

AMA Implementation in Germany: Results of BaFin's and Bundesbank's Industry Survey

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INTRODUCTION

This chapter gives an overview of the implementation of advanced measurement approaches (AMA) in Germany from the supervisors' point of view. It summarises and in some aspects comments on the pictures German supervisors have recently drawn from the AMA implementation efforts they have seen from their banks so far.

Regarding the approval of the AMA, the Federal Financial Supervisory Authority (BaFin) and the Deutsche Bundesbank issued an application package and a press release in October 2005, announcing that applications for the approval of the AMA are possible now. This application package will soon also be available in English on BaFin's and Bundesbank's Web sites (BaFin (<http://www.bafin.de>) and Bundesbank (<http://www.bundesbank.de>). Banks and other interested practitioners should carefully read those documents as well as the draft new solvency ordinance (proposed implementation of the EU guidelines into German law), which will be enacted in 2006.

To get a better idea of how German supervisors will implement the operational risk (OpRisk) part of the new European directive and Basel II before the enactment of the solvency ordinance, it is

*The authors express their personal views. This chapter does not contain any official statement neither from BaFin nor from Deutsche Bundesbank.

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helpful to read the recommendations of the Fachgremium OpRisk (Industry Working Group on Operational Risk), which also have been published on BaFin's and Bundesbank's Web sites, albeit only in German. In this committee, experts from BaFin and Bundesbank, together with experts from German banks and industry associations, have agreed on recommendations on how to implement some crucial requirements in the area of operational risk.

Besides working on national rulemaking, BaFin and Bundesbank, naturally, also show interest in how German banks implement the new requirements on operational risk. In August 2004, German supervisors asked the banks under their supervision what approaches they plan to use for the calculation of OpRisk capital requirements. According to the results of that survey, 58 credit institutions in Germany wanted to introduce an AMA in 2008 and 134 a standardised approach for operational risk in 2007 (see also BaFin's, 2004, p 96). Especially, the high number of potential AMA candidates was surprising and raised some concerns about the application process. The high number of potential AMA candidates reflects the fact that, in Germany, smaller banks regard the implementation of an AMA at least in the medium term as realistic. Still, after further discussions with the banks, German supervisors believe that the actual number of applications for AMA use in 2008 will be far lower than 58.

To collect information on the status of implementation and related work in progress as of year end 2004, German supervisors have developed a structured questionnaire for an industry survey. This questionnaire with 59 short questions on implementation issues and references to the Basel framework text is available on BaFin's and Bundesbank's Web sites in a German version. Banks were asked to briefly answer the questions in the questionnaire and to provide additional information and documentation, for example, their OpRisk framework, their roll-out plans concerning operational risk and details concerning their OpRisk model. This industry survey was based on the requirements from the new Basle Accord, not the European directive, because of some uncertainties with the details of the European directive at that time. Altogether, 15 banks (from all three pillars of the German banking system) have participated in the survey on a voluntary basis. The results of the survey have been put together by a supervisory working group with

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members from BaFin and Bundesbank, and are based on the written answers of the above-mentioned 15 banks as of year end 2004. To keep the survey consistent, additional information from conversations with individual banks in 2005 has been added only for the purpose of clarification, not for the purpose of updating the results.

The results of the industry survey itself (in German) can be found on the Web sites of BaFin and Bundesbank. The following chapters follow in principle and with some abridgement and additional comments the structure and content of the industry survey. It should be noted again that views expressed in this chapter represent personal views of the authors and not necessarily those of BaFin and Bundesbank.

TOPIC OVERVIEW AND STATE OF IMPLEMENTATION

Banks may receive supervisory approval to use internally developed AMA to calculate their regulatory capital requirements for operational risk if these approaches are used for managing operational risks within the bank and if regulatory requirements are fulfilled. These requirements refer to the scope of application of an AMA, including partial use in combination with another approach (standardised or basic indicator approach) as well as qualitative and quantitative requirements. The latter include methods and procedures for the identification, measurement, monitoring, reporting and management of operational risk and how these are embedded in the organisational structure. Special requirements exist regarding the four elements (internal data, external data, scenario analysis, and business-environment and internal-control factors) that have to be included in the AMA. Altogether the AMA must adequately cover the operational risk of the individual bank.

The state of AMA implementation varies among the different banks that have participated in the survey. Especially large private banks, but also the Landesbanken, have made significant progress in developing methods and implementing the AMA.

The basic concepts for managing operational risk are largely outlined and already implemented in most banks. Only few banks are just starting their implementation efforts. However, there is still need for further development concerning the modelling of operational risk, especially regarding model validation and taking into account business environment and internal control factors.

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Implementation projects for the latter are sometimes less prioritised or stopped because of lower business relevance. For some areas of the regulatory framework, such as approval of the use of correlation and insurance within the model or the use of business environment and internal control factors, the industry is awaiting supervisory regulation to be finalised or additional regulatory guidance, for example, additional explanatory notes, to be published. BaFin and Bundesbank are working within the Expert Group on Operational Risk (Fachgremium OpRisk) together with industry experts on solving these issues.

AMA – SCOPE OF APPLICATION

With supervisory approval, banks can use an AMA for calculating the regulatory capital charge for operational risk on an individual and a consolidated basis. A bank will be permitted to use an AMA for some parts of its operations and the basic indicator approach or standardised approach for the remaining parts (“partial use”) if certain conditions are met. It is necessary that already, with the application for AMA, a significant part of the operational risk be included in the model and that, within an adequate time period after approval, all major activities will be included in the AMA.

If a bank applies for the AMA on a consolidated basis, the group-wide application also includes the use of the AMA by individual subsidiaries on a solo level. The capital requirements on the solo level can be calculated using an allocation method or an individual AMA. Especially for significant subsidiaries outside of the European Union, the latter might be necessary, subject to requirements of the host supervisor. A bank that uses the AMA on a group-wide level may also use the standardised or basic indicator approach for its subsidiaries on a solo level. In Germany banks will not have to apply for the use of those simpler approaches but will have to notify BaFin in advance about the use of the standardised approach. More details concerning the use of the standardised approach can be found on the Web sites of BaFin and Bundesbank.

Partial use

Almost half of the banks surveyed plan a partial use; only a few have not yet decided. The remaining part state that they will not use the partial use.

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According to a recommendation of the German Industry Working Group on Operational Risk, the inclusion of a significant part of the OpRisk activities should be verified using the relevant indicator from the Standardised and Basic Indicator Approach (gross income) or another suitable indicator. According to this recommendation, German supervisors should regard 50% of the chosen indicator as a rough benchmark to decide whether a significant part of all OpRisk activities is covered by the AMA.

BaFin and Bundesbank give the impression in their survey that banks have already developed their own measures to determine significance. These include measures based on (administration) costs, headcount, processes, internal capital figures and gross income as well as combinations of these measures.

Roll-out plan

If a bank applies for the AMA starting in 2008, German supervisors will allow it to calculate the regulatory capital requirement until 2008 using the BIA, if an adequate risk management is established. Based on the requirements in the Basel framework, a permanent partial use is not allowed under normal circumstances. The bank must provide its supervisor with a plan specifying a timetable on how to roll out the AMA across all but an immaterial part of its operations. Based on the above-mentioned working group recommendation, an AMA bank must show in their implementation plan that after five years at least roughly 80% and after ten years at least roughly 95% of their business activities and all major areas will be included in the AMA. Within the partial-use period the bank must ensure that an adequate risk management is available also for those parts not included in the AMA. If all but an immaterial part is included in the AMA, German supervisors will probably allow AMA banks to calculate the capital charge for the remaining immaterial part by scaling up the model results and if necessary using add-ons.

Most of the banks have not yet given detailed information regarding their implementation time schedule. Some banks wait for more regulatory guidance. Most banks state that they will implement the standardised approach as of 1 January 2007 and will move to the AMA afterwards, but a final decision for the implementation of the AMA starting 2008 or later has not yet been made

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by all banks. Few banks mention how they define the immaterial parts, which will not be included in their AMA.

