The Basel Framework in practice – implementing the Basel advanced approaches in Germany

In Germany, the new Basel Capital Accord (Basel II) has been in force for all institutions since 1 January 2008. When calculating their minimum capital requirements under Pillar 1 of the revised framework, institutions are now free to choose whether to use one of the simple standardised supervisory approaches or advanced approaches based on their own internal methods. The use of internal methods for regulatory purposes requires approval by Germany's Federal Financial Supervisory Authority (*Bundesanstalt für Finanzdienstleistungsaufsicht* or BaFin).

Institutions from all sectors of the banking industry are now using their own methods to measure risk. Using Advanced Measurement Approaches for supervisory purposes has proved a correct decision. Current trends also show, however, that some areas of the framework still require some improvement. Examples include the capital requirements for certain types of securitisation transactions and the capital charge for event and default risk in the trading book. In addition, banks' risk management must be improved across the board for all types of risk, particularly liquidity risk. Moreover, the capital relief associated with the advanced approaches under the Basel Framework needs to be reviewed.

Minimum capital requirements under the Basel Framework

Revised framework adopted in 2004

The key objective of the Revised Framework for capital adequacy (Basel II), which was adopted in 2004, is to align regulatory capital requirements for banks more closely to the actual risks they incur and to take account of recent trends in the financial markets and institutions' risk management practices (Pillar 1). This internationally developed framework was transposed into European law by Directive 2006/48/EC, which in turn was transposed into German law in the German Banking Act (*Kreditwesengesetz*) and by the "Regulation Governing the Capital Adequacy of Institutions, Groups of Institutions and Financial Holding Groups" (Solvency Regulation) via the "Act Implementing the Revised Banking Directive and the Revised Capital Adequacy Directive" (*Gesetz zur Umsetzung der neugefassten Bankenrichtlinie und der neugefassten Kapitaladäquanzrichtlinie*) of 17 November 2006.

The provisions of the "Market Risk Amendment" published by the Basel Committee in 1996 allowed the use of internal market risk models; Pillar 1, with its Internal Ratings-Based Approach (IRBA) for credit risk and the Advanced Measurement Approaches for operational risk[1] (AMA), enables banks to use internal procedures to calculate regulatory capital requirements for these two types of risk, too.

In order to facilitate the transition, in 2007 credit institutions were able to choose between Basel's Foundation IRB Approach and the Standardised Approach under the new Basel Framework, on the one hand, and Principle I, which had so far been in force in Germany, on the other, for calculating their regulatory capital requirements. Since 1 January 2008, the new Basel rules have been in force for all credit institutions in Germany – as well as in all other EU countries, Switzerland and Japan.

The Internal Ratings-Based Approach (IRBA)

Structure

Regulatory capital requirements for credit risks

Under the IRBA, credit institutions have to apply three risk parameters for each transaction of a given borrower when establishing their regulatory capital requirements for credit risks: the probability of default (PD), the exposure at default (EAD) calculated using credit conversion factors (CCF), and the loss given default (LGD). Under the Foundation IRBA, banks estimate only the PD itself for exposures to sovereigns, banks and corporates and use supervisory values for LGD and CCF. Under the Advanced IRBA, by contrast, institutions estimate all parameters themselves. For retail exposures,[2] institutions always have to estimate PD, LGD and CCF themselves.

Use of the IRBA requires BaFin approval

Credit institutions wanting to use the IRBA to calculate their regulatory capital requirements

1 Operational risk means the risk of losses resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk.
2 Claims on natural persons and associations of natural persons or on small and medium-sized enterprises under certain conditions.

need rating systems approved by BaFin which meet the minimum quantitative and qualitative requirements set forth in the Solvency Regulation. Whereas the minimum quantitative requirements concern, most notably, the estimate of the risk parameters and the required data inputs, the qualitative requirements relate to all processes associated with the rating procedures. This includes corporate governance when introducing, using and updating rating systems, issuing ratings and loans, and also the incorporation of ratings into the bank's credit risk management framework. The minimum qualitative requirements for the IRBA are based, in principle, on the "Minimum Requirements for Risk Management" (*Mindestanforderungen an das Risikomanagement*, or MaRisk), which apply to all credit institutions. They supplement MaRisk by adding special requirements in terms of rating systems intended to ensure that all institutions using internal procedures for calculating regulatory capital requirements measure risk with the requisite level of reliability and accuracy.

The IRBA rules for classic credit business have been supplemented by special provisions for specific aspects of credit risk measurement and management: the Internal Assessment Approach (IAA) for exposures in unrated securitisation positions in an Asset-Backed Commercial Paper (ABCP) programme and the Internal Models Method (IMM) for netting agreements. The IAA and IMM both require separate approval procedures. The IRBA is more risk sensitive than the old Principle I and offers a more suitable set of incentives for improving credit institutions' risk management strategies. Henceforth, capital charges will increase in proportion to the risk of the assets in question.

