD\right] \quad (7)$$

where: $b(PD)$ is the maturity adjustment factor dependent of PD

$1 + b(PD) \cdot (M-3)$ is the multiplicative scaling factor linear in M

For maturities ranging from one to seven years, a linear relationship between maturity and credit risk is viewed as a reasonable approximation to both industry-standard mark-to-market (MTM) credit risk models – such as J.P. Morgan' s CreditMetrics^{TM} (CM) and KMV's Portfolio Manager^{TM} (PM) – and multi-period default-mode (DM) models.[23] Research undertaken to calibrate the maturity adjustment factor indicates that this factor is very sensitive to whether the underlying credit risk modelling approach is based on a MTM or a DM framework. Thus, for each framework an alternative has been developed for the calibration of b(PD).

Calibration of BRW

The *Value at Risk* (VaR) approach recognizes that trading activities generate a return for banks but there is still a range of possible outcomes that includes possible operating losses. The market risk approach considered capital as being required to insulate the institution against a very severe negative event or events in its trading portfolio. Thus, the VaR approach relates capital to some target level of confidence that capital for market risk will not be exhausted.

Since total regulatory capital includes at least a portion of a bank's general loan loss reserves, IRB risk weights have been developed within the context of achieving adequate coverage of total credit losses – i.e expected and unexpected losses (EL and UL) – over an assumed one-year time horizon. Therefore, the concept of economic capital is based on the idea that future gains or losses of a portfolio of credit exposures can be described by its *probability density function* over a specified time horizon. In theory, a bank which knows this function can assign capital that will reduce its probability of failure over the appropriate time horizon to any desired confidence level. This can be seen as the *target solvency probability* or *loss coverage target* for the bank.

[23] See *CreditMetrics-Technical Document*, Bathia, M. and Finger, C.C. and Gupton, G.M., April 1997, as well as *The Merton/KMV Approach to Pricing Credit Risk*, Sundaram, R.K., January 2001.

The calibration methods described below are based on the same credit risk modelling framework but modified to ensure coverage of both, EL and UL. Under this framework, the risk weights are implicitly calibrated so that with a specified minimum probability – i.e. the target solvency probability – capital will cover total credit losses. An appropriate balance between two empirical approaches – one direct and another survey-based or indirect – was applied for calibrating risk weights for corporate exposures under the IRB standard which involves the following:

- Estimating the volatility of credit losses in a portfolio over a one-year time horizon.
- Determining the level of capital needed to achieve possible target solvency probability.

Survey-Based Risk Weights: The implementation of the indirect approach for estimating risk weights is based on detailed information about internal economic capital allocations against large corporate loans. The estimated weights imply relative economic capital requirements which are attributed by each bank to corporate loans having particular configurations of PD, LGD and M. The survey data indicated broad comparability across banks in the relationship between PD and relative economic capital levels, holding LGD and M fixed. In contrast to the current 100% risk weight for all corporate loans, the survey evidence highlighted the greater relative credit risk attributed to higher PD borrowers and the proportionality of economic capital levels and banks' LGD assumptions. This suggests, that for large corporate portfolios, a capital standard could be constructed to generate risk weights whose sensitivity with respect to PD would be broadly compatible with existing internal economic capital processes. In opposite to the effects of PD and LGD, M was much less consistent across surveyed banks and depended critically on the underlying credit risk model.

Direct Estimates of Risk Weights: The results of exercises in credit risk modelling are comparable to those obtained from the survey evidence. In particular, while the sensitivity of economic capital levels to PD and LGD were well defined across a range of modelling frameworks and parameter specifications, the effects of M on economic capital were quite sensitive to particular modelling choices.

Derivation of Benchmark Risk Weights

The equation of BRW_C for corporate exposures – dependent on a given PD – was developed on the basis of survey and model-based evidence. Finally, a continuous function was selected to represent the relationship between a corporate borrower's PD and the associated risk weight for a benchmark loan to that borrower having a three-year maturity and LGD equal to 50%. The formula presented here is the BRW function that was usually suggested in the second consultive document of the Basel committee:

$$BRW_C(PD) = 976.5 \cdot \Phi\Big(1.118 \cdot \Phi^{-1}(PD) + 1.288\Big) \cdot \left(1 + 0.047 \cdot \frac{1 - PD}{PD^{0.44}}\right) \tag{8}$$

where:$\Phi(x)$ is the cumulative distribution function for a standard normal random variable.