For those parts not covered by the AMA, most banks want to apply the standardised approach. Some consider using a combination with the basic indicator approach in exceptional cases.

Definition of areas to be included in the AMA

For the partial use, banks have to define areas for which an AMA or a simpler approach will be used. These areas can be determined based on business line, legal entity, geographical aspect or suitable internal delimitation.

The question regarding the definition of areas included in the AMA was not relevant for seven banks answering the questionnaire, since they do not intend a partial use. The other banks mostly indicate the use of a delimitation based on internal business lines; only one bank wants to implement a partial use based on legal entities.

Mapping of gross income

To calculate regulatory capital requirements with a simpler approach within the partial use, it is necessary to determine the relevant indicator. On a consolidated basis this might be problematic if (non-banking) subsidiaries are taken into account that do not file a financial statement in line with the bank accounts directive. Moreover, the relevant indicator on a consolidated basis is often less than the sum of the relevant indicators of the subsidiaries due to consolidation effects. In principle, banks use the consolidated financial statement to determine the relevant indicator and allocate this indicator to the business lines afterwards.

Banks mostly state that they use IAS (International Accounting Standards) segment accounting to derive the indicator for the corresponding business line. Two banks want to allocate the relevant indicator derived from a consolidated basis to the different business lines using certain parameters (eg, legal entities' gross income, total assets, costs, headcount).

Significant subsidiaries with an AMA on a standalone basis

Based on the Basel framework, the host supervisor may require significant subsidiaries to calculate regulatory capital requirements on a standalone basis. The rules within the European Union are less strict. The directive suggests a joint group-wide approval process.

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Under normal circumstances within this approval process, a joint decision of home and host supervisors about the feasibility of the AMA for calculating regulatory capital charges on a consolidated and on an individual basis should be achieved. This includes methods for the allocation of capital determined on a consolidated basis to the individual subsidiaries.

Only a few banks explicitly mention that they will calculate a standalone AMA for individual subsidiaries. Some banks expect large problems with this approach because of the limited availability of data. Others think there is no benefit for calculating capital requirements for individual subsidiaries, because the management of operational risk is done on a business-line not a legal-entity basis.

Allocation mechanism

In principle, supervisors prefer risk-sensitive methods for allocating capital, but it might be interpreted from the CEBS's (Committee of European Banking Supervisors) consultation paper that simpler approaches could under certain circumstances be used as well (see CEBS, 2005, p 464) if an adequate allocation of capital for individual subsidiaries can be achieved. As there is no standard for such an allocation method in the directive or in CEBS's guidelines so far, the validity of an allocation can be verified only within the approval process.

The allocation of regulatory capital is relevant only for banks that operate on a consolidated basis (groups). Two groups already plan to use a risk measure for allocating capital. Others want to use the relevant indicator (gross income), headcount or costs.

OPRISK FRAMEWORK

The OpRisk framework contains organisational guidance that includes rules for the identification, assessment, monitoring (including reporting) and management (control/mitigation) of operational risk. Strategic commitments and a bank-specific definition of operational risk, which can be extended beyond the regulatory definition, are part of this as well.

OpRisk strategy

The new Basel Accord demands the installation of a framework, where banks determine their operational risk appetite, the

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organisational guidance and the essential features of the risk-management process (see Basel Committee, 2004, para 737). Directive 2000/12 EC includes such requirements in Appendix V. Not all banks taking part in the survey have already developed a risk strategy in line with the above-mentioned requirements.

Operational risk is immanent in the banking business. It is therefore elementary to determine which risks should be taken by the bank and which should be mitigated using management action, should be avoided or transferred to a third party. These decisions should be used in the internal management. To do so, methods for the identification, assessment, monitoring (including reporting) and management (control/mitigation) of operational risk have to be developed and put into practice. Moreover, the parties responsible for the above have to be determined.

Determination of risk appetite

From the banks included in this survey only a few made explicit statements concerning their risk appetite, but some give a broad indication. Some banks have not yet determined a risk appetite for operational risk. In some cases this is envisaged in line with the determination of an overall risk appetite. The answers of half of the banks indicate a risk-averse position regarding operational risk. These banks state their willingness to largely avoid large operational risks or to use mitigation techniques. Some banks say they want to judge their operational risk looking at their risk/return situation.

There are no statements regarding limitation (it should be noted that the idea of limitation for operational risk can be interpreted in a rather broad way) of operational risk from a third of the banks. This was partly justified by stating that an effective limitation of operational risk in a systematic way is not possible. Nevertheless, banks check limit utilisation and use this indicator in their management process. Despite these systematic problems, approximately half of the banks strive to implement a limitation for operational risk that is linked to the overall risk capacity of the bank.

Transfer of operational risk to third parties

The majority of the banks pursue concepts that allow transferring parts of the operational risk to third parties. More than half of the

banks indicate that they use insurance to transfer risk. Some banks state that insurance is of significant importance, especially for low-frequency, high-severity areas of operational risk.

Further methods to transfer risk mentioned by banks are the securitisation of risks (catastrophe bonds) and, with some restrictions, outsourcing. From a regulatory standpoint, the use of other risk mitigants is still problematic, although a last-minute change in the text of the directive now allows this in principle within the European Union. The consequences of outsourcing certain areas to third parties for the OpRisk exposure of a bank must be analysed on a case-by-case basis and included in the model in a risk-sensitive manner.

The definition of operational risk

The measurement system of a bank must comprise at least the regulatory definition of operational risk. This definition includes legal risk but does not include reputational and strategic risk. For internal use, extensions to this regulatory definition are permitted.

Seven banks use the Basel definition for operational risk for internal purposes as well. Six banks use a somewhat tighter wording in their definition of operational risk as they explicitly use the word "employee" instead of the more general category "people". Losses caused by external people are sometimes explicitly defined as external events, which results in an overall consistency with the regulatory definition.

Most banks include legal risk explicitly in the definition of operational risk. Sometimes, individual risks (such as legal risk, crime risk) are excluded from the internal definition. If such risks included in the regulatory definition are excluded in the bank's definition, this should not be acceptable for regulatory purposes.

Few banks enlarged their internal definition by including reputational risk. They included qualitative judgements of related potential effects in their OpRisk database but they do not include them in the modelling.

OPRISK CONTROL AND MANAGEMENT FUNCTION

The OpRisk control and management function (ORCMF) develops and implements as well as executes methods for identification, assessment, monitoring (including reporting) and management

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(control/mitigation) of operational risk. ORCMF, as well as the business divisions and internal audit, must have enough resources available. Conflicts of interest between ORCMF and the business must be avoided.

Regarding the above-mentioned topic, the "Sound Practices for the Management and Supervision of Operational Risk" are often used as a basis for the implementation. All in all, the implementation is well advanced in this area.

Tasks and responsibilities in the OpRisk control and management function

The implementation of the organisational structure for OpRisk control and management is largely completed in most banks. All concepts include centralised and decentralised functions for the management and control of operational risk. The centralised functions must be sufficiently independent from the business to avoid conflicts of interest. Only a few banks have not yet completed the underlying concepts.

Nearly all banks divide their OpRisk control and management function mainly into the steps identification, assessment, monitoring (including reporting) and management (control/mitigation).

Senior management responsibility

All banks know that the ultimate responsibility for operational risk remains with senior management. Banks mention the following topics as the most important tasks of senior management:

- adoption of a risk strategy;
- establishing an OpRisk culture;
- approval of an OpRisk framework (eg, policy, guideline, handbook) and changes to the framework if necessary;
- establishing the necessary organisational structure;
- budgeting process;
- determining limits for operational risk;
- decisions if OpRisk topics are escalated (for instance, losses, risk-assessment results) as well as decisions necessary for steering the business; and
- responsibility for the overall risk capacity of the bank.