Use in Germany

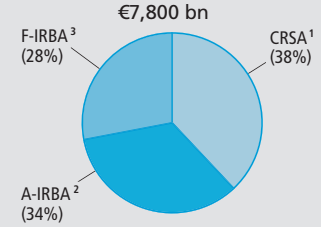
Categories of banks

IRB systems are currently being used in all three pillars of the banking industry (the private, public and cooperative sectors) and for all types of credit business (retail and commercial banking, specialised lending, transactions with banks and sovereigns, securitisations etc). Currently, 59 institutions and groups have applied for approval for their IRBA systems, 21 of which have applied to use the Advanced IRBA. IRBA banks can be divided into two fundamentally different categories: large banks offering a broad range of services, and smaller and medium-sized yet highly specialised institutions. This is because large banks have the necessary resources and data histories to introduce numerous internal ratings-based systems nationwide. Smaller and medium-sized institutions, such as building and loan associations, mortgage banks, automotive and consumer credit banks, and specialised lending banks, by contrast, only need a small number of internal ratings-based systems to cover their entire base of borrowers, owing to their specialisation. Both categories generally already have many years of experience with systematic approaches for assessing credit risk; the threshold for applying for approval to use the IRBA is therefore relatively low.

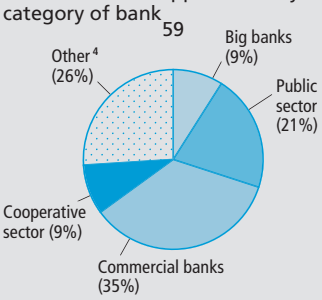
More broadly based smaller and medium-sized credit institutions, however, believe the burden involved in using the IRBA outweighs

Implementation of the revised Basel capital recommendations

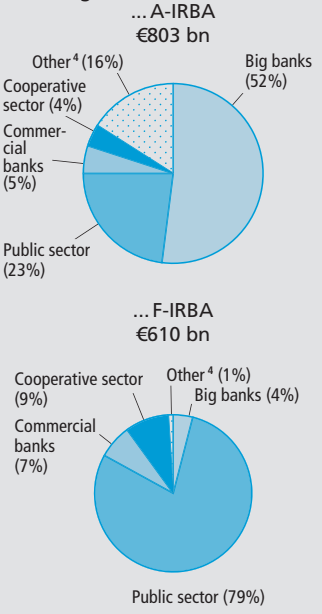
Breakdown of the balance sheet totals of all domestic banks by type of credit risk approach



Number of IRBA applications by category of bank



Risk-weighted assets in the ...



1 Credit Risk Standardised Approach. — **2** Advanced IRB Approach. — **3** Foundation IRB Approach. — **4** Mortgage banks, building and loan institutions, and special purpose banks.

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the advantages, at least at present. Overall, IRBA institutions account for around two-thirds of the balance sheet total of all banks. The adjacent chart provides an overview of the use of the IRBA in Germany by category of banks. Germany is one of Europe's leaders in terms of IRBA coverage throughout the banking system.

Implementation from the institutions' perspective

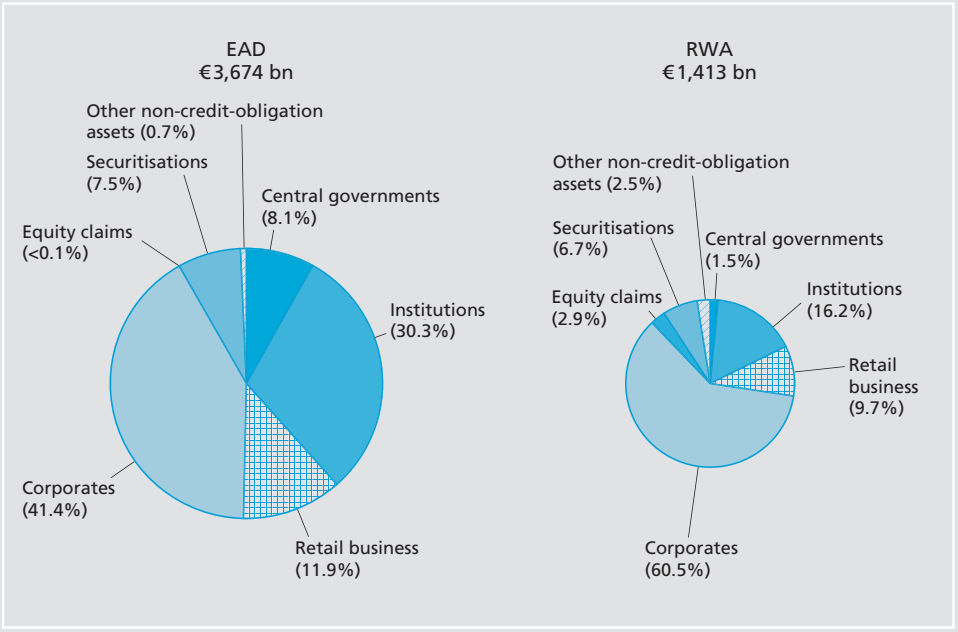
Partial use and duration of implementation

Credit institutions have the option of introducing the IRBA over a period of up to five years (also known as partial use). This allows institutions to gradually implement suitable rating systems.[3] Institutions are taking up this option in a variety of ways. The average implementation period required to cover all portfolios with the IRBA is around three years. However, around a quarter of institutions hit the exit threshold within a year after launching the approval process.

Upon entry into the IRBA, the coverage of institutions' portfolios by internal rating systems averages 77% as measured by risk-weighted assets (RWA) and 82% as measured by EAD. At the end of the implementation phase, the average figures are just under 96% for RWA and 97% for EAD. With the

3 To launch the approval process, institutions must cover at least 50% of their lending business using the IRBA, measured against the exposure at default and risk-weighted assets (entry threshold). After two-and-a-half years, coverage must, in each case, be at least 80% (supervisory reference point). After five years at the latest, the implementation period is over and coverage must, except with the express approval of BaFin, have reached the 92% level (exit threshold). This means that generally not more than 8% of lending business may be permanently exempted from the IRBA.