Obviously the above expression consists of three separate factors. The first term 976.5 is a constant scaling factor to calibrate the BRW_C to 100% for PD = 0.7% and LGD = 50% as shown below:

$$\begin{aligned} BRW_C(0.7\%) &= 976.5 \cdot \Phi(1.118 \cdot \Phi^{-1}(0.007) + 1.288)(1 + 0.047 \cdot \frac{1 - 0.007}{0.007^{0.44}}) \\ &= 976.5 \cdot \Phi(1.118 \cdot (-2.455) + 1.288) \cdot 1.414 \\ &= 1380.96 \cdot \Phi(-1.457) \\ &= 100 \end{aligned}$$

The second term $\Phi\big(1.118 \cdot \Phi^{-1}(PD) + 1.288\big)$ represents the sum of EL and UL and is associated with a hypothetical, infinitely-granular portfolio of a one-year loan having a LGD of 100%, based on the idea of only one systematic risk factor X. The systematic risk factor stands e.g. for the current state of the economy that next to firm-specific risks has an influence on the fact whether a firm defaults or not. Such models are in the literature generally called *one-factor models*.[24] The committee emphasizes that this approach includes two industry-standard credit risk models (PM and CM) and provides a reasonable approximation to a third, Credit Suisse Financial Product's $CreditRisk^{+TM}$ (CR^+).[25]

In the one-factor model, the borrowers' asset-change Y_i can be divided into two components: A systematic (X) and a idiosyncratic (U_j) component whereby the idiosyncratic risk factor is in contrast to the systematic risk factor dependent on every single borrower j (with j = 1,...,K). Concerning these two variables X and U_j, the first two of five assumptions are met:

1) $X, U_1, ..., U_K \sim N(0,1)$.
2) $\forall$ j = 1,...,K: X and U_j are stochastically independent as well as all U_j.

Due to these assumptions, X and U_j (for j = 1,...,K) are standard normal distributed and in pairs stochastically independent but not the sum of X and

[24] See *A one-parameter representation of credit risk and transition matrices*, Belkin, B., Forest, L.R., Suchower, S., CreditMetrics Monitor, Third Quarter, 1998 as well as *The one-factor CreditMetrics model in the New Basel Capital Accord*, Finger, C.C., RiskMetrics Journal 2, 2001.

[25] See Credit Risk^+: A credit risk management framework, Credit Suisse Financial Products, 1997.

U_j. Therefore, a weight-factor w (with $w \in [0;1)$) has to be introduced with w_j for the systematic risk factor and with $\sqrt{1-w_j^2}$ for the idiosyncratic risk factor as shown in the third assumption:

3) $\forall$ borrowers j = 1,...,K: The modelling relationship between the borrowers' asset-change Y_i - which is lognormally distributed - the systematic risk factor X and the idiosyncratic risk factors U_j is as follows:

$$Y_j = w_j \cdot X + \sqrt{1-w_j^2} \cdot U_j \tag{9}$$

In addition, if there are identically correlations ρ, the equation 9 can be simplified to the following:[26]

4) $\forall$ borrowers j = 1,...,K: There are identical correlations with $\rho = \rho(Y_j, Y_k) = w_j \cdot w_k > 0$.

$$Y_j = \rho \cdot X + \sqrt{1-\rho} \cdot U_j \tag{10}$$

From this assumption follows, that all Y_i are standard normal distributed with the same multi-normal distribution and the same correlation ρ. Concerning the correlation ρ, the fifth and last assumption is met. This asset return correlation assumption (better known as asset value correlation) is underpinning the proposed corporate credit risk charges and is consistent with the overall banks' experience.[27]

5) The asset return correlation ρ is constant over time, independent of any risk factor and assumed to be 0.2.