Only few banks state that the centralised OpRisk function directly reports to its responsible board member. In one rather small bank the centralised OpRisk function is assigned to the head of controlling, who directly reports to the board member responsible for controlling.

Tasks and organisational structure of the OpRisk control and management function

All banks delegate OpRisk control and management tasks to a centralised function and decentralise some responsibilities to the business lines. In some cases an additional OpRisk committee takes on more general OpRisk management tasks.

According to the survey the major tasks of the centralised OpRisk function are:

- development of an OpRisk strategy;
- definition, updating and control of implementation regarding the OpRisk framework;
- developing guidelines and concepts that are related to the OpRisk framework;
- developing (including validation and optimisation) of qualitative and quantitative methods and tools to identify, assess, analyse, report, control and manage operational risk;
- systematic OpRisk control within the bank;
- leading the yearly qualitative risk assessment (such as self-assessment);
- consolidation of all relevant risk information for the OpRisk reporting;
- escalation and control of escalation done by other functions regarding important OpRisk facts as well as making suggestions for possible (re-)action to the board and if available to the OpRisk committee;
- calculation of the OpRisk capital and the regulatory capital requirements (including allocation); and
- centralised point of contact for questions regarding operational risk, to coordinate activities and to support the business.

Additionally, banks list among the tasks a backtesting and benchmarking of the model results as well as the contact to supervisory bodies to explain the so-called *use test* and to show that the regulatory requirements can be fulfilled.

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Partly, the above-mentioned tasks are performed by decentralised functions that are assigned to the centralised OpRisk function.

According to the survey, senior management of the relevant organisational units, business divisions and corporate centres are in principle responsible for the operational risk in their area as well as for proactive risk management. Moreover they are responsible for ensuring that the delegated tasks of the OpRisk management and control process are adequately performed in their area (eg, reporting of loss events).

The banks taking part in the survey assign the following tasks to senior management:

- proactive risk management in their respective area of responsibility, which includes decisions about taking, avoiding and transferring risks. Furthermore, initiation, escalation and implementation of decisions regarding risk mitigation;
- making sure that the OpRisk framework as well as rules, standards and methods of the centralised OpRisk function are met;
- making sure that the relating requirements regarding the organisational structure are met;
- development of rules, processes and methods for their area that are in line with the OpRisk framework;
- playing their part in the risk assessment;
- monitoring developments in Operational risk relating to their area of responsibility;
- creation and support for risk awareness and risk culture; and
- providing all the relevant OpRisk data, especially for the centralised OpRisk function.

Besides the centralised and decentralised functions, about half of the banks have OpRisk committees in place with members from different areas of the bank to support senior management. Sometimes there are different committees for the different regional parts of the group. Some banks have committees for other risk areas in addition to the OpRisk committee, which all report to an overall risk committee with members from senior management.

The tasks of the OpRisk committee include:

- definition of a risk strategy;
- monitoring of the implementation;

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- discussion of the overall risk situation;
- decision regarding actions in the escalation procedure;
- improving the quality of risk management;
- supporting the management of risk that is spread to different business lines;
- sometimes developing standards and procedures as well as suggestions on how to solve fundamental OpRisk questions; and
- sometimes presenting suggestions to the risk committee or senior management.

A particular task of internal audit is the independent assessment of the implementation and the functioning of the OpRisk control and management processes. This includes the examination of the processes in the centralised OpRisk function. Only few banks state that an audit of the OpRisk data quality or the OpRisk measurement systems has already taken place.

Sometimes information from internal audit is considered in the scenario analysis and audit reports are used to check the loss data and risk records. From a supervisory point of view, it is necessary to make sure that an independent examination by internal audit for these areas can still be ensured.

Independence of the ORCMF

The ORCMF is usually split between a centralised and a decentralised function. The centralised function is in charge of developing the methods and taking on coordination tasks in risk management, such as the creation of OpRisk reports. This function must be independent from the business lines, which bear the major operational risks. Decentralised OpRisk functions are often embedded in the business-line hierarchy and execute operative tasks within the business line. In these cases it is necessary from a supervisor's point of view to make sure that the guidelines of the centralised OpRisk function are paid attention to.

Staff resources of the ORCMF

Given the available information regarding staff resources, a judgement if the resources are sufficient was not always possible. For some banks the staff resources seem to be rather tight.

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The available data from 13 banks lead to the result that the ratio of headcount of the centralised OpRisk function to headcount of the parent bank lies between 0.03% and 0.38% (mean 0.14%). Data concerning the OpRisk headcount in internal audit and the business lines was often not available. If available, the data were not comparable because headcount was not given in terms of full-time equivalents. Therefore, no additional ratios were calculated. Furthermore, the appropriateness of staff resources must be viewed in relation to the size and complexity of the individual bank and not only in relation to headcount.

Staff working in the centralised OpRisk function mostly have several years of experience in different areas of the banking business, mostly in risk control and management with an economic or scientific/mathematical background.

OpRisk culture and staff awareness

Besides implementation of the framework and related training programmes, most banks surveyed provide additional information regarding operational risk, for instance, by intranet publishing, staff magazines and telephone or email service via the centralised OpRisk function.

Reporting and management information system

Roughly half of the banks use a partly automated link to incorporate OpRisk information in the reporting and management information system (MIS). In all banks the centralised OpRisk function is responsible for processing the risk information for the OpRisk reporting. In most banks the centralised OpRisk function is also responsible for checking the quality of the data that are used in the reports.

The reports are sent mainly to the board, senior management, operational risk or risk committees, as well as senior management of business lines or subsidiaries. Only in some cases does the supervisory board receive these reports regularly. However, this is a necessity for the supervisory board to fulfil its duties properly.

The reporting frequency varies depending on addressee and content between weekly and yearly. A yearly reporting is sufficient only for certain parts of the information. For others, a higher reporting frequency seems necessary. Senior management should

decide about reporting frequency and the basic content of the reports, but this task can also be delegated to an OpRisk committee or the addressees of the reports.

Senior management and people responsible for the different business lines mainly receive complete OpRisk reports quarterly or semi-annually, whereas loss data are submitted on a monthly basis.

The reports mainly contain:

- occurred losses, which are grouped regarding region, organisational units, risk category and date of occurrence;
- reporting regarding course and reason for large losses or losses which occur frequently;
- peer-group comparisons using consortium data;
- OpVAR;
- risk indicators and risk profiles;
- usage of loss limits;
- new developments regarding methods and concepts; and
- management action intended, suggested or already in place.

Only about half of the banks explicitly state that they have an ad hoc reporting for large losses in place. In these reports, information on large losses is given or major changes of the risk situation are noted. In principle, an ad hoc reporting is necessary for an adequate risk management. The supervisory board should receive reports at least semi-annually or annually.

Loss reaction processes

Half of the banks have an ad hoc escalation procedure in place, triggering action at a given loss amount, which ranges between €10,000 and €500,000. Only three banks use more sophisticated loss thresholds. Sometimes the kind of loss reported is defined qualitatively, for example, a requirement to report all fraud losses or all losses that are known to the public.

Eight banks state that it is the responsibility of the business divisions to react to losses. In four banks, the ORCMF is involved in this process. In most banks, the OpRisk function is informed about new processes already in place or suggestions regarding future risk mitigation action. Two banks also give this information to internal audit, which can start further examinations.

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Interfaces between the OpRisk function and other functions

Besides collecting loss data in their own area and playing their part in scenario analysis, some functions adopt more tasks regarding the management of operational risk. These tasks refer mainly to an exchange of available information or an involvement in the development of disaster recovery plans. Interfaces sometimes exist between internal audit and the OpRisk function for the examination of processes as well as for the use of information and experience from internal audit in the OpRisk management. This overlap is acceptable only if the independence of internal audit can be maintained. Further interfaces and the respective delimitation of areas are quite heterogeneous and determined by the individual organisation of the bank. Therefore, a more detailed comparison is not possible.