The EAD* and RWA** of IRBA banks by exposure class



* Exposure at default. — ** Risk-weighted assets.

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exception of credit claims on the Federal Republic of Germany, its Federal States and municipalities, and inter-group claims, institutions are currently only making sparing use of the option of exempting sections of their portfolios permanently from the use of the IRBA. Instead, they are striving for full coverage of their portfolios with internal ratings-based systems. The above chart gives an overview of the percentage share of each IRBA exposure class in the portfolios of all IRBA banks – broken down by EAD and RWA.

Institutions apply for approval for an average of seven IRB systems, though the number of systems submitted for approval ranges from just one to more than 50 different procedures. The explanatory notes on page 61 show which procedures are most commonly used by institutions.

Implementation from a supervisory perspective

"Implementation of Basel II" Working Group

In close cooperation between institutions, supervisors and banking associations, the implementation of the new rules was prepared in the "Implementation of Basel II" Working Group, therefore ensuring that, from an early stage on, the affected institutions had the necessary certainty of planning for implementation in important aspects.

Approval process

Before BaFin gives any institution approval to use the IRBA, supervisors first check that all the requirements for using the IRBA have actually been met. This approval process con-

sists largely of suitability examinations of all rating systems prior to their use for calculating regulatory capital requirements and the review and oversight of the implementation plan throughout the implementation period. This includes, in particular, continually observing implementation progress and compliance with the requirements governing the temporary and permanent partial use of the IRBA for certain portfolio sections.

Suitability examinations

Suitability examinations are a key element of the approval process and are conducted mainly by the Bundesbank. They serve to verify actual compliance with the requirements for using an IRBA. Since a considerable portion of the IRBA requirements relate to banks' internal processes, the suitability examinations are usually conducted on-site. In some 220 suitability examinations, the Bundesbank has, to date, reviewed compliance with minimum requirements for over 360 rating systems.

Joint rating projects of associations and categories of banks

Banking associations have initiated joint rating projects to give small and medium-sized institutions the opportunity to use the IRBA at a reasonable cost. Such pool projects not only reduce the cost of developing the systems but also broaden the pool of available data for parameter estimation. Supervisors have been following these projects closely. One tried-and-tested strategy in the approval process is the so-called pilot bank concept, in which the entire methodology and implementation of the systems in the institutions' internal processes are comprehensively examined at previously designated "pilot banks". Other institutions participating in the pool project then tap the knowledge gained from the pilot examination for their implementation examinations, thereby reducing the examination workload considerably. The pilot banks obtained approval in all major pool projects. The approval process is now complete for all banks involved except for the public and cooperative sector. Savings banks and cooperatives, in particular, currently see little benefit in using the IRBA because of the extra time and effort involved in implementation and are therefore, in most cases, currently using these jointly developed systems for internal control purposes only.

International cooperation

Internationally active banking groups often apply uniform rating systems across national borders. Under European law, an international group operating in the EU must obtain approval from the parent's national supervisory authority (home supervisor). When deciding on approval, home supervisors must take into account all factors that the supervisory authorities of the foreign subsidiaries (host supervisors) deem relevant for approval. This process requires close consultation among all supervisors involved in order to prevent duplication of work. In Germany, 12 groups whose parent institutions are domiciled abroad, chiefly in France and the Benelux countries, have to date filed an application for IRBA approval. In addition, 30 German parents have applied for IRBA approval for their foreign subsidiaries, most of which are located in Luxembourg, Ireland and the United Kingdom. Two different variants of cooperation in cross-border approval procedures have proved successful in practice: either the affected supervisors are directly involved

Rating model methodology

IRBA banks in Germany employ three basic rating models.

Scoring systems are quantitative decision-making tools in which key quantitative and qualitative data are used to derive a risk assessment which is called a "score". These scores are generally determined using classic statistical procedures such as discriminant analysis and regression models. Linear methods are most common. Scoring systems are mainly used in retail business with private clients or small and medium-sized enterprises. Purely statistical methods can be applied to these portfolios since sufficient data, in particular default data, of adequate quality are available. Scoring systems frequently have a two-tier structure. In the loan approval process, so-called application scoring is used, with comprehensive data on the borrower's economic situation taken into account. This is frequently followed by so-called behavioural scoring, which focuses primarily on payment behaviour, which banks know from observing the borrower's account movements. The greater the risk involved and the larger the borrower, the more the differences between the rating procedure applied when a loan is approved and that applied during the lifetime of the loan diminish; the same methods are employed.

While, in the corporate client segment, most banks only use data they have collected and processed themselves, in retail business almost all banks also employ data supplied by external credit information providers, particularly when approving loans. However, these external data represent just one risk factor in the overall system; in addition, all banks incorporate as much of their own information as possible into their systems. The weight of such external information generally declines with the transition to behavioural scoring.

Expert systems and comparable knowledge-based methods are applied for assessing the risk of very complex borrowers, eg large internationally active enterprises and credit institutions as well as sovereign borrowers. They incorporate not just highly qualitative data but also, to a predefined degree, individual features of the borrower being assessed. Rating criteria and the assessment leeway are both based on past experience and expert assessments. This procedure has two advantages. On the one hand, such borrowers' credit risk is measured and assessed in a uniform and consistent manner; on the other, the particularities of highly heterogeneous borrowers can also be taken into account.

