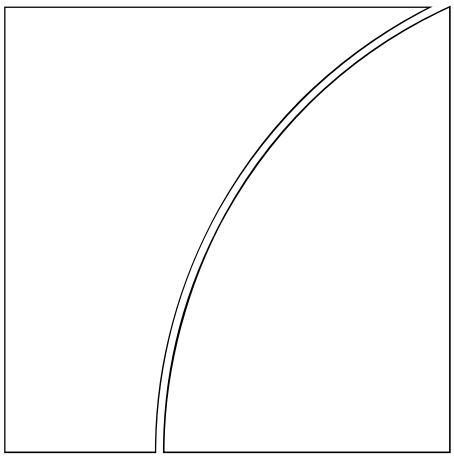
Basel Committee
on Banking Supervision



Working Paper on the Regulatory Treatment of Operational Risk

September 2001

BANK FOR INTERNATIONAL SETTLEMENTS

Risk Management Group
of the Basel Committee on Banking Supervision

Chairman:
Mr Roger Cole – Federal Reserve Board, Washington, D.C.

Banque Nationale de Belgique, Brussels	Ms Dominique Gressens
Commission Bancaire et Financière, Brussels	Mr Jos Meuleman
Office of the Superintendent of Financial Institutions, Ottawa	Mr Jeff Miller
Commission Bancaire, Paris	Mr Laurent Le Mouël
Deutsche Bundesbank, Frankfurt am Main	Ms Magdalene Heid Ms Karin Sagner
Bundesaufsichtsamt für das Kreditwesen, Bonn	Mr Jürgen Dreymann
Banca d'Italia, Rome	Mr Claudio D'auria Mr Sergio Sorrentino
Bank of Japan, Tokyo	Mr Eiji Harada
Financial Services Agency, Tokyo	Mr Hirokazu Matsushima
Commission de Surveillance du Secteur Financier, Luxembourg	Mr Davy Reinard
De Nederlandsche Bank, Amsterdam	Mr Klaas Knot
Banco de España, Madrid	Mr Juan Serrano
Finansinspektionen, Stockholm	Mr Jan Hedquist
Sveriges Riksbank, Stockholm	Ms Camilla Ferenius
Eidgenössiche Bankenkommission, Bern	Mr Daniel Sigrist Mr Martin Sprenger
Financial Services Authority, London	Mr Helmut Bauer Mr Victor Dowd
Bank of England, London	Ms Alison Emblow
Federal Deposit Insurance Corporation, Washington, D.C.	Mr Mark Schmidt
Federal Reserve Bank of New York	Ms Beverly Hirtle Mr Stefan Walter
Federal Reserve Board, Washington, D.C.	Mr Kirk Odegard
Office of the Comptroller of the Currency, Washington, D.C.	Mr Kevin Bailey Ms Tanya Smith
European Central Bank, Frankfurt am Main	Mr Panagiotis Strouzas
European Commission, Brussels	Mr Michel Martino Ms Melania Savino
Secretariat of the Basel Committee on Banking Supervision, Bank for International Settlements	Mr Ralph Nash

Table of Contents

Working Paper on the Regulatory Treatment of Operational Risk

The purpose of this paper prepared by the Risk Management Group of the Basel Committee is to further the Committee's dialogue with the industry on the development of a Pillar 1 capital charge for operational risk in the New Basel Capital Accord. Comments on the issues outlined in this paper would be welcome, and should be submitted to relevant national supervisory authorities and central banks and may also be sent to the Secretariat of the Basel Committee on Banking Supervision at the Bank for International Settlements, CH-4002 Basel, Switzerland, by 31 October 2001. Comments may be submitted via e-mail: BCBS.capital@bis.org[1] or by fax: + 41 61 280 9100. Comments on working papers will not be posted on the BIS website.

A. Introduction, definitions and data issues

Background and the rationale for an operational risk charge

In recent years, supervisors and the banking industry have recognised the importance of operational risk in shaping the risk profiles of financial institutions. Developments such as the use of more highly automated technology, the growth of e-commerce, large-scale mergers and acquisitions that test the viability of newly integrated systems, the emergence of banks as very large-volume service providers, the increased prevalence of outsourcing and the greater use of financing techniques that reduce credit and market risk, but that create increased operational risk, all suggest that operational risk exposures may be substantial and growing.

This recognition has led to an increased emphasis on the importance of sound operational risk management at financial institutions and to greater prominence of operational risk in banks' internal capital assessment and allocation processes. In fact, the banking industry is currently undergoing a surge of innovation and development in these areas.