OPRISK MODELLING

If the regulatory requirements for a measurement system are fulfilled, the model used for internal control may also be used for the determination of regulatory capital. Besides the requirements regarding the input factors, there are also requirements to the measurement system.

Advanced measurement approaches have to adequately incorporate internal and external loss data and scenario analyses, as well as individual business-environment and internal-control factors for capital calculation. Detailed requirements exist for the adequacy of the model, recognition of correlation effects, consideration of expected losses and insurance, and the process of model validation. Key for the approval of the model is the so-called use test, in which the bank must show that it adequately uses the results of the risk-measurement system for internal controls.

Model approach

Six of the participating banks have already created and implemented a concept for modelling. Other banks have done first studies and are now creating concepts or have not yet done significant work in this area at all. Concerning the type of approach, most banks use a loss-distribution-based approach (LDA). Only a few banks plan a scenario-based approach (sbAMA).

For the LDA, mostly internal loss data have been used so far. The importance of external data varies among banks. Several banks do

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not comment on the use of external data. Few banks use expert estimates or scenario analyses to alter the model parameters. Some banks, however, do not possess a significant number of internal losses, especially low-frequency, high-severity losses. Thus, appropriate techniques for complementing internal data with external data in order to compensate for the lack of low-frequency, high-severity events are needed.

Scenario-based approaches use external losses for creating scenarios. Further, internal and external loss data have to be used for a validation of the scenarios.

Most banks do not comment on the type of external data that will be used. External data may be drawn from public sources or bought from external vendors. Some banks are members of a data consortium. The external data used must be relevant to the bank using it. It may thus be necessary to adjust the loss frequency and loss severity distribution of the external loss data. Only a few banks have decided on such a scaling mechanism, which is usually implemented via size variables such as number of employees, gross income and number of transactions.

Few banks already use explicit correlation estimates and insurance within the AMA. Most banks, however, do not comment on this topic in the survey and are still in the planning phase.

Value-at-risk (VAR) is mostly calculated using a Monte Carlo simulation. Sometimes, extreme-value theory is used. A challenge for such a separate modelling is the treatment of the discontinuity when combining the two parts of the distribution.

The data used for modelling are grouped by risk category (event category or risk cause) and business lines in most banks. The categorisation is mostly based on the Basel guidelines. Some banks however use a less granular categorisation, due to poor data availability or deviant internal categories.

Almost all banks use the Poisson or (negative) binomial distribution for estimating the loss frequency. The loss severity is modelled mostly with the lognormal, sometimes with the Pareto or Weibull distribution. Parameters for distributions in scenario-based approaches are mostly guessed by experts. Maximum-likelihood and GMM methods are mostly used as analytical tools.

Qualitative adjustments to the modelling results are made at different levels. Sometimes, the qualitative aspects of the measurement

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system, such as self-assessments, are used in the overall model as a weighting factor. In very few cases, distributions for different data areas are given different factors. The qualitative weighting factors mostly represent a degree of freedom in the model, which was often hard to comprehend on the basis of the banks' documentation and which was mostly justified through qualitative means.

For model validation the banks were still awaiting regulatory guidance, since the number of internal losses is often not sufficient to justify a statistical validation. The parameter estimates and the choice of distribution are usually judged qualitatively. A quantitative validation is sometimes done via a chi-square test. BaFin and Bundesbank have extensively covered the validation issue with the industry in the Industry Working Group on Operational Risk.

Main drivers of operational risk

The primary goal when deriving risk drivers should be to minimise the number of unknown events that might lead to major operational losses. This is done implicitly in most banks through the analysis of internal and external data and scenarios.

Even though not explicitly mentioned, nine of the participating banks understand scenarios of single or combined major loss events as the main drivers of operational risk and incorporate said scenarios into the model. Two banks evaluate the risks for individual business lines through qualitative expert estimates or the backward-looking analysis of historical data and incorporate the results into the model.

The question concerning the main risk drivers seems to have caused some controversy. Half of the banks do not derive main risk drivers with regard to their individual firm. Often, only those risk cells are identified that reflect the largest operational risks according to the model used. Many banks define extreme loss events (sometimes defined by size) as their main risk drivers. A description of the risk content in the sense of a driver or loss event, however, is not given through quantification.

Severe loss events

Severe loss events are defined differently among the banks. Seven banks have not yet explicitly defined severe losses. Four banks use an absolute value (between €25,000 and €500,000) for the definition

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of severe losses. Other banks use relative values that are derived from the VAR or the operating profit. Two of these banks define reputational losses as severe losses, independent of their size.

Seven banks do not treat severe losses separately in the model. In other cases these losses are modelled via the peaks-over-threshold (PoT) method or extreme value theory.

Calculation and consideration of the expected loss

The capital calculated with the AMA must incorporate the unexpected as well as the expected loss. If a part of the expected loss is adequately captured in a bank's business practice, BaFin will allow this part of the expected loss to serve for a reduction of OpRisk capital requirement. For this it is necessary to describe how the size of the expected loss is determined and how it is covered in business practices, such that banks' own funds remain untouched. To determine the expected loss, statistical as well as other objective methods may be used.

Some banks determine the expected loss as the expected value of the loss distribution. According to the current regulatory debate, a statistical calculation based on the loss distribution is allowed in principle, while it is not yet clear which statistical value is to be used as a cap. The Operational Risk subgroup of the Accord Implementation Group (AIGOR) already published further guidelines on this issue (see Basel Committee, 2005) and CEBS will presumably publish further guidelines on this issue soon.

Most banks consider expected losses from operational events in their business practices, or plan to do so. Two banks have decided so far to cover expected losses with capital. Five banks include these losses, sometimes based on their experience, into their pricing calculation, or plan to do so. Another five banks provision for expected losses in their business planning, or plan to do so.

Proving that expected losses are adequately treated in business practice has been very difficult for banks so far. One way to do this might be a crosscheck of occurred losses with the funds provided/pocketed for those losses via pricing.

Correlation assumptions in AMA models

Dependencies between loss events and diversification effects can be considered in the model via correlation assumptions, including

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the aggregation of risk figures for the calculation of the capital figure. However, those assumptions must be sound and well founded.

Almost half of the banks do not give precise statements on how they plan to quantify or consider correlations within the AMA. The other banks model loss events using a frequency and a severity distribution, where data are grouped in the cells of a business line/risk category matrix. None of the banks explicitly mentions that it models dependencies between loss frequencies and loss severities or between loss severities within individual cells.

To aggregate risk estimates, sometimes simple dependency structures (Gaussian copula) are used for the frequency distributions between cells, while the severity distributions are assumed to be independent.

According to the provided documentation, some banks model directly on a top-down basis or use methods similar to a top-down approach, such that no aggregation of risk numbers is required. It remains open as to whether, in these cases, the risk-measurement system is granular enough for an adequate internal management of risks.

Four banks aggregate the risk figures on a cell basis to a VAR for the entire bank. The methods used differ from a simple sum (perfect correlation between cells) to a correlation of zero for some cells in combination with a correlation of one on a higher level (for instance, across certain event types).

BaFin and Bundesbank have discussed correlations intensively within the Industry Working Group on Operational Risk and are confident that CEBS will issue guidance on this issue soon.

Enhancement and expansion of the model

Most banks are currently focusing on the development or completion of missing components and are only partially concerned with refinements or enhancements to the model. Thus, processes towards model expansion do not yet play a significant role.

Overall, the model development team is also responsible for the expansion of the model. Usually this is done within the centralised OpRisk function. The development and enhancement of the model is sometimes done in cooperation with external partners, such as software developers, universities and other banks. Refinements to

the quality of the data are essential for the expansion of a mathematical model. They will then allow one to draw new conclusions with respect to model parameters and assumptions. Some banks refer to expert knowledge from the market and credit risk areas and from internal audit for the enhancement of the OpRisk model.