Simulation models are employed mainly for specialised lending and project finance. These elaborate procedures are based almost entirely on statistics and forecast future cash flows from such investments. To this end, a very large number – frequently up to 20,000 – different scenarios for the project are simulated and the distributions of future cash flows derived from them. These distributions can then be used to determine the investment's default risk. The result of such simulation processes is largely dependent on the underlying assumptions, which must therefore be reviewed constantly. In addition to the unavoidable disadvantages outlined above, simulation models have the very great advantage of allowing the risk inherent in an investment to be measured in a structured way that is consistent and uniform within the bank.

Besides these pure forms of rating methods, hybrids which combine elements of the scoring procedure, expert systems and simulation models are also frequently used in practice. Procedures where standardised quantitative information is prepared statistically and supplemented with expert-based qualitative assessments are most common.

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in the on-site approval examinations, or the approval examinations are divided between home and host country supervisors according to agreed responsibilities. Responsibilities are often divided according to the systems' use, with systems in use throughout the group being examined by the home supervisor and locally used systems by the host supervisor. In its dual role as home supervisor and host supervisor, the German supervisory authority is in constant contact with foreign supervisory authorities. Cooperation in all international projects is now largely free of friction, since internationally comparable standards have developed for IRBA systems.

Results of implementation at credit institutions

Largely problem-free approval process

The current practice of close cooperation between institutions and supervisors has contributed to a largely problem-free approval process. Because rating systems are, in many cases, well documented, audit teams are able to prepare intensively for the suitability examinations.

More efficient credit risk management at banks

However, all banks that have obtained approval to use the IRBA were well prepared and had invested heavily in credit risk management. Their credit risk management is therefore not only more accurate but also more efficient. The IRBA has thus given credit risk management a considerable innovative boost. Banks are using, in some cases, highly refined and methodologically complex systems to determine and assess credit risk, for example when rating specialised lending facilities (see also explanatory notes on page 61).

Yet for other portfolios and borrowers, too, the introduction of internal ratings-based procedures has rendered the measurement and management of credit risk more structured, more systematic and more precise than just a few years ago.

Quantitative aspects

The introduction of the IRBA has led to a distinct improvement in the quantitative aspects of institutions' credit risk measurement practices. As regards the estimation of risk parameters, nearly all IRBA banks have made the most progress in calculating PD. The systems are now achieving, in some cases, very good results in terms of statistical forecast quality and discriminatory power. This is due to the many years of experience these institutions have had in the systematic assessment of borrowers' creditworthiness and also to the existence at these institutions of databases with a relatively long data history.

Data quality problems still pose challenges to banks

However, for many institutions, datasets are an area in which there is still plenty of room for improving the implementation of the IRBA requirements for calibrating rating systems in terms of the PD, CCF (and, by extension, EAD), and LGD risk parameters. In some cases, the pool of data hardly goes beyond the required minimum history. Estimates frequently need to be derived from aggregated portfolio variables because the data needed for more granular estimates, such as at rating grade level, are not yet available. The largest challenges in system calibration continue to lie in setting the conversion factors for calculating EAD.

Qualitative supplement by Pillar 2

Institutions, however, must also be aware of the limitations of risk measurement that is characterised by complex models. Models are always constrained by assumptions and simplifications as well as by the limited nature of the data used. It is therefore important, in terms of proper risk management, to supplement rating systems with qualitative, forward-looking elements such as suitable stress tests and scenario analyses. There is a close link here between the minimum requirements for the IRBA and the MaRisk requirements for proper risk management, demanded of credit institutions under Pillar 2 of the Basel Framework and reviewed by supervisors.

Improved IT systems at banks

The IRBA banks have used the introduction of their internal ratings-based procedures to streamline and thoroughly revamp their evolved and, in many cases, very heterogeneous IT infrastructure. This currently ongoing process is laying the groundwork for a distinct improvement in data quality at all institutions affected. IRBA systems can therefore be expected to rest on a better empirical foundation in future.

Collateral-based LGD estimates

Nearly all German institutions use an exclusively collateral-based approach to estimating LGD. This is mainly the consequence of the standard practice in Germany of accepting collateral only with a broad declaration of purpose. Accordingly, in a first step, an internal procedure is used to assign borrowers' various collateral items to their loans. In a subsequent second step, the LGD for each loan is derived from the degree of collateralisation and the realisation rate of the assigned collateral. German practice therefore differs from that in countries such as the United States, Canada or the United Kingdom, where lending is much more standardised: generally collateral is contractually tied to a specific loan, and, for certain types of loans, only a specific set of collateral can be used. Therefore, transaction-specific factors such as the type of loan play a major role in determining LGD in those countries yet are irrelevant to German credit institutions.

Stress tests

Stress tests of default risk are therefore another important aspect of the IRBA. The IRBA's risk sensitivity means capital requirements react cyclically, ie they rise in line with credit risk. An essential condition for IRBA approval is therefore that banks can demonstrate how well they are prepared for this interrelationship. This requires that they regularly conduct stress tests. Pillar 1 stress tests are designed to prove that a credit institution can meet its regulatory capital requirements even in a volatile business environment. Pillar 1 stress tests therefore help forecast and address the effects inherent in a risk-sensitive framework.

The most frequent scenario assumed in Pillar 1 stress tests is an across-the-board increase in the risk parameters. According to knowledge gleaned thus far from approval examinations, the cyclical downswings assumed in such stress tests would probably lower the capital ratio by around one to two percentage points.