Reflecting these developments, the Basel Committee on Banking Supervision established the principle of developing a Pillar 1 minimum regulatory capital charge for other risk, including operational risk, in its 1999 Consultative Paper. Following the consultation process and its own analysis, the Committee decided that only operational risk should be subject to a capital charge under Pillar 1. Additional elements of 'other risk' – for instance, interest rate risk in the banking book and liquidity risk – will be dealt with solely through Pillars 2 and 3. This position was expressed in the January 2001 Consultative Package and forms the assumption underpinning the Risk Management Group's (RMG's) ongoing analysis.

This paper contains an overview of the RMG's work to date on refining the proposals for a Pillar 1 regulatory minimum capital requirement for operational risk. It reflects the RMG's extensive contact with financial industry representatives, its review of the many thoughtful and constructive comments received on the January Consultative Package, and the RMG's own internal deliberations. This work has resulted in a number of significant changes to the January proposals. These changes include:

---

[1] Please use this e-mail address only for submitting comments and not for correspondence.

- Refinement of the definition of operational risk that underpins the regulatory capital calculations;

- Proposed reduction in the overall level of the operational risk capital charge;

- Introduction of a new regulatory capital approach that is based on banks' internal risk estimates (the "Advanced Measurement Approaches" [AMA]); and

- Consideration of the role of insurance as a risk mitigant in the regulatory capital calculations.

These changes are described more fully in the sections that follow. The RMG intends to continue work to refine these proposals in light of industry comments and with the benefit of tranche 2 Quantitative Impact Study (QIS) data that it will review further over the course of the autumn.

Definition of operational risk

In the January 2001 Consultative Package, operational risk was defined as: "the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events". The January 2001 paper went on to clarify that this definition included legal risk, but that strategic and reputational risks were not included in this definition for the purpose of a minimum regulatory operational risk capital charge.

This focus on operational risk has been generally welcomed, although concerns were expressed about the exact meaning of 'direct and indirect loss'. As mentioned above, for the purposes of a Pillar 1 capital charge, strategic and reputational risks are not included, and neither is it the intention for the capital charge to cover all indirect losses or opportunity costs. As a result, reference to 'direct and indirect' in the overall definition has been dropped. By directly defining the types of loss events that should be recorded in internal loss data, the RMG can give much clearer guidance on which losses are relevant for regulatory capital purposes. This leads to a slightly revised definition, as follows: **"the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events"**. The RMG confirms that this definition does not include systemic risk and the operational risk charge will be calibrated accordingly.

It is important to note that this definition is based on the underlying causes of operational risk. It seeks to identify why a loss happened and at the broadest level includes the breakdown by four causes: people, processes, systems and external factors. This "causal-based" definition, and more detailed specifications of it, is particularly useful for the discipline of managing operational risk within institutions. However, for the purpose of operational risk loss quantification and the pooling of loss data across banks, it is necessary to rely on definitions that are readily measurable and comparable. Given the current state of industry practice, this has led banks and supervisors to move towards the distinction between operational risk causes, actual measurable events (which may be due to a number of causes, many of which may not be fully understood), and the P&L effects (costs) of those events. Operational risk can be analysed at each of these levels.

Data collection

A key issue in the area of operational risk management – as well as in the development of regulatory capital requirements – is the collection and analysis of loss data. Whilst a growing number of institutions are collecting and analysing operational loss data, with some operating

internal capital assessment and allocation mechanisms on this basis, it is clear that there has been no industry standard for such data exercises. Such data collection is important for the assessment of operational risk at individual institutions. There also is increasing recognition amongst banks and supervisors that the sharing of loss data, based on consistent definitions and metrics, is necessary to arrive at a comprehensive assessment of operational risk.

The Committee has been keen to incentivise banks to develop further data collection and analysis. The proposal for a Pillar 1 capital charge has been an important stimulant in this regard, but, more directly, the RMG, via the QIS project, has set in train a data collection exercise that will help calibrate and test the proposed framework for operational risk. This framework, which was established in close collaboration with the banking industry and others, breaks operational risk exposures and losses into a series of standardised business lines and "event types". The business lines are intended to be generally applicable across a wide range of institutions. The event types are intended to group operational risk losses into distinct components according to the nature of the underlying operational risk event. Annex 2 contains the full framework of business lines and event types[2].