Validation of the model

The EU directive suggests that supervisors examine the satisfactory operation of the validation processes, whereas Basel II demands the validation via an independent function. Specialised knowledge is required for validating the model, which is sometimes present only in the centralised OpRisk function. Therefore, part of the validation process may temporarily be done by the centralised OpRisk function if internal audit is adequately involved in monitoring the validation process.

Due to the low number of loss data, a validation with statistical means is not possible in all cases. Therefore, quantitative and qualitative methods may be used for validation. A comparison with the capital requirements for simpler approaches is not sufficient to validate the model.

Only a few banks make general remarks on validation within the industry survey. Specific regulatory requirements are not included in the current guidelines and an industry standard on validation has not yet been established. Most banks are still in the development phase of validation.

Some banks envision a check of the model by internal audit. It remains open, however, whether model details (such as parameter estimates) are incorporated or whether only the processes of modelling and risk control are examined. Only a few banks establish a unit for model validation within their organisation that accesses independent resources such as credit risk management within the risk management unit.

Furthermore, some banks contemplate the use of expert estimates or benchmarking for model validation. This may be supported by data consortiums, which possess a larger number of loss data.

Relevance of the four elements within the model

All four elements (internal data, external data, scenario analysis, and business-environment and internal-control factors) must be

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adequately combined within the AMA. How this combination is done and what importance is given to each element is not defined in the regulatory guidelines. Therefore, external data may be used to create scenarios and derive loss distributions from scenario analyses within the AMA. It must be assured, though, that there is no double-counting of risk-mitigating effects within the model.

For eight banks, internal loss data play a dominant or at least an important role in the model. For one-third of the banks, the concepts are already advanced enough to display the increased importance of internal loss data within the model. Most banks also use external data directly within the model to capture extreme losses or use a mixed approach with two different loss distributions. Scenario analyses are often used as a complement to the loss distributions, especially where data are sparse or in the area of extreme losses. Few banks will use scenario analysis as a predominant tool in the long run.

Few banks consider the results of scenario analyses as the most important model input factor. The other three elements are seen by those banks mostly as a support for expert estimates on loss figures within the scenarios. In some cases, a validation of scenarios or model results with internal and external loss data is considered.

The incorporation of business-environment and internal-control factors is still in the conceptual phase in most banks. Only a few banks consider them in the quantification phase of the model so far.

Consideration of insurance in the model

Insurance may be incorporated into the AMA model if regulatory requirements are fulfilled. The maximal reduction for OpRisk capital, however, is limited to 20%.

Nine banks do not yet incorporate insurance in the model. Some banks consider mostly property and liability insurance. These banks use insurance within the model to derive the overall loss distribution. Sometimes insurance is modelled separately and tied to loss events using an allocation table. The modelled compensation payments, including haircuts, are deducted from possible gross losses to determine possible net losses. The potential insurance cover included considers deductibles, liability caps and payment possibilities. Some banks use insurance payments directly

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to generate net losses and model with those losses. In these cases, actual insurance payments are considered. Banks would then have to demonstrate how capital-reducing effects will still be available in the future and how the regulatory requirements, especially the haircuts and the 20% cap, will be fulfilled. Sometimes, insurance is used within scenarios to alter the loss distributions that enter the model.

Some banks have the technical means to use insurance within the model. However, they are not yet doing so, since the regulatory requirements for a capital reduction cannot be completely met.

So far, only some banks calculate the capital-reducing effect of insurance. Sometimes, banks state that insurance will not have a strong influence on the VAR; sometimes a reduction of the VAR of up to 35% is expected, which would far exceed the regulatory acceptance level.

Consideration of outsourcing

Outsourcing of business activities plays a major role for some banks; for others it is utterly insignificant. The operational risk (eg, legal risk) arising from outsourcing must be considered within the model and within risk management, especially if OpRisk events that occur in outsourced activities will affect the bank itself. The EU directive explicitly requires business continuity plans to be available for all major business functions. This also includes functions provided from third-party members via outsourcing.

Some banks have detailed outsourcing guidelines that incorporate decision processes for outsourcing. In addition, these banks have documentation on outsourced processes and business activities and pose implicit organisational and conduct rules to the service providers.

Operational risk related to outsourcing is mostly captured using qualitative self-assessments. Some banks use a so-called *risk stocktaking*, which includes the evaluation of outsourcing contracts concerning risk exposure and the implemented and required emergency plans. Furthermore, the quality of service-level agreements and the possibility of switching to other service providers in case of a default are evaluated. These evaluations are sometimes divided into major and non-major outsourcing providers. The risks arising from non-major outsourcing providers are sometimes modelled with risk

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indicators, while the major risks are incorporated in the model via scenarios or explicit loss events.

Some banks consider the risks arising from outsourced functions with methods that are also used for the modelling of insurance. Occurred risks are incorporated into the modelling, taking into account contract clauses on the liability of the service provider.

Relevance of the AMA for risk management

According to the EU directive, the AMA will be closely integrated into day-to-day risk management of the bank. The measurement system must factually be used for risk control and mitigation. Furthermore, methods should exist that allocate regulatory capital to business units. This requirement, known as the use test, is key for the approval of an AMA and needs to be implemented at the time of the examination. CEBS has already published guidelines on the requirements of the use test.

The degree of maturity of the AMA and its incorporation into risk management varies. Only a few banks already use advanced controlling methods.

All banks use the standardised risk measure value-at-risk (VAR) to display their OpRisk loss potential. The economic capital for operational risk is calculated with confidence levels that sometimes exceed regulatory demands. The economic capital is usually calculated as a quantile of the loss distribution minus the expected loss, depending on the desired external rating. The economic capital calculated is sometimes already used as a control element through its allocation to the business lines. This is done to generate incentives for improved risk management. Some banks also use the risk measures to calculate return on capital. Different ratios are used that reflect the overall performance measurement concept of the bank, such as return on equity, economic value-added and return on risk-adjusted capital.

Most banks add that they are communicating information relevant to management via management reports. Almost all banks, for example, use qualitative surveys, which do not enter the model, to generate actions that affect operational risk management.

Internal data

Internal loss data are an important foundation for the modelling and management of operational risk. The quality of the data and its

homogeneous allocation to risk categories and business lines, as well as the separation from other fields of risk, is very important for the goodness of the measurement system and for the validation of models based mostly on scenario analyses. The relatively low number of data compared with other risk categories causes problems. A data history of five years or three years for the initial use is a regulatory requirement if the bank intends to use the AMA to calculate regulatory capital requirements.

The work on internal data is complete in almost all banks. In some cases, remaining tasks such as belated data capture or quality-assurance methods (eg, concerning the allocation to risk categories) still have to be completed. Clear internal guidelines on the allocation of loss data and methods for the clarification of boundary issues, and therefore for the improvement of allocation criteria, are a must to ensure the homogeneity of the data. A check of the data gathered in the business lines is usually done within the central OpRisk unit.

The data are processed using IT-based databases. Besides well-known products, some banks also use self-developed tools or still have to implement IT-systems that guarantee the availability and integrity of the data. The required data history will be present in all banks until 2008. Whether the quality of the data will be sufficient in all cases, and thus allow for the generation of objective risk measures with the AMA, is especially dependent on the further efforts to improve the data basis regarding the amount and homogeneity of internal and external loss data. Furthermore, detailed statements on loss causes must be available for external data in order to generate scenarios or to validate scenarios generated, especially in the area of extreme loss events.

Allocation of internal loss data

Two types of allocation should be distinguished:

- The categorisation of loss data for the allocation to the regulatory categories, where it is sufficient to allocate to the Tier 1 categories of Basel II.
- The categorisation of loss data to internal categories used for modelling, which may differ across banks depending on their business activities and risk situation.

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A refinement of the regulatory loss and business line definitions for internal use may be reasonable and helpful for risk management. The development of an industry standard in this area will be especially useful to share loss data via data consortiums. Nevertheless, the regulatory categories are a common source for modelling and especially for a standardised exchange of loss data across banking groups. Therefore, banks must be able to sufficiently allocate their loss data to these event categories and business lines.