In addition, many banks need to make further improvements to their internal processes. For

Institutions' internal processes need further improvement

instance, the IRBA – unlike MaRisk – does not contain the option of classifying individual transactions as not risk relevant. Banks are frequently reluctant to implement the requirement that a rating process be conducted even in the case of fully secured loans. It is initially always necessary, however, to determine a borrower's – and thus the direct counterparty's – default risk. Collateralisation is merely downstream and serves to limit damage in the event of default. Although such loans may seem risk-free upon initial approval, a drop in the value of the collateral can seriously diminish the collateralisation effect. Intra-year updates to the rating of IRBA exposures represent another problem with which institutions have to contend. This requirement is significant because only it can ensure constant monitoring of the credit risks taken.

Overall, the structured risk measurement and monitoring framework of IRBA rating procedures renders different types of risk comparable and assessable. German IRBA banks are now in a much better position with respect to their credit risk management practices than they were just a few years ago.

Notices of approval and conditions

Conditional approval

To date, 52 institutions have been given approval to use the IRBA, with 20 receiving approval to use the Advanced IRBA. Approval, however, does not mean that all the minimum requirements for IRB systems are fully met from the outset. In fact, the approval examinations have also revealed deficits, yet these do not necessarily have to stand in the way of IRBA approval. If the findings revealed have only a minimal impact on capital backing and if no major minimum requirements are seriously violated, conditional approval may be granted. However, the shortcomings have to be remedied quickly. Approvals have been conditional with just a few exceptions. The specific design of the conditions and the deadline for remedying the shortcomings depend on their severity. Actual progress in remedying the shortcomings is reviewed by the Bundesbank in on-site follow-up examinations.

To date, some 30 rating methods have been denied approval for IRBA use after initial suitability examinations. Frequently, these systems were not fully integrated into the internal control framework, or the requirements for parameter estimation were not fulfilled.

Securitisations

Approaches for IRBA securitisation exposures

There are three approaches to the treatment of securitisations in the IRBA, which follow a clear hierarchy. Use of the external Ratings-Based Approach (RBA) is mandatory for all externally rated exposures or for those for which a rating can be inferred from external ratings. For an unrated securitisation exposure, either a Supervisory Formula Approach (SFA) or – for exposures extended to ABCP programmes – an Internal Assessment Approach (IAA) subject to approval by supervisors can be used.

Types of securitised assets

Currently 11 German institutions have obtained IAA approval. Institutions are not restricted to using just one Internal Assessment Approach but instead can, depending on the

type of securitised asset, use a variety of sub-approaches, each of which requires separate approval. A large portion of German institutions' IAA business is made up of the securitisation of trade receivables, car loans and lease receivables. However, some exotic types of claims, such as claims against insurance corporations or claims from court decisions, are also securitised; their risk structure and riskiness mean that it takes a lot of time and effort to develop transparent and adequate risk models for these types of claim.

Implementation of the IAA at institutions

The IAA first created the option of a portfolio-based credit risk measurement using internal models for these types of transaction. Options for individualising the model are tightly constrained since each internal assessment approach has to be based on a published method used by a recognised external credit assessment institution (ECAI). In principle, this enables a high degree of transparency and a focus on the market standards created by ECAIs. However, it has regularly proved to be very difficult to show that such models are based on published methods developed by a recognised ECAI. ECAIs have, in the past, been extremely reluctant to publish concrete assumptions for some exposure classes. However, the IAA suitability examinations have shown that banks were nevertheless able to develop adequate risk measurement approaches for various types of exposure. Deficiencies in individual IAA models related to unclear definitions of their scope of application or an absence of defining criteria for this; also, guarantees were not always recognised adequately in risk assessments. The suitability examinations placed particular emphasis on transparency and on independent monitoring of key classification parameters.

Current developments

The securitisation market, which had been steadily growing over the past few years, was recently buffeted by the financial market crisis; this involved a visible decline in the volume of securitisations. At the same time, considerable deficiencies were revealed, especially in managing the risks involved in complex securitisation structures. The risks of these products were seriously underestimated by all market agents, partly because they overrelied on the ECAIs' assessments when establishing their own risk assessments. In addition, many of these products are exceedingly opaque, making it considerably more difficult to assess risk properly. Based on these considerations, the Basel Committee has adapted the rules on capital requirements for securitisations in order to ensure that capital charges for these risk exposures are more commensurate with the risks involved (see explanatory notes on page 66). For the future, it will therefore be important to supplement the Pillar 1 methods of measuring risk for securitisations with stress tests and other appropriate analyses of the securitised portfolios so as to employ a broader spectrum of risk measurement procedures.

In principle, securitisations continue to represent a useful refinancing and risk management instrument. However, because these instruments often have a complex structure, institutions must place much greater emphasis on analysing potential risks than previously. In the past, such studies have sometimes been neglected.

Regulatory changes

Securitisation rules

As a consequence of lessons learned from the current financial market crisis, the Basel Committee is planning to raise the risk weights for so-called resecuritisations. These are securitisation transactions that are themselves based on securitisation transactions, including liquidity lines to ABCP programmes that include securitisation exposures. To prevent capital arbitrage between the banking book and the trading book, capital requirements for securitisation exposures in the trading book are to be brought into line with those for the banking book. In addition, changes to the conversion factors for eligible liquidity facilities – to a uniform 50% under the Credit Risk Standardised Approach (CRSA) – and the elimination of preferential conversion factors for market disruption facilities are intended. As a further consequence, operational standards of what constitutes a careful credit check are being formulated.