The definitions of event types are intended to encompass certain operational risk losses that currently may be embedded in credit or market risk related exposures. Going forward, the RMG wants to encourage banks to track explicitly these types of operational risk losses to arrive at a comprehensive assessment of the true operational risk profile within and across institutions. The Committee expects banks to include all operational risks in the loss event database and have clear policies implemented for the management of these risks. Nevertheless, for regulatory capital purposes the Committee expects banks to attribute operational risk related credit and market loss events to those risk areas for the calculation of regulatory capital requirements. The Committee will calibrate the overall capital charge for operational risk to prevent double counting with the credit capital charge. Banks should not retroactively seek to strip out operational losses from their existing credit loss databases and calculations in determining their regulatory capital requirements for credit risk.

There were two strands to the work in the QIS: the first strand provided information on exposure indicators and the economic capital allocation to operational risk by business line. These data were instrumental in allowing the provisional estimate of the relative risk of the business lines and hence a preliminary reporting of the survey results as they relate to the Basic Indicator and Standardised Approaches, using a 'top down' methodology (i.e. a technique where a predetermined amount of capital is allocated across business lines). The results of this analysis are set out below.

The second strand of the QIS aimed to collect loss data from individual banks on a consistent and coherent basis and so allow a 'bottom-up' assessment of all three approaches to operational risk capital. This tranche of the survey will also allow exploration of the issue of 'double counting' operational risk, as discussed above. Additional analysis of this tranche of QIS will continue over the autumn and will be reflected in further output from the Committee.

B. Overall calibration

As noted in the January 2001 Consultative Package, the Committee's preliminary assessment of the possible future level of operational risk regulatory capital was 20% of

[2] The RMG will continue to review the specific content of business lines and risk event types.

current minimum regulatory capital (MRC). This estimate was based on a number of sources, including industry surveys of operational risk, a Committee survey on operational risk (including economic capital allocation) and reports from individual institutions. In particular, the figure was based on an average of 20% of economic capital allocated to operational risk, based on data reported by a sample of firms and from other sources. This level of capital was used to provide a preliminary calibration for the Basic Indicator Approach.

Industry commentators have argued strongly that the 20% figure overstates the amount of regulatory capital necessary to provide adequate coverage of banks' operational risk exposures. They argued that the sample of firms used to generate the 20% figure was small, as the Committee itself acknowledged, and that the resulting figure reflects an over-estimate of the actual share of economic capital allocated for operational risk, in part due to definitional differences between the scope of the charge and the economic capital allocation by banks. Further, they argued that in combination with the revised capital treatment of credit risk, the 20% figure would generate an increase in the general level of capital requirements, contrary to the Committee's stated goal of keeping the overall level of capital constant for the industry as a whole.

In light of these comments, and a review of the data submitted by banks under the first portion of the QIS, the Committee has agreed that the 20% figure should be lowered. It is proposed that a figure of 12% of minimum regulatory capital would provide a more reasonable cushion and produce required capital amounts more in line with the operational risks actually faced by large, complex banking organisations. The reduction to some extent also reflects that these organisations make use of insurance to mitigate operational risk. Annex 3 explores the data underpinning this decision in more detail.

This new overall calibration level has implications for the specific parameters to be used in the capital calculations, in particular, for the "alpha" in the Basic Indicator Approach and the "betas" in the Standardised Approach. In the January Consultative Package, the Committee suggested that alpha under the Basic Indicator Approach equal 30% of gross income. In light of the lower overall calibration level, and additional analysis of the relationship between gross income and capital, preliminary analysis of industry data suggests that an alpha in the range of 17-20% of gross income would produce capital charges consistent with the overall target calibration level. This analysis further suggests betas that fall in a range around this level. More detailed analysis of the beta factors is discussed below in the section on the Standardised Approach and in Annex 3.

The Committee has stated that the level of capital required under the AMA will be lower than under the simpler approaches to encourage banks to make the improvements in risk management and measurement needed to move toward the AMA. The RMG has sought to attain this goal in specifying a floor for the AMA. It is preliminarily proposed that the floor be set at 75% of the capital requirement under the Standardised Approach, which implies a capital level of 9% of minimum regulatory capital under the AMA. A review of the QIS data plus an initial establishment of the AMA floor are discussed in the following section, which contains more detailed descriptions of the measurement methodologies.

C. The measurement methodologies and analysis of QIS results

The framework outlined below presents three methods for calculating operational risk capital charges in a 'continuum' of increasing sophistication and risk sensitivity: (i) the Basic Indicator Approach; (ii) the Standardised Approach and (iii) Advanced Measurement Approaches. Since the January 2001 Consultative Package, a considerable amount of effort has been devoted to the development of the framework, and in particular the AMA. The Advanced Measurement Approaches show the most evolution from the January proposals and underpin the second strand of the QIS exercise referred to above, and so are dealt with in the first of the following sections. The RMG remains committed to exploring the means by which all three approaches may be developed and improved.