Event categories

The Basel event categories and the allocation examples presented in the appendix of the Basel framework do not present a complete and consistent loss event categorisation, since the examples are not final and not concise.

To improve the allocation quality, banks often use decision trees, central contacts and training with example events.

Almost half of the participating banks use the internal loss categories according to the Tier 1 and Tier 2 categories of Basel II. Some banks adapt their internal categories to the Tier 2 categories of Basel II. If Tier 3 event categories are used also, then banks usually supplement the Basel guidelines with their own allocation criteria. Sometimes, however, methods for a complete and consistent allocation are still missing.

Most banks have already defined internal Tier 1 and Tier 2 loss categories – for instance, based on data standards of existing data consortiums. An allocation to the regulatory categories is in these cases guaranteed via allocation methods, while the model is based on the internal categories.

Business lines

The principles and criteria for the allocation of loss data to the business lines must be consistent and coincide with the allocation principles of the relevant indicator in the standardised approach.

Business activities and internal organisation among banks is heterogeneous. Some banks closely follow the regulatory business lines; others are organised more granularly. Some banks are active in only very few business lines.

Some banks directly associate internal business lines with the regulatory Tier 1 business lines. Most banks have a more detailed

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structure and associate loss data with internal profit centres or processes, which are then associated with the business lines, sometimes at Tier 2. Few banks distribute loss data associated with internal categories proportionally to different regulatory categories via an allocation key. This is allowed for regulatory reporting only if the allocation is plausible, concise and sufficiently documented. For modelling purposes the total loss of a single event may not be divided into single losses unless a perfectly positive correlation is assumed.

Losses in centralised functions

For management purposes, it seems appropriate to separately collect and model losses in centralised functions. For regulatory purposes, however, it is necessary to allocate these losses to the regulatory business lines.

In some cases, it could not be derived from the provided documentation if that is always the case. In principle, the proportional allocation will blur information necessary for the modelling and management of the risks, which should be taken into account in the loss database – for example, via the grouping of single, connected losses with associated loss data points. Some banks see the need for further regulatory guidance on this subject and suggest the creation of a ninth business line for losses in centralised functions. Such a business line is already used by several banks. This is allowed for internal purposes; for regulatory reporting, the introduction of a ninth business line is not expected in medium-term.

Losses in centralised functions are mostly allocated to the regulatory business lines according to the cost unit principle or, in some cases, causal analysis and assigned to the regulatory business lines via allocation keys. These allocation keys must be chosen objectively. The derivation of the allocation keys is not always sufficiently documented.

Loss events in several business lines

Loss events may touch several business lines. In most cases, these losses are collected separately per business line (cost carrier) and combined using associated loss numbers. This seems adequate, since the loss amount is easiest to determine in the affected unit. When doing so, however, it should be guaranteed that loss events

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that exceed the loss threshold cumulatively are also considered in cases in which the single losses per business line lie below the threshold. In principle, the associated loss numbers are given by the centralised OpRisk function. In some cases, connected losses are grouped into a single, common loss and the loss amount is distributed to the business units with an allocation key. In such cases perfectly positive correlation is assumed in the model.

In a few cases, the loss is allocated entirely to a single business line, usually the one that is affected the most. In some cases, the loss may be associated with a superordinated business line. This might, depending on the portion of these losses on the total dataset, lead to a bias in the results of the model and have negative effects on risk management.

Associated losses

Grouping losses that occur separately but have a common cause is necessary to receive an aggregated sum of losses. This is essential for making informed decisions on necessary measures. Most banks group losses using an associated loss number. Sometimes, the possibility of successive losses is explicitly mentioned in the database. Other databases allow for an indication on whether the collection of a specific loss event is completed.

Some banks collect such losses as single loss events if they affect only a single business line or have a common cause. A belated grouping of losses is sometimes possible. The creation of associated loss events and *ex post* supplementing of individual loss events with additional connected losses are in principle adequate data-collection practices.

Boundary regarding credit risk

Losses caused by operational risk related to credit risk must be identified, collected in the loss database and marked separately. These risks, however, are still considered only for credit risk capital requirements.

All banks examine credit losses for operational risk. In general they register credit losses in the OpRisk database and mark these losses.

The thresholds for the examination of credit losses for operational risk are very diverse and lie between specific provisions of €1,000

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and €500,000, in a single case even €2,000,000. Even though the principle of proportionality needs to be applied here, the thresholds used by some banks seem to be too high to uncover the operational risk connected with the overall credit exposure. In some banks, an adjustment of the thresholds is discussed.

Boundary regarding market risk

There are no special requirements on how to deal with operational risk within the market risk area. Such risk has to be considered for OpRisk capital calculation.

Most banks treat and collect operational losses in market risk according to the overall company guidelines for operational risk. In some cases, a marking of operational losses in the area of market risk is planned.

In practice, losses from operational risk may not always be differentiated from losses resulting from market risk. To ensure an adequately complete data collection, special measures are required. However, hardly any usable pieces of information on this topic are provided in the banks' documentation. Processes that are based on the existing front-office/back-office structure should be sufficient to ensure an adequate capturing of losses due to systematic double checks.

To ensure a complete collection of losses from market risk, in some cases reconciliation of the front-office trades with accounting is done. In the event of severe losses, principles for an ad hoc reporting are in place in some banks. A plausibility check for completion of the data collection can also be performed in the back-office areas.

Relevance of internal data

The continuing relevance of the internal data used needs to be ensured to avoid biases in risk measurement and management. One-third of the banks already have methods for ensuring the ongoing relevance of their internal data. Some further banks are fine-tuning their concepts on this subject. Partially, the type and extent of the adjustment is checked on a case-by-case basis. Documented guidelines for such procedures will be required.

From the point of view of some banks, the short time horizon of the data collection and the scarcity of the data are seen as obstacles

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for the development of methods. The necessity for the definition of such methods is not yet understood by all banks.

The basis for the evaluation of the relevance was the current organisational structure/business units, activities/products/processes, risk-mitigating effects in place and the time between the occurrence of a loss event and the time of modelling. All banks that present concepts use qualitative factors for adjusting the loss data.

Some banks also adjust for the current organisational structure/business units, activities/products/processes. Methodically, the historical loss data are attributed to the new structure or, if an activity is abandoned, removed from the modelling process. However, banks still keep the available data. Partially, loss events that can no longer occur due to risk-mitigating measures are exempted from the modelling as well. Some banks consider the timeframe between the occurrence of a loss and its inclusion in the model when judging the relevance of their data. In these cases, a lower weight is given to older data compared with newer data. In some occasions, it is planned to abandon losses that are older than five years. In any case, low-frequency, high-severity losses are still considered via respective scenarios or are still used for modelling.

An adjustment of the loss severities and frequencies of collected loss data with qualitative factors (scaling) has not been performed by any of the participating banks so far.

When judging the quantitative relevance of loss data, some banks state that they are scaling losses to current price levels and exchange rates before modelling. An inflation adjustment for historical loss severities was performed with the German consumer price index.

The allocation of responsibilities for the assessment and adjustment of the data is apparent in only few banks. The responsibility in these banks is with the centralised OpRisk function. Sometimes, reconciliation with the business is planned. In one bank, the relevant business lines, corporate centres or subsidiaries perform the assessment on a yearly basis. If the relevance of internal loss data is assessed by the business lines, conflicts of interest must be avoided by adequate regulations.

Loss history

A sufficient number of losses and the timeframe of their occurrence are an essential basis for loss-data-based models. It is apparent

from the documentation of the banks, that all participating banks will reach the required three-year loss history with the introduction of the AMA in 2008. Some banks have entered losses into the loss data collection belatedly.

One-third of the banks have submitted a viable assembly of the captured loss events, categorised by business lines and risk categories. Some banks also have submitted an overview of the captured losses. However these overviews could not be evaluated further due to the low number of data.