The EU is also planning changes to the securitisation rules as part of the forthcoming directive amendment. Conversion factors for liquidity facilities will be amended in line with the Basel rules. In addition, institutions (as investors) are, in future, to be allowed to assume securitisation risks only if originators confirm that they will retain a percentage of the risk. The quantitative criterion will be supplemented by qualitative requirements, with penalties imposed if these are not met.

Additional capital charges for market price risk in the trading book (incremental risk charge or IRC)

Over the past few years, the significance of complex and illiquid credit products in the trading book has been growing steadily. This is because trading volumes in these products have risen and the capital charges in the trading book are more favourable than those in the banking book. In light of this, the option of electing not to model event and default risks in the trading book explicitly no longer appears justified. Consequently, *inter alia* capital charges for specific price risk were adjusted by requiring that additional capital be held for the default risk (incremental default risk charge, IDRC) on existing exposures. The appropriate rules were published in July 2005 and incorporated into the Basel framework.

However, the losses incurred recently cannot necessarily be attributed to defaults, but may be due, for example, to credit migration. Consequently, focusing on default risk alone only partially addresses existing problems. The Basel Committee therefore agreed to extend the incremental capital charge on migration risks using conservative parameter assumptions. For the specific price risk of securitisations, the same risk weights must be used as in the banking book. In addition, several modifications to the Market Risk Amendment are being made; in particular, stress periods must be used when determining capital requirements.

The relevant consultation papers were scheduled for publication in January 2009. The finalised Basel framework is currently expected for mid-2009.

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Advanced Measurement Approaches for operational risk

Use of AMAs in Germany

Institutions in Germany can use any of three procedures to determine the capital charge for operational risk: the Basic Indicator Approach (BIA), the Standardised Approach (TSA) or the Alternative Standardised Approach (ASA), and Advanced Measurement Approaches (AMAs). In the default BIA, the capital charge is calculated based on an institution's weighted average gross income over the past three years as an indicator of operational risk. In the TSA/ASA, this indicator is differentiated by the institution's business lines, and qualitative risk management requirements are added. Only in the AMA is the capital charge determined using a tailor-made internal model. The use of the AMA requires approval from BaFin.

Using the approaches

Currently, ten institutions and groups of institutions, including four large German banks and four subsidiaries of foreign institutions, have received approval to use the AMA. Just under 70 institutions use the TSA to calculate the capital charge for operational risk. The remaining 2,000 or so institutions resort to the BIA for their prudential reports. AMA institutions cover 46% of the balance sheet total of all banks, the TSA accounts for 24% and the BIA for 30%.

Partial use rare

The Solvency Regulation permits institutions to use the AMA to calculate the capital charge for only part of the institution upon adopting the AMA (also known as "partial use"). However, the majority of AMA institutions are already making full institution-wide use of this approach.

At internationally active big banks, AMA capital charges account for between 4% and 13% of the overall capital charge. For the other institutions, this percentage is much higher, reaching as much as 70%. This can be explained by the specific business structure of these institutions; as they are specialised in, for example, securities settlement, they have little credit risk and increased operational risk.

Overview of approved Advanced Measurement Approaches

Use of internal and external data

When it comes to the concrete implementation of AMAs, data, modelling and output and control need to be viewed as key levels (see explanatory notes on page 68). For the data level, internal loss data are a *sine qua non* for modelling operational risk. For that reason, they are a key element at the data input level. The internal operational loss databases maintained by internationally active large banks encompass anywhere from around 1,000 to somewhere in the tens of thousands of data points, while those of some other institutions have just a few hundred data points. Generally, however, institutions tend to define a minimum threshold for recording loss events which is normally somewhere between €5,000 and €10,000.

The Solvency Regulation prescribes the use of relevant external data for modelling; these external loss data are generally vetted by institutions. Some institutions use only those

AMA design

Advanced Measurement Approaches (AMA) for operational risk generally comprise three levels: data input, statistical model, and output and control.

Four factors are used as data input: internal loss data, external data, scenario analyses and business environment and internal control factors. Internal loss data reflect the institution's historic operational losses. They must be differentiated by loss event category (eg internal and external fraud, damage to physical assets, system failure) and business line. External data provided by other institutions, which might, for example, be bought or acquired in an exchange within a data consortium, supplement historic data, particularly by adding rare, extreme losses. Loss scenarios created by experts represent potential future risks. The business environment and internal control system represent the bank's current risk profile on a stand-alone basis and relative to other institutions.

These four elements must be properly combined with the aid of a statistical model. In general, distribution functions are used to determine the likelihood and amount of a loss. This yields the Value at Risk (VaR) measure. VaR is generally initially calculated for internally defined business lines and loss event categories and later aggregated to form a VaR figure for the entire institution. The institution itself can choose the granularity of this internal model. As with credit risk, a confidence level of 99.9% over a one-year holding period is targeted when determining regulatory VaR. VaR is also used as the capital charge for operational risk; however, insurance payments up to a total of 20% of the capital charge as well as expected losses may be subtracted provided they are adequately recognised.

The capital charge must be incorporated into the operational risk management framework. In particular, the capital charge should be allocated to internal business lines. Frequently, an additional VaR is used at another, generally higher confidence level for economic capital management. Moreover, the use of the AMA is also conditional on other qualitative requirements, such as an independent management unit for operational risks, adequate reporting and internal auditing.