It has become clear in the course of the RMG's work that there is a high likelihood that the QIS will not provide sufficient data to rely solely on bottom up calibration of the different capital approaches. Moreover, discussions with the banking and insurance industries has led the RMG to conclude that a variety of potentially credible advanced approaches to calculating operational risk capital are being developed.[3] Given the relatively short track record of industry efforts in this regard, the Committee has concluded that it would be premature to thwart development of alternative advanced approaches by focussing exclusively on the Internal Measurement Approach (IMA), the only option under the AMA that was discussed in the January Consultative paper.

The RMG has therefore developed a new proposal for an advanced, risk-sensitive Pillar One capital requirement based on loss quantification, which would provide incentives for firms to develop institution-specific operational risk measurement approaches. The Basic Indicator and Standardised Approaches would remain as the first two options, but instead of providing just a Committee-defined Internal Measurement Approach, a broader set of Advanced Measurement Approaches would be available. The AMA will permit banks to calculate their regulatory capital requirements for operational risk based on internally generated risk estimates, subject to a floor based on the Standardised Approach.

Advanced Measurement Approaches

The AMA are the most risk sensitive of the approaches currently being developed for regulatory capital purposes. As noted above, the Committee has developed the concept of Advanced Measurement Approaches in recognition that a variety of potentially credible approaches to quantifying operational risk are currently being developed by banking institutions and that the regulatory regime should not stifle innovation at this critical point in the development process. The regulatory capital requirement for operational risk under the AMA would be based on an estimate of operational risk derived from a bank's internal risk measurement system. This risk estimate would be subject to a floor based on the Standardised Approach capital charge for operational risk.

Thus, under the AMA, banks would be allowed to use the output of their internal operational risk measurement systems, subject to qualitative and quantitative standards set by the Committee. In many regards, this structure – the use of internally generated risk estimates subject to qualitative and quantitative standards – mirrors the structure of the internal models

[3] Through on-going dialogue with the industry, the RMG has heard from banks, insurers and others on alternative advanced approaches to assessing capital for operational risk.

alternative in the Market Risks capital requirements[4]. As in the market risk setting, the qualitative standards would address the bank's operational risk management environment, processes, and risk control efforts. The quantitative standards would include a supervisory soundness standard that all internally generated risk estimates would have to meet, as well as criteria for the definition of operational risk embedded in the risk measurement system, the use of internal and external loss data, and validation of parameters and system output. Among the most important of these quantitative standards is that the risk measurement system must be based on internal loss data that can be mapped into the Committee-specified business lines and event types. For certain event types, banks may need to supplement their internal loss data with external, industry loss data. Annex 1 contains a more detailed description of the general criteria for the AMA, as well as the qualitative and quantitative standards.

Under the AMA, operational risk capital charges would be subject to a floor based on the Standardised Approach capital charges for operational risk. Initially, this floor would be fairly stringent, reflecting the fact that the internal methods used to quantify operational risk are still in early stages of implementation and that the AMA do not, as yet, contain detailed criteria for the specific quantification methods likely to be used by banks. It is proposed that the floor be set at 75% of the Standardised Approach capital charge. However, the intention would be for the Committee to revisit developments in this area on a regular basis – perhaps every two years commencing from the release of the final revisions to the Accord – with the intention of identifying those measurement approaches that have been developed most rigorously by the banking industry. More detailed qualitative and quantitative standards could be developed based on the emergence of sound industry practices in areas such as measurement and validation techniques. The floor could be lowered, and eventually eliminated, for approaches meeting these more detailed standards.

A key purpose of incorporating the AMA concept as one of the methods under Pillar 1 is to allow the development of a range of nascent capital assessment techniques. The Committee would however be interested to gauge which of the current range of techniques is most likely to be developed by a critical mass of banks in the foreseeable future, and so allow focus to be given to its work over the coming months and years. In order to assist in this process, the Committee is setting out its current understanding of the range of possible approaches under an AMA type framework (Annex 4). This is not intended to be an exhaustive list of current or emerging industry practice or of the measurement approaches that might ultimately be recognised under the AMA.