Given all these assumptions, a *default-point model* is introduced. In this model, there is a default for borrower j exactly when Y_i is equal or less than a certain default point d_j which – in turn – is defined as:

$$PD_j = P(D_j = 1) = P(Y_j \leq d_j) \tag{11}$$

where: d_j is the default point with: $d_j = \Phi^{-1}(PD_j)$

D_j is a bernoulli distributed default indicator with:

$$D_j = \begin{cases} 1 & , \text{ for default by obligor j} \\ 0 & , \text{ otherwise} \end{cases}$$

[26] See *Die Risikogewichte der IRB-Ansätze: Basel II und "schlanke" Alternativen*, Wehrsohn, U. et al, risknews, 11/2001.

[27] See *ISDA's Response to the Basel Committee on Banking Supervision's Consultation on the New Basel Capital Accord*, International Swaps and Derivates Association (ISDA), 2001, S.13.

To go back to the modelling relationship, it is necessary to abstract from a single borrower to the whole homogeneous portfolio. Therefore, in the event of a default – i.e $Y_j \leq d_j$ – the conditional PD for a fixed realisation x of the same risk factor X is used:

$$\begin{aligned} PD_j(x) :&= P(D_j = 1|X = x) \\ &= P\left[\sqrt{\rho} \cdot x + \sqrt{1-\rho} \cdot U_j \leq \Phi^{-1}(PD_j)\right] \\ &= P\left[U_j \leq \frac{\Phi^{-1}(PD_j) - \sqrt{\rho} \cdot x}{\sqrt{1-\rho}}\right] \end{aligned} \tag{12}$$

As it can be seen from the assumptions above, all U_j are standard normal distributed and the average asset correlation coefficient ρ is 0.20. Furthermore, the Committee decided to calibrate the coefficients within this expression to an assumed loss coverage target of the 99.5% quantile of the standard normal distribution. Thus, the 1 - 99.5% = 0.5% quantile of $N(0,1)$ is $\Phi^{-1}(0.005)$ = -2.576. Therefore, $\mathrm{PD}_j(\mathrm{x})$ can be calculated as follows:

$$\begin{aligned} PD_j(z) :&= \Phi\left(\frac{\Phi^{-1}(PD_j) - \sqrt{0.20} \cdot (-2.576)}{\sqrt{0.80}}\right) \\ &= \Phi\left(1.118 \cdot \Phi^{-1}(PD_j) + 1.288\right) \end{aligned} \tag{13}$$

The last factor $\left(1 + 0.047 \cdot (1 - PD)/(PD^{0.44})\right)$ is an adjustment to reflect that the BRW_C are calibrated to a three-year average maturity.

This construction is based on survey evidence and simulation results which were pooled judgementally to develop a smooth functional relationship between the values of PD and b(PD).

A graphical depiction of IRB risk weights for a hypothetical corporate exposure having an LGD equal to 50% without an explicit maturity dimension is presented below. Note that for given PD, the corresponding BRW_C can be calculated by using formula 8 as presented in Table 7 below. Furthermore, the minimum BRW_C is 14 due to a 0.03%-floor which was imposed for PD values. The floor is due to the committees evaluation of banks difficulties in measuring PDs adequately. As described in the minimum risk weight function 6, the RW_C are capped at 625% which corresponds to a PD of exactly 17.15%. From this point on, the BRW_C function runs above the RW_C function.

Maturity-Adjustments to Corporate Risk Weights

Especially in the advanced IRB approach maturity is treated as an explicit risk component. Therefore, the approach to maturity in the Basel Capital Accord