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losses that have occurred in business lines that they also have at their banks. Other banks, for their part, examine external data individually in terms of their relevance to them. In individual cases, only around half of the available external data points are used in the model.

Differences in number of scenarios in the model and their influence

Moreover, scenarios developed by experts enter into the procedures at the data level. The weight of the scenarios used in the model ranges from less than 5% to 50%. As a logical consequence, the number of scenarios relevant for the model varies equally widely, ranging from seven to well in excess of 200.

Use of business environment and internal control factors likewise heterogeneous

Finally, business environment and internal control factors represent a fourth input element at the data level, which institutions use in a variety of ways. Although risk indicators, such as the availability of staff, play a key role, they are often supplemented by expert self-assessments of the risk situation which are evaluated using scorecards or comparable systems. The impact of this element on the AMA capital charge ranges between 5% and 20% for all institutions.

LDA very widespread in Germany

Institutions tend to use in-house models. In Germany, the Loss Distribution Approach (LDA) has established itself as the market standard. The use of an LDA, however, requires a large quantity of internal and external loss data. The LDA is therefore particularly popular with internationally active big banks. Other institutions tend to make greater use of expert opinions in the form of self-assessments and scenario analyses to model operational risk. An exclusively scenario-based approach, such as is often employed in Japan, for instance, is currently not in use in Germany.

Statistical models use a large number of distributions

Alongside institutions that use an LDA to calculate operational loss frequencies and amounts, institutions that use hybrid approaches also employ distribution functions to calculate the capital charge. In order to determine the probability of an operational loss occurring (loss frequency), all banks use a Poisson distribution, sometimes in combination with additional distributions. When modelling loss amounts, the picture is somewhat more mixed: nearly all institutions test several different distribution assumptions and, following statistical analyses, choose the assumption that best fits the data. Two institutions use an empirical distribution of internal loss data alongside the parametric distributions.

Sizeable differences in model granularity

Pursuant to the Solvency Regulation, institutions may model operational risk on internally defined business lines and event categories without using the supervisory matrix of eight business lines and seven event categories. All institutions have chosen this option, as the quantity of internal loss data makes estimating distributions a relatively difficult matter in some matrix fields; not all 56 matrix fields are used. Some institutions model functional relationships between the matrix fields in the model when determining the capital charge, thereby making use of the option of deviating from the Solvency Regulation provision requiring that the capital charges of the individual matrix fields be added up. The combined

probability distribution of the aggregated matrix fields is mostly modelled using a Copula approach.

Validation remains difficult

Validating the data elements and the model continues to present a particular challenge. The small size of the pool of data makes it more difficult to statistically validate operational risk models than, for example, market risk models. All institutions thus use not only statistical analyses and stress tests but also qualitative methods and expert knowledge for validation.

Organisational integration

In operational risk control, all AMA institutions have set up a central unit for managing operational risk. This unit, together with the board of directors, establishes a framework that clearly assigns responsibilities for modelling, managing and controlling operational risk. The subsidiaries of foreign institutions use the parameters set by the parent institutions and either adapt these frameworks or integrate them into their own guidelines fully.

Insurance and EL deducted in some cases

Under certain conditions, institutions can deduct insurance and other risk transfer mechanisms from the AMA capital charge, thereby reducing capital requirements. Six institutions currently use insurance in their AMAs. This reduces their AMA capital charges by between 0.4% and 20%. Moreover, expected losses (EL) from operational events can be deducted from the capital charge provided their adequate recognition in business practice can be demonstrated. Six institutions deduct EL, reducing their AMA capital charges by 2% to 10%.

Allocation used at national and European level

For control purposes, the capital charge, which is generally first calculated for the entire institution, must be allocated to the relevant internal business lines or legal entities. Unlike the Basel Framework, which expressly permits allocation to determine capital charges only in the case of non-significant foreign subsidiaries, European law permits allocation in principle. However, the quality of the allocation mechanism used is a key factor that is looked at by both home and host supervisors in the approval process.

Banks mainly still use simple allocation keys such as gross income or headcount. Only very few institutions already use a combination of such factors or calculate the allocation key in a risk-sensitive manner during modelling, for instance, using specifically defined risk variables. Over time, institutions are expected to move to risk-sensitive allocation keys.

Impact on regulatory capital requirements

Calibrating Basel II capital requirements on the basis of Quantitative Impact Studies

Pillar 1 of Basel II was calibrated based on previous Quantitative Impact Studies (QIS) with the aim of maintaining the level of capital requirements in the banking sector as a whole. Particular emphasis was placed on the IRB Approaches. In order to give credit institutions an incentive to introduce more risk-sensitive procedures for measuring their credit risk, the new capital requirements were calibrated such that an IRB Approach will generally yield lower capital requirements than the Credit Risk Standardised Approach.