The Standardised Approach

In the Standardised Approach, banks' activities are divided into 8 business lines. Within each business line, there is a broad indicator specified that reflects the size or volume of banks' activities in that area. The indicator serves as a proxy for the scale of business operations and thus the likely scale of operational risk exposure within each of these business lines. The table below shows the proposed business lines and indicator.

[4] *Amendment to the Capital Accord to Incorporate Market Risks*, Basel Committee on Banking Supervision, January 1996

Business Lines	Indicator	Beta factors (%)
Corporate finance	Gross income[5]	β_1
Trading and sales	Gross income	β_2
Retail banking	Gross income	β_3
Commercial banking	Gross income	β_4
Payment and settlement	Gross income	β_5
Agency services and custody	Gross income	β_6
Asset management	Gross income	β_7
Retail brokerage	Gross income	β_8

Within each business line, the capital charge is calculated by multiplying the indicator by a factor (denoted beta) assigned to that business line. Beta will be set by the Committee and serves as a rough proxy for the industry-wide relationship between the operational risk loss experience for a given business line and the aggregate level of the indicator for that business line. It should be noted that the indicator relates to the data reported for that business line, not the whole institution, i.e. in corporate finance, the indicator is the gross income generated in the corporate finance business line. If a bank is unable to allocate an activity to a particular business line, it is proposed that income relating to that activity should be subject to the highest beta factor for which the bank reports activity.

At the present time, the RMG proposes that gross income be used as the indicator in all business lines for the sake of simplicity, comparability, reduction of arbitrage possibilities and, most significantly, a lack of evidence of greater risk sensitivity of other indicators.

The total capital charge is calculated as the simple summation of the regulatory capital charges across each of the business lines. The total capital charge may be expressed as follows:

$$K_{TSA} = \Sigma (EI_{1-8} * \beta_{1-8})$$

Where:

K_{TSA} = the capital charge under the Standardised Approach

[5] Gross Income = Net Interest Income + Net Non-Interest Income (comprising (i) fees and commissions receivable less fees and commissions payable, (ii) the net result on financial operations and (iii) other income. This excludes extraordinary or irregular items.) It is intended that this measure should reflect income *before* deduction of operational losses. The inclusion of (ii) net profit and loss from financial operations implies in practice that a bank losing money in terms of proprietary trading reduces its capital charge for operational risk. The RMG seeks feedback as to whether this is a desirable feature and, if not, as to how it might be addressed. The ECB Report on "The EU banks' income structure", prepared by the Banking Supervision Committee, has shown that the net profit on financial operations is the most volatile sub-category of non-interest income for the EU banks (average EU co-efficient of variation of profit on financial operations 56 in the period 1993-1998 compared to 27 for total non-interest income), its relative importance varies between EU countries and, that it is the part of the banks' income most affected by accounting practices. A way forward in refining "gross income" in the context of the Basic Indicator and Standardised Approaches could be the use of an average figure (e.g. three-year average). This could partly alleviate the impact of fluctuations of trading activities. The RMG understands that the definition of gross income may be problematic in some jurisdictions due to varying accounting standards, and will, as the need arises, continue to work to clarify the definition to ensure consistency across jurisdictions.

EI_{1-8} = the level of an exposure indicator for each of the 8 business lines

β_{1-8} = a fixed percentage, set by the Committee, relating the level of required capital to the level of the gross income for each of the 8 business lines.

The Basic Indicator Approach

Banks using the Basic Indicator Approach have to hold capital for operational risk equal to a fixed percentage (denoted alpha) of a single indicator. The current proposal for this indicator is gross income. The charge may be expressed as follows:

$$K_{BIA} = EI * \alpha$$

Where

K_{BIA} = the capital charge under the Basic Indicator Approach

EI = the level of an exposure indicator for the whole institution, provisionally gross income

α = a fixed percentage, set by the Committee, relating the industry-wide level of required capital to the industry-wide level of the indicator.

Analysis of QIS data

As noted above, the Committee has undertaken a data collection and analysis exercise – the Quantitative Impact Study – to assess the likely impact of its proposals and, in the case of operational risk, to collect data to support the calibration of the capital charge. In the case of operational risk, two tranches of data were requested: the first covered exposure indicators and capital (both regulatory and economic), the second actual loss data.