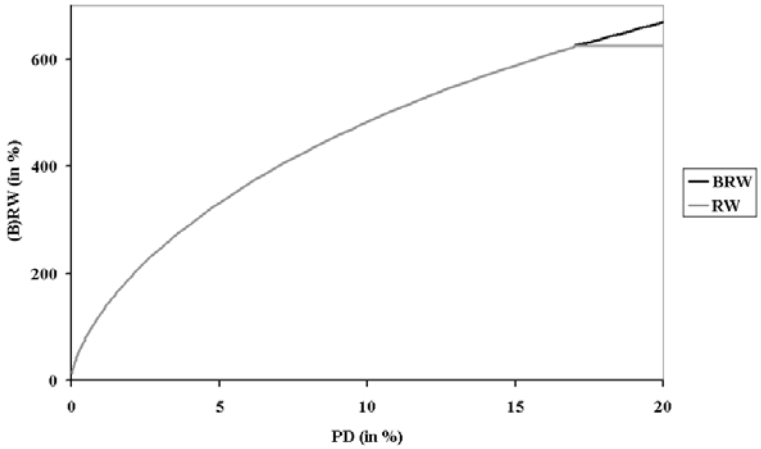

Fig. 4. (Benchmark) risk weights as a function of PD

Table 7. Benchmark risk weights for corporate exposures

PD (in %)	BRW_C **(in %)**	**PD (in %)**	BRW_C **(in %)**
0.03	14.1	1.0	125.0
0.05	19.1	2.0	192.4
0.1	29.3	3.0	246.0
0.2	45.1	5.0	331.4
0.4	69.9	10.0	482.4
0.5	80.6	15.0	588.0
0.7	99.8	20.0	668.2

shall also be discussed here. Generally within the banking industry two classes of credit risk models tend to be most prevalent, the mark-to-market (MTM) and default-mode (DM) models.

Both models are generally employed under the assumption of a one-year time horizon and both capture credit losses associated with defaults that occur within this time horizon. However, the two approaches differ with regard to how they deal with credit deterioration short of default. While in default-mode models there are only two states of an exposure, default and non-default, in MTM models changes in a loan's credit quality are also considered. Usually in a MTM model the probability of an upgrade or downgrade - and therefore of an improvement or an deterioration of the credit quality - of a loan is modelled by a transition matrix.

The sensitivity of economic capital to maturity depends critically on the choice of the credit risk model. In this light, two alternative schedules of

maturity adjustment factors b(PD) were developed, one based on a MTM another on a DM framework.

While both approaches were described in the second quantitative impact study we will illustrate here only one of the two options: the MTM approach to maturity. The reason is that in the new suggestions of the Basel committee probably only this option will be considered, while the DM option was excluded from the accord.

Changes in a loan's credit quality over the time horizon are translated into changes in the loan's economic value based on an assumed valuation relationship. This links the loan's risk rating to an assumed market-based credit spread that is used to value the loan at the end of the horizon. A credit deterioration short of default is presumed to reduce a loan's value, generating an implicit credit loss. The sensitivity of a loan's end-of-horizon value to a credit quality deterioration short of default is dependent on its maturity. As a consequence, maturity has a substantial influence on economic capital within MTM models, with longer-maturity loans requiring greater economic capital. The schedule of maturity adjustment factors is based on an underlying MTM calibration approach. The calibration of b(PD) according to the committee reflects survey evidence and simulation results and is a smooth functional relationship between PD and b(PD):

$$b(PD) = \frac{0.0235 \cdot (1 - PD)}{PD^{0.44} + 0.047 \cdot (1 - PD)} \tag{14}$$