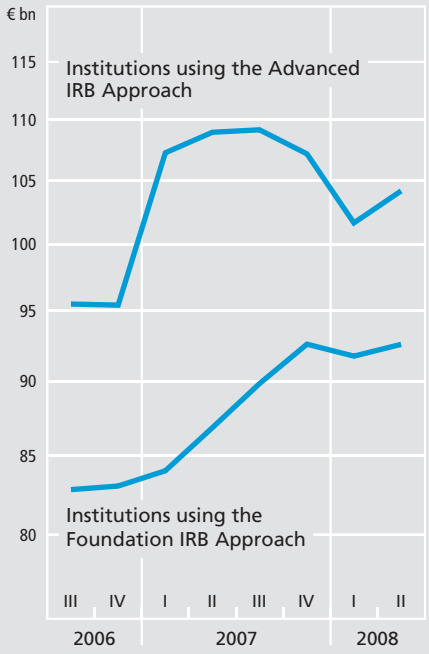
Capital relief

On the basis of banks' capital reports, the Bundesbank has analysed credit institutions' own funds requirements under the Solvency Regulation and under Principle I. A direct comparison of own funds requirements under the new and the old regimes is exceedingly difficult, however, because both normal business developments and the financial market crisis have led to considerable changes in banks' portfolio structures. If IRBA banks' last capital reports before approval and their reports after approval are compared and an attempt made to adjust the reported values for effects that are not attributable to the changed risk weights in order to gain a first estimate of these effects, many institutions can be seen to have lower capital requirements. The capital relief is currently limited by the "floor" provisions. These mandate that, in the first three years after introduction of the IRBA, capital held by banks to cover counterparty risk is not permitted to fall below the thresholds of 95% (2007), 90% (2008) and 80% (2009) of the comparable Principle I requirements.

The new Basel capital requirements were calibrated under the premise that capital requirements for the entire banking system would not change. In addition, regulatory capital relief was intended to set incentives for using advanced approaches. Two working groups, one at Basel and one at European level, are currently devoting intensive study to the question of whether these calibration objectives have been achieved in practice, with initial results expected later this year. In the light of these results and the conclusions that can be drawn from the current financial market crisis, it will remain to be decided next year what adjustment measures have to be taken. Options include maintaining the so-called Principle I floor or redefining the supervisory scaling factor (currently 1.06) in the rules for calculating capital requirements.

Aggregate own funds of German IRBA banks

Quarterly, log scale



Deutsche Bundesbank

Institutions' own funds constant

Trends in own funds requirements are of interest, but so are trends in the level of own funds held by institutions. The above chart shows the trend in the own funds held by banks using the Foundation IRB Approach and those using the Advanced IRB Approach over the period from September 2006 to June 2008. Total available own funds have remained largely constant since the entry into force of the Solvency Regulation at the end of 2006.

Outlook: further development of the advanced approaches under the Basel II framework

Follow-up examinations and ...

All in all, many institutions have qualified to use the more advanced Pillar 1 approaches to determine capital charges for credit risk and operational risk. First-time IRBA suitability examinations are currently still in progress at eight institutions. Moreover, the institutions that have already obtained approval are transferring additional rating systems to the IRBA during the implementation phase. At the same time, follow-up examinations to determine the progress made in fulfilling the conditions listed in the approval notice are being conducted at several banks.

... model refinements

Many institutions that have already obtained approval have begun to refine their systems. In response to this trend, BaFin and the Bundesbank published the "Guidelines for changes to IRBA systems" (*Merkblatt zur Änderung von IRBA-Systemen*, available only in German) in December 2007. German supervisors are thereby seeking to structure the dialogue between IRBA banks and supervisors. While the aim is to allow institutions to refine and improve their IRBA systems quickly, supervisors have an interest in ensuring that the minimum requirements set forth in the Solvency Regulation continue to be fulfilled after institutions have refined their models. The path embarked upon with the notice has so far proved feasible.

Considerable evolution among AMA banks

In the past few years, German institutions have made major progress in implementing the AMA. There are still deficits in implementing the requirements in terms of validation, business environment and internal control factors and capital allocation. This will become a focal point of future supervisory activity. For the AMA, too, supervisors will publish guidelines on how to deal with model changes; consultation with the banking industry is currently in progress in the expert panel on operational risk.

Modifying the rules for the trading book

In the case of the market risk models, broad-brush rules for the trading book had to be adapted to current trends.

Mounting importance of credit products in the trading book

The composition of credit institutions' trading books has undergone sustained change since the "Market Risk Amendment" entered into force. Above all, the significance of complex, relatively illiquid credit products in the trading book has grown, with the result that the across-the-board capital add-ons that used to be possible no longer cover event and default risk. In addition, the turmoil in international credit markets has illustrated how complex credit risks in institutions' trading books can lead to heavy losses.

Motivated by these two trends, the Basel Committee has now wrapped up its work on rules governing an additional capital requirement to cover market price risk in the trading book. These new rules are scheduled to enter into force in 2010; institutions have until then to develop and implement new models that cover event and default risk. This represents a journey into uncharted waters for the industry and supervisors alike. Supervisors are gearing up for a sharp increase in 2009 and 2010 in the need for on-site examinations at

those institutions that wish to use internal models to calculate the regulatory capital charge for specific price risk in the trading book.

Gap between internal methods and supervisory methods diminishing

The new advanced approaches mean the gap between banks' internal methods and supervisory methods has diminished. Overall, supervisors have successfully designed the rules for capital backing such that they can be applied by big and small institutions alike. Investment in risk management is thus already showing a medium-term payoff thanks to the systematisation of risk measurement and risk assessment.

Basel II and the financial market crisis

Even in the light of the current financial market crisis, there is no reason to abandon the systematic approach of the Basel Framework. As full application of the Basel II rules did not become mandatory until after the crisis had erupted, the new capital framework has just now taken full effect. However, some rules have to be revised in the light of recent events. Increased consideration should be given particularly to methods which link micro findings to macro findings to deliver an overall view of the stability of the financial system. To this end, the Bundesbank has proposed the introduction of an international credit register, which could improve knowledge of the distribution of a considerable portion of credit risk for institutions and supervisory authorities alike.