The comparability of the presentations is restricted due to the bank-specific categorisation. Nonetheless, it is obvious from the loss data that, with the exception of one bank, most losses occur in the risk categories execution, delivery and process management. The fewest loss events are found in the risk categories employment practices and workplace safety, business disruption and system failures as well as internal fraud.

Almost half of the banks began collecting losses between 2000 and 2001; the others started between 2002 and 2004. Most banks currently hold between 100 and 500 datasets for operational losses. Only a few banks possess 1,000 or more datasets.

Data thresholds

Suitable thresholds must be defined for capturing loss data in a database. The spectrum of these thresholds varies from €100 to €10,000 and thus does not exceed the example in the Basel guidelines. For the collection of operational losses from credit risks, the thresholds were sometimes much higher.

For some banks, losses from criminal activities have a special status and are collected in any case independent of the size of loss amount. Two banks differentiate the thresholds by business lines. These banks have defined a lower threshold for the areas of private banking and the subsidiary business. Furthermore, some banks allow their subsidiaries to define lower loss thresholds.

Banks will have to deal with the subject of loss thresholds in the future as well, by considering how higher thresholds will increase model risk by creating biases or errors in the estimated parameters. Furthermore, it should be examined how different loss thresholds will affect the parameter estimations. The statistical methods used

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in the AMA model have to be examined concerning their capability to treat truncated loss data.

Loss datasets

All banks use databases for the collection of internal loss data, in which a large number of data fields (between 40 and 100) is used for the capturing of a loss event. The datasets of all banks contain at least the required fields of gross loss, time of loss, risk mitigation and description of loss trigger and cause.

Concerning the time dimension, the databases of all banks require the capturing of the time of occurrence of a loss or a loss event. All banks also capture the time of recognition of the loss event or loss.

Almost all banks assign a status (open or complete) to the datasets/loss events. Most banks also capture the time of accounting or further accounting information. Sometimes, multiple data fields are reserved for a description of the loss event. For a better assignment of the losses, most banks capture the product, process or project involved.

Some banks determine the loss severity using the amount of payments made or the recovery value and incorporate also the cost of internal services used and occasionally also lost revenue. Most banks however capture the gross amount of a loss directly and consider only in few cases, internal costs or opportunity costs. If the amount of a loss can not be determined directly, most banks capture a potential loss amount. All banks also capture loss mitigating effects, in some cases the mitigation effects are separated by type.

About half of the banks state, that they capture the loss amount in the currency of the country in which it occurred. This seems to be plausible.

All banks also structure their data in a way that they can also capture gains connected with OpRisk events. Only few banks state however, that they do so. For the administration of the loss data captured within the bank, most banks define technical datasets within the system. These usually comprise the date of capturing and the person entering the data. Some banks also include an editing history (such as changes or checks) into their datasets.

Most banks plan to use the loss data collection as the basis for management action. These banks have reserved some data fields for suggested management action and their realisation.

External data

Relevant external data must be considered in the measurement system. This includes data on loss events from loss databases of third-party vendors, consortia and association databases, and public sources.

External data are especially relevant for the measurement of risk events with potentially high losses and for the development of scenarios. For the latter, datasets containing a precise description of the losses are required. This is often not the case for anonymised consortium datasets.

Some of the banks are members of the data consortiums ORX (Operational Risk data eXchange association), VÖB (Association of German Public Sector Banks), BVI (Bundesverband Investment and Asset Management eV) or Gold (Global Operational Risk Loss Database). The quality of the external datasets and its homogeneous allocation to event categories and business lines is very important for the quality of the measurement system and for model validation. This is especially true for loss data from data consortiums. Therefore it is necessary that, not only within banks but also within data consortiums, the quality of the datasets is guaranteed through adequate processes.

Choice of external data sources

Some banks have already made concrete choices on external datasets and created relevant concepts, for example, how external data should be used in the model. One-third of the banks has at least made a decision on the data sources and outlined concepts on how to use external data.

Some banks have not yet made a decision on the use of external data; some are awaiting the creation of a solution from their respective banking association.

External data are gained from publications, via public providers and the participation in data consortiums. Public data sources used include OpVantage, Fitch First and SAS Global Data. External data providers extract information mostly from public sources and usually

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collect only data exceeding a high threshold, for instance, US\$1 million. The thresholds of data consortiums are usually much lower.

Almost half of the participating banks are involved in the exchange of loss data via the data consortiums ORX, VÖB, Gold and BVI. The thresholds are much lower than with public external data providers. Almost all banks get external data from more than one source and use the datasets for different purposes within the model. It was not always possible to determine whether the number of external loss data are sufficient to adequately capture potentially severe loss events.

When choosing external data providers, the business activities should be considered. For example, banks with worldwide business activities should select data providers with worldwide loss data and similar business and geographical focuses. For banks that are active only in Germany, the participation in a national data consortium may be sufficient.

For banks that get external data exclusively from data consortiums, a lack of low-frequency, high-severity losses might be problematic when modelling the tails of the loss distribution.

To adjust the external datasets to internal standards, adequate scaling mechanisms should be installed.

Scaling methods

No homogeneous use of scaling methods is established so far. A scaling of external data to adjust them to the individual institution seems necessary whenever banks are incorporating data from other banks that differ in terms of size, business activities and complexity.

Sometimes, external data are entered into the model without scaling. This is adequate if losses have occurred in similar size, business activity and complexity. Partially, the loss severities are scaled due to expert estimates or gross income, headcount or total assets. Some banks assess the relevance of external datasets before scaling and exclude datasets irrelevant to their business activities. Few banks consider all external datasets as relevant. Most banks have not yet made precise commitments on this subject.

Independent validation of the use of external data

If external data are used, banks have determined an independent function for validating the conditions and processes concerning

their use. Usually, this is internal audit; sometimes it is delegated to a trustee of the data consortium. In principle, the latter is possible only for consortium data, not for public data.

Purpose of external data

The following purposes for external data use are stated by a third of the participating banks.

- Use of external data within the model:* External data are used by the majority for the modelling of sparsely filled risk cells and for the modelling of high-impact areas (tails). Partially, these datasets are used for an adjustment of the internal loss distribution or for the validation of the results of scenario analyses.
- Use of external data in scenario generation:* The majority of the banks use external data for this purpose.
- Use of external data for validation:* Partly external data are used for this purpose.
- Use of external data for other purposes:* Partly external data are used as information sources for OpRisk management and for benchmarking within the business lines.

Datasets for external events

The submitted data must contain all regulatory required and other significant information on OpRisk losses (such as date of occurrence, date of capturing, gross loss, net loss, insurance payment). Whether the creation of the datasets and the processing of external data will meet the regulatory requirements can be judged only in the overall context of the model. Aside from the number and the structure of the data, a homogeneous understanding of the recorded values is essential.

The following conclusions can be drawn:

- a consistent definition of OpRisk terms is currently not always provided in practice; the loss definition may vary across different data sources;
- the consistent collection practice for losses (such description of a loss event including cause) is not always given;
- the consistent categorisation by event categories and business lines leaves room for improvement; and

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- the anonymisation of the datasets provided by data consortiums leads to a lack of important information.

Scenario analysis

Scenario analyses are methods in which experts estimate the probability and potential severity of risk events. Scenarios are understood as assumed causes of events and their effects on the bank and its business. Scenarios can be derived from, for instance, external datasets. Scenarios must be validated using actual loss experience, which is mostly reflected in internal data and in external data in the case of high-severity events.

Use of scenario analysis

All banks plan to use scenario analysis within the AMA. In most cases, the implementation of these methods was planned to start in 2005. Half of the banks say they will use scenario analysis for business reasons as well, such as the qualitative identification of process and control weaknesses.