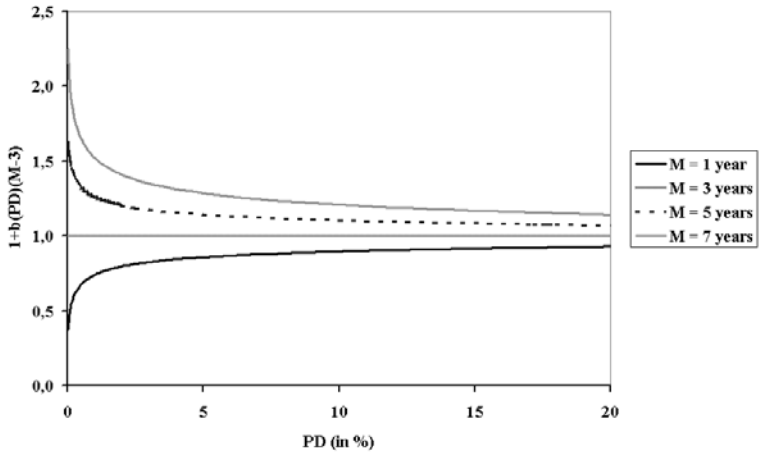

Fig. 5. MTM-based maturity adjustment for different maturities

As it can be seen from the chart above, the MTM-based maturity adjustment factors are a decreasing function of PD. This inverse relationship reflects the fact that maturity has a greater proportional effect on economic capital the greater the probability of downward credit quality migrations short of default relative to PD. For very low PD values – i.e. very high credit quality – the likelihood of a downgrade short of default within one year is high relative to the likelihood of a default. Consequently, the effect of maturity on economic capital is relatively large. In contrast, as PD values increase, the likelihood of default within one year increases more rapidly than the likelihood of a downgrade short of default, implying a reduced sensitivity of economic capital to maturity. In the limit as PD approaches 100%, it becomes certain that the borrower will default within the one-year horizon and the likelihood of a downgrade short of default tends to zero, implying that maturity has little or no effect on economic capital, i.e. b(PD) equals 0.

At the end of this section, a graphical representation of risk weights is given for corporate exposures with a maturity of 1, 3, 5 and 7 years setting LGD to 50% as it is assigned in the foundation approach. Especially for exposures with a long maturity and a high PD estimate, the ceiling of a 625% is the limit for the assigned risk weight. Obviously for longer maturity horizons the assigned risk weights are clearly higher for the same probability of default.

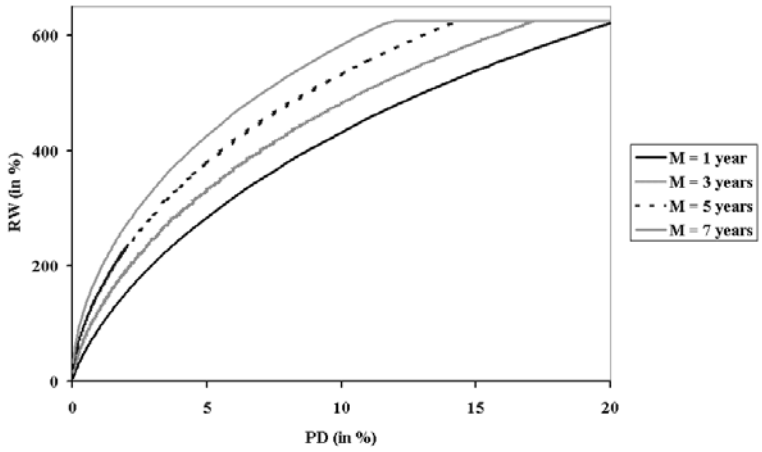

Fig. 6. Risk weights as a function of PD for different maturities

5 Modification of the Approaches

5.1 Severe Criticism of the Suggestions

The suggestions both for the standardised and IRB approach of the second consultative document were subject to extensive discussions. Especially small and medium-sized companies (SMEs) were afraid of higher capital costs for banks that would lead to worse credit conditions for these companies. Also the desired incentive character of the IRB approach for banks was very questionable, since risk weights in many cases were rather higher for the IRB approach than for the STD approach.

Table 8 shows a comparison of the assigned risk weights for the old accord and both approaches of the new capital accord for different risk classes. Obviously there is a clear tendency in the IRB of assigning lower risk weights to companies with a very good rating and much higher risk weights to such companies with a rating worse than BB-. On the one hand this is consistent with recommendations e.g. by Altman/Saunders (2000) where is stated that risk weights for AAA or AA bonds in the ST approach are chosen too high while for BB- or worse rated companies the risk weights may be chosen too low. However, considering especially SMEs that will probably not obtain a rating in one of the first three categories, banks will have to hold a higher amount of capital for such companies.

Table 8. Comparison of risk weights

Rating	AAA to AA-	A+ to A-	BBB+ to BB-	below BB-	without
Old Accord	100%	100%	100%	100%	100%
ST	20%	50%	100%	150%	100%
IRB	14%	14%	36%-200%	200%-625%	–

Thus, especially small and medium sized companies and companies with a rating rather in the "speculative grade" area may suffer from higher capital costs for the banks that will be passed down to the companies.

One can further see that there is not a real incentive for banks with many exposures in the "higher risk" area to use the internal rating based approach, since the capital to hold may be much higher than so far. Therefore, it is questionable whether the Incentive Compatibility which shall encourage banks to continue to improve their internal risk management practices is really existing.

Also the relationship between assigned risk weights and maturity of the second consultative document is questionable. The assumed linear relationship between maturity and assigned risk weights can be observed in these curves.