Validation and adjustment of scenario analyses

Most banks are still in the conceptual phase of validating their scenario analyses. This is also the case for some of the banks that have already implemented their concepts for scenario analyses. In principle, scenario analysis should be performed at least annually. This includes the creation of new scenarios and the abandoning of obsolete ones. The results of the analyses are sometimes checked for plausibility with internal or external data. Only a few banks have developed methods for determining and reducing the inaccuracies of expert estimates.

Business environment and internal control factors

Operational risk is influenced by the business-environment and internal-control factors, such as a change in the complexity of the business activities, the business volume or in internal controls. These changes must be captured adequately. Business-environment and control factors may be included in the measurement system, for example, through the use of objective indicators or by expert opinion determined in a systematic process. The influence of these

factors on the model must be validated over time with internal and external data.

Concerning the use of business-environment and internal-control factors within the model, most banks have not yet developed advanced concepts. Only in few cases are the factors identified and raised periodically as risk indicators. The methods for incorporating these factors as a model component are mostly still in the development phase. Internal control factors are already used for risk management, though. However, only a few banks have implemented corresponding methods in the model as well.

Some banks do not see the necessity to define and raise indicators for these factors on a regular basis. Instead, these banks state that they survey and judge the quality of their processes and their internal controls within their scenario analysis or other tools for self-evaluation. Business-environment factors should be considered in these methods as well. In some cases, it is planned that internal audit validates the estimation results and methods with the help of available loss data. However, these estimates do not necessarily enter the measurement system. This is problematic, especially if the factors suggest an increase in the VAR.

OPRISK MANAGEMENT

OpRisk management is fundamentally different from market and credit risk management. Operational risk is usually not taken to create a profit and is not restricted to certain portfolios. Operational risk is implicitly generated with each activity and is intrinsically present in the entire bank. The management of operational risk is closely tied to modelling and the use test. In addition to the results of the model, further indicators on significant risks (for instance, key risk indicators) are often used for managing operational risks. In principle, the term *OpRisk management* comprises the reduction, avoidance, transfer and acceptance of operational risks.

Methods for OpRisk management

In about half of the banks, the business lines are responsible for the management of operational risk. Some banks differ between the decentral responsibility of the business lines and the measures taken by the central OpRisk function, the OpRisk committee and senior management. In only a few banks, the responsibility of the

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OpRisk function is restricted and allows only recommendations on risk-mitigating measures to the business lines.

Expected losses from operational risks are considered, for instance, in pricing calculations. A reduction of the risk may be achieved, through, say, process improvements. Some risk events, however, may not be completely avoided, such as natural catastrophes, terrorist attacks and external fraud. A business continuity plan and the use of insurance may reduce or transfer the results of such events.

Risk management is often based on reports, which also include measures on how to avoid future losses. About half of the banks have tied a self-assessment to OpRisk management, which is supposed to evaluate the effectiveness of the measures.

Only a third of the banks use AMA model results for management purposes. Partly, in this area room for improvement has already been identified. The other banks are still working on concepts or began the work on concepts in 2005.

Aside from specific management methods, banks also use traditional control elements such as double checks, internal audit and organisational guidelines.

Risk indicators

Risk indicators are principally planned within the framework of OpRisk management or are already implemented. The indicators should be as forward-looking as possible. From the viewpoint of the banks, sufficient accuracy of the prediction could be confirmed in only a few cases.

Some banks use global risk indicators for all business areas and additionally other, more specific, indicators for single business units. The latter are chosen by the OpRisk unit in accordance with the business lines involved.

Risk indicators from the personnel or IT department as well as process-oriented indicators are used mostly. Popular indicators include staff turnover and indicators regarding complaints. In some cases, a large number of indicators are used. The indicators are often raised monthly, or occasionally more or less frequently. The adequacy of the used frequency can be judged only individually for each indicator.

Risk indicators are often part of the reporting system. Sometimes, indicators are raised monthly but reported only in longer

time intervals. Sometimes, the risk indicators are translated into a traffic light scheme with predefined thresholds. Other banks will define thresholds only if a sufficient number of relevant data are available. Besides the thresholds, the change of the indicators over time permits the extraction of relevant information for management and the drawing of conclusions on the effectiveness of the measure implemented.

Some banks check the adequacy of the indicators on a regular basis, for instance, through the connection between indicator and loss events. Sometimes, the relevance of the indicators is judged with self-assessments or changes to the VAR.

Most banks state that they use risk indicators as early-warning systems. Partly, banks have rules in place that require further analysis or development of appropriate measures if thresholds are exceeded. Some banks use risk indicators for risk quantification as well. In these cases, the OpVAR values are adjusted within a certain framework.

Insurance

All banks use at least basic insurance to cover their operational risk within the risk-management framework. Occasionally, insurance effects are already considered in the loss database. The use of insurance in the model, however, is tied to regulatory requirements, especially regarding the future availability of the insurance coverage. So far, only few banks state that they use insurance within the model according to the regulatory guidelines.

Outsourcing

When outsourcing relevant activities with respect to the banking business in Germany, it is necessary to consider BaFin's circular No 11/2001. According to the European directive, emergency and business continuity plans should be in place for all major activities. This includes activities that have been outsourced.

Only a few banks consider outsourcing as a risk-management tool and regard it as a risk-transfer method. The risks arising from outsourcing (including legal risks) should be considered within the model.

Major outsourced activities are systematically captured and considered in scenario analyses by some banks. Risks from minor

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activities are sometimes evaluated with key risk indicators. Losses from outsourced activities are collected by the banks if they affect the bank itself.

New outsourcing activities are evaluated in advance with respect to their operational risks. Half of the banks say that they use service-level agreements for the management of outsourced activities.

Other-risk management tools

Currently, no bank states that it uses other tools, such as derivatives, for risk management within the OpRisk framework. Very few banks plan to actively use such tools in the future, depending on industry development and supervisory requirements.

Incentives for the improvement of OpRisk management

The creation of incentives for the improvement of OpRisk management within the AMA – for example, through capital allocation – is a requirement from the Basel guidelines that is not implicitly mentioned in the EU directive. Still in this context, a validation and improvement of the AMA is required since the models are not yet fully developed.

Some banks name different methods as part of their incentive systems for the improvement of OpRisk management:

- lower regulatory capital for business lines that successfully reduce their operational risk;
- capital allocation also for economic capital;
- target agreements based on risk indicators; and
- partial deduction of known and booked losses for bonus calculations.

Some banks also refer to training measures, OpRisk workshops and the tasks of internal audit.

OUTLOOK

Since the beginning of the industry survey, a major proportion of the participating banks have made further progress regarding concepts and implementation of their AMAs. Especially the increasing number of available loss data allow banks to refine and improve their measurement methods and their methods for validation in a

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dynamic process. As a consequence, the risk-management processes, which are in parts based on the results of the measurement system, could be improved.

The partially low data availability, which often poses a challenge for AMA model development, is improving noticeably. This is especially due to the work of data consortiums, in which the participating banks are exchanging data according to uniform standards. For risk measurement it is essential that the data used within the AMA model be collected and categorised in a consistent manner. Therefore, the anonymised consortium data must, aside from relevant information on the loss events, contain specifications that make the integration of these data into the bank-specific AMA models possible. The data consortiums as well as the banks should perform adequate quality checks to ensure the required data quality.

As a general conclusion, the authors have the impression that the survey among German AMA candidates was very helpful for the supervisors. With this input from the industry, for which we are very thankful, we were able to get a deeper insight into the limitations and the potential of the different advanced measurement approaches in banks. This information will help us to increase the quality of the rules and guidance on operational risk in Germany as well as within CEBS and AIGOR.

Still, the debate between supervisors and banks about acceptable and unacceptable AMA variants has to increase to ensure a level playing field throughout the AMA application process. A major instrument for achieving this in our view is the organised contact among supervisory experts in the international working groups, but also with industry experts, for instance, via our national Industry Working Group on Operational Risk. We hope that also with publications such as this, the dialogue will be stimulated.

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