Comparing the assigned Risk Weights to actually observed spreads in the market, one can find that for high rated bonds credit spreads rise - maybe even in a linear relationship - with longer maturities. This behavior matches

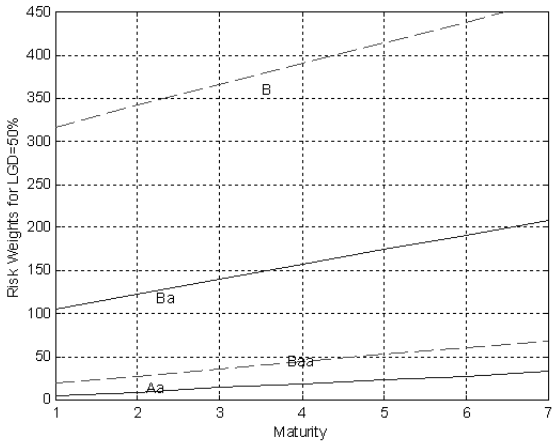

Fig. 7. Assigned risk weights as function of maturity for different ratings

the model of the Basel committee where higher risk weights are assigned to exposures with longer maturities. However, especially for lower rated bonds credit spreads do not show a positive correlation with maturity. For Ba rated bonds the spreads are constant while for single B rated bonds the spreads fall from year one. Obviously the assigned Risk Weights according to the maturity adjustments are not really matching the market Credit Spreads for corporate exposures rated from B to Baa. The reason for the falling credit spreads in lower rating categories can be explained empirically by the fact that as the threat of default recedes, risk neutral investors require a smaller yield spread to compensate them for expected default loss.

It seems as if this market behaviour of credit spreads is not incorporated in the MTM model also considering maturities. Even worse, many SMEs were afraid that due to higher risk weights for long-term loans, banks could even refuse to make such contracts anymore.

The problems and criticism mentioned above was also confirmed by so-called quantitative impact studies (QIS) conducted by banks for the Basel committee. According to the second quantitative impact study (QIS2) by the Basel Committee requirements for banks would increase by the suggestions of the STD approach. For the IRB approach capital requirements would even be higher. According to a study for several of the G10 major banks the capital requirements would be between 6% and 14% higher. Therefore, the goals of the accord to keep the overall capital unchanged were not satisfied.

Thus, obviously to match the goals set by the committee there was need for a revision of some features in the accord - especially for the BRW function in the IRB approach that should provide an incentive for banks to use the IRB and refine their risk management procedure.

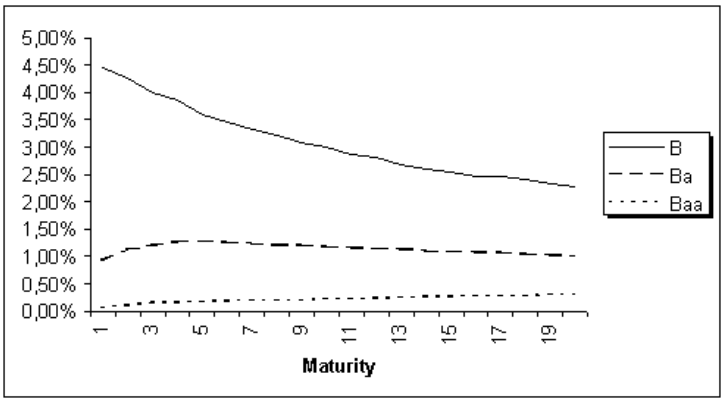

Fig. 8. Maturity and credit spreads for bonds rated Baa-B

5.2 Possible Changes in the Final Version

According to the Basel Committee there will be several changes in the final version of the accord. After a third quantitative impact study that is conducted in late 2002 the final version will probably be available in 2003. Still, there has already been an announcement of possible changes by the committee and further suggestions for a refined risk weight function and different treatment of maturity, SMEs and overall capital. In the following section some of the possible changes will be briefly described according to a press release by the committee.

Treatment of SMEs

One of the major criticism was the treatment of more risky loans or companies especially small and medium sized companies (SMEs). In recognition of the different risks associated with SME borrowers, under the IRB approach for corporate credits, banks will now be permitted to separately distinguish loans to SME borrowers from those to larger firms. SME borrowers are defined as companies with less than Euro 50 Million in annual sales - thus, e.g. in Germany more than 90% of the companies will fall into this class. Under the proposed treatment, exposures to SMEs will be able to receive a lower capital requirement than exposures to larger firms. The reduction in the required amount of capital will be up to twenty percent, depending on the size of the borrower. Further, banks that manage small-business-related exposures in a manner similar to retail exposures will be permitted to apply the less capital requiring retail IRB treatment[28] to such exposures, provided that the

[28] For a detailed description of the treatment of retail exposures see *Consultative Document - The IRB approach to Credit Risk*, BCBS, 2001

total exposure of a bank to an individual SME is less than Euro 1 Million. Such exposures are then treated the same way as credits to private customers. A similar threshold is also assumed to be established in the standardised approach. The committee assumes that this should result in an average reduction of approximately ten percent across the entire set of SME borrowers in the IRB framework for corporate loans.

Treatment of Maturity

A second criticised drawback was the assigned maturity adjustment in the second consultative document - especially the linear relationship between maturity horizon and the assigned risk weights for more risky loans. Banks using the advanced IRB framework for corporate lending, as well as banks using the foundation IRB approach, will be required to incorporate maturity adjustments calculated using a mark-to-market methodology. However, in recognition of the unique characteristics of national markets, supervisors will have the option of exempting smaller domestic firms from the maturity framework. In this framework smaller domestic firms are defined as those with consolidated sales and consolidated assets of less than Euro 500 Million. If the exemption is applied, all exposures to qualifying smaller domestic firms will then be assumed to have an average maturity of 2.5 years, as under the foundation IRB approach. With these new regulations the committee hopes to counter the fears that due to higher risk weights, banks would refuse to give long-term loans to SMEs.

Treatment of Overall Capital

One concern that has been identified in the Committee's prior impact surveys has been the potential gap between the capital required under the foundation and advanced IRB approaches. To modestly narrow this gap, the average maturity assumption in the foundation approach will be modified from 3 years to 2.5 years, and the majority of the supervisory "loss-given-default" (LGD) values in the foundation IRB approach will be reduced by five percentage points (e.g. for senior unsecured exposures from 50% to 45%). These changes will be combined with offsetting changes to the IRB risk-weight function for corporate lending.

More fundamentally, the Committee is also proposing to alter the structure of the minimum floor capital requirements in the revised Accord. Under the new approach, there will be a single capital floor for t2006 and 2007 following implementation of the new Accord. This floor will be based on calculations using the rules of the existing Accord. Beginning year-end 2006 and during the first year following implementation, IRB capital requirements for credit risk together with operational risk capital charges cannot fall below 90% of the current level required, and in the second year, the minimum will be 80% of this minimum. Should problems emerge during this period, the Committee

will seek to take appropriate measures to address them, and, in particular, will be prepared to keep the floor in place beyond 2008 if necessary.

The capital requirements for the various exposures included in QIS 3 have been designed to be consistent with the Committee's goal of neither significantly decreasing nor increasing the aggregate level of regulatory capital in the banking system. Nevertheless, it is possible that the QIS 3 study may indicate the need for some adjustments. It is important to note that - if required - the Committee is prepared to make both upward and downward adjustments to the amount of required capital.

The refined BRW Function

As a consequence of the fair comment on the risk weight function assigned in the IRB approach the Basel committee will suggest a refined BRW function. The modified formula relating probability of default (PD) to capital requirements differs from the formula proposed in January in several ways.

One major change is that there is no explicit scaling factor in the formula anymore. Also the confidence level that was implicit in the formula has been increased from 0.995 to 0.999, to cover some of the elements previously dealt with by the scaling factor. The January formula incorporated an implicit assumption that asset correlation is equal to 0.20. The new formula assumes that asset correlation declines with PD according to the following formula:

$$\rho(PD) = 0.1 \cdot \frac{1 - e^{-50 \cdot PD}}{1 - e^{-50}} + 0.2 \cdot (1 - \frac{(1 - e^{-50 \cdot PD})}{1 - e^{-50}}) \tag{15}$$

For the lowest PD value it is equal to 0.20 and for the highest PD value it is equal to 0.10. There is at this stage no modification to the proposed inclusion of an implicit maturity adjustment for all exposures in the foundation IRB approach based on the assumption of an average three-year maturity. The modified formula can then be calculated by first calculating the correlation value that corresponds to the appropriate PD value. This value enters then the main formula for the capital requirement. Capital requirements and risk-weighted assets are related in a straightforward manner. With the given confidence level and $\Phi^{-1}(0.999) = 3.090$, the resulting formula is the following:

$$BRW_C(PD) = \Phi\left(\frac{\Phi^{-1}(PD) + \sqrt{\rho} \cdot 3.090}{\sqrt{1-\rho}}\right)\left(1 + 0.047 \cdot \frac{1 - PD}{PD^{0.44}}\right) \tag{16}$$

As it can be seen in figure 9 the combined impact of these changes is a risk-weight curve that is generally lower and flatter than that proposed in January, which are the directions suggested by industry feedback and the Committees own quantitative efforts.

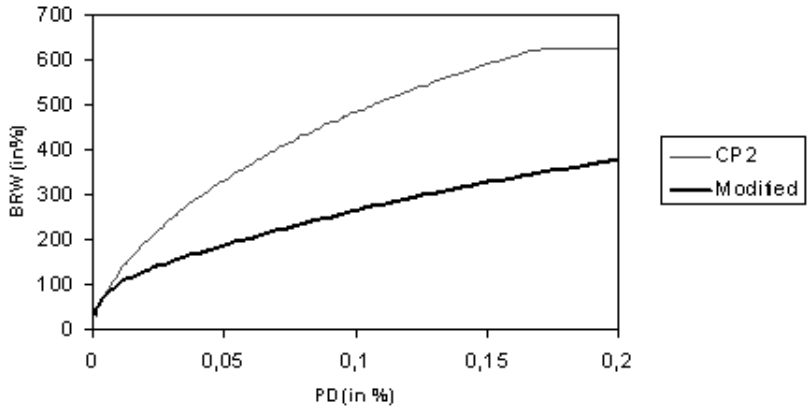

Fig. 9. Modified corporate risk weight curve compared to CP2

With this altered risk weight functions assigned BRWs are clearly lower than before and especially for more risky loans the required capital will decrease by up to 40%.

6 Summary

In 1988 when the first Capital Accord was publicized, there was only one option for measuring the appropriate capital of internationally active banks. Since then the business of banking and the financial markets have undergone significant changes. Therefore, the Committee was obliged to develop a new Accord which should be more comprehensive and more risk sensitive to the default risk of the obligor than the old one. As a consequence, from 2006 on banks will have the possibility to choose one of three approaches to credit risk for their portfolios. The choice wether a bank uses the STD, the foundation IRB or the advanced IRB approach depends critically on the ability of estimating own risk components and on meeting supervisory requirements. However, in the long run all internationally active banks should use the advanced IRB approach or at least the foundation IRB approach in line with improvements in their risk management practices and in line with the benefit in holding their intrinsic amount of credit risk.

Nevertheless, there were also some undesirable drawbacks in the new Accord and not all of them have been changed yet. For instance, there was no incentive for banks dealing with low-rated companies to use one of the IRB approaches to calculate their risk weights. In the version that was suggested in the second consultative document, in the STD approach the risk weights of good-rated companies were chosen too high while for worse-rated companies they were too low. Low-rated companies may still have an incentive to give up their solicited rating if the 100% risk weight for non-rated companies

remains. Another point of critique are the requirements for using one of the IRB approaches. They were originally set too high, so that it might still be questionable whether all banks will be willing to use the IRB approach by the beginning of 2006.

By reading this survey paper, one should always keep in mind that the described version of the new Basel II Accord is probably not the final one which will be implemented. There ares still many features and several changes in discussion, before the final version will be provided in 2003. However, what remains is the evolution of a more risk sensitive and comprehensive regulatory approach to credit risk. Also the way the BIS is dealing with suggested changes and criticism is commendable: the final version is likely to be a result of a lively discussion between regulators, practitioners from banks and researchers in the field of credit risk.

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