The methodology for calculating the figures shown below is set out in Annex 3. In short, the RMG has taken as its starting point for this analysis of the Basic Indicator and Standardised Approaches, 12% of current minimum regulatory capital. In the case of the Standardised Approach, for each bank supplying operational risk economic capital data by business line, the RMG reviewed the relative economic capital associated with each business line and then allocated the minimum regulatory capital accordingly. Relating this capital data to the gross income data by business line, for each of the banks in this sub-sample of the QIS survey, gives the following results:

Analysis of QIS data: the Standardised Approach
(Based on 12% of Minimum Regulatory Capital)[6]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Median	Mean[7]	Weighted Average	Standard Deviation	Weighted Average Standard Deviation	Minimum	25th Percentile	75th Percentile	Maximum	Number
Corporate Finance	0.131	0.236	0.120	0.249	0.089	0.035	0.063	0.361	0.905	19
Trading & Sales	0.171	0.241	0.202	0.183	0.129	0.023	0.123	0.391	0.775	26
Retail Banking	0.125	0.127	0.110	0.127	0.066	0.008	0.087	0.168	0.342	24
Commercial Banking	0.132	0.169	0.152	0.116	0.096	0.048	0.094	0.211	0.507	27
Payment & Settlement	0.208	0.203	0.185	0.128	0.068	0.003	0.100	0.248	0.447	15
Agency Services & Custody	0.174	0.232	0.183	0.218	0.154	0.056	0.098	0.217	0.901	14
Retail Brokerage	0.113	0.149	0.161	0.073	0.066	0.050	0.097	0.199	0.283	15
Asset Management	0.133	0.185	0.152	0.167	0.141	0.033	0.079	0.210	0.659	22

For the Basic Indicator Approach, alphas are calculated as 12 percent of minimum regulatory capital divided by gross income. The “Individual Observations” results are calculated using separate observations for each bank for each year it is in the sample. The “Bank Averages” results are calculated based on a single simple-average observation per bank across the years it is in the sample.

Analysis of QIS data: Basic Indicator Approach
(Based on 12% of Minimum Regulatory Capital)[8]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Median	Mean[7]	Weighted Average	Standard Deviation	Weighted Average Standard Deviation	Minimum	25th Percentile	75th Percentile	Maximum	Number
Individual Observations										
All Banks	0.190	0.221	0.186	0.135	0.120	0.019	0.137	0.246	0.831	355
Type 1 Banks	0.168	0.218	0.183	0.136	0.121	0.048	0.136	0.225	0.659	151
Type 2 Banks	0.205	0.224	0.220	0.134	0.111	0.019	0.139	0.253	0.831	204
Bank Averages										
All Banks	0.193	0.221	0.183	0.132	0.117	0.020	0.138	0.244	0.678	126
Type 1 Banks	0.170	0.219	0.179	0.133	0.118	0.056	0.140	0.224	0.547	53
Type 2 Banks	0.203	0.222	0.220	0.132	0.108	0.020	0.137	0.247	0.678	73

6 Outliers were omitted where the resulting beta factors were greater than 1.0.

7 The RMG does not anticipate that the simple mean would be used as a basis for calibrating betas and alpha, but provides the data here for informational purposes.

8 A small number of alphas greater than 1.0 were omitted as outliers.

Future review and adjustment of reported beta data

It is important that the data set out in the tables above are interpreted appropriately and any inferences drawn from these results are subject to a number of important caveats.

There are important issues connected to the comparability of the economic capital data supplied by banks. Whilst the RMG set a clear definition of operational risk in the QIS survey, there are remaining concerns that the reported economic capital data have been assessed on a range of measures, and using different methodologies. For example, the differing use of external operational risk data could have a considerable impact on the relative economic capital allocations. Therefore, results of analysis based on this data, while each individually valid, might not be comparable. With larger samples, these problems are likely to be reduced, but in the sample sizes as small as those exhibited above such issues could be significant. There are also concerns over the exact content of the operational risk economic capital data reported by banks. Again, whilst explicit guidance was given on the definition and content of this risk, the RMG has concerns that some operational risk was not captured consistently in the sample. The RMG is also aware that, for many banks, insurance instruments cover operational risk and that this may be reflected in economic capital allocations. Therefore, a calibration based on economic capital allocation may result in beta values that understate the full operational risk exposure.

Another important issue relates to sample size. As can be seen from column 10 of the above tables, whilst the data for the Basic Indicator Approach is relatively plentiful, the sample sizes available for the analysis of the Standardised Approach are quite small. This reflects the fact that only a small number of banks (29) were able to provide an allocation of operational risk economic capital across business lines. The problem is heightened in some of the less common business lines and, in one case, the RMG had to base its analysis on a sample of only 14 banks. As a result, there is significant volatility of results within each business line and, statistically, the RMG has found it difficult to determine with certainty whether the betas differ in a meaningful way across business lines. In other words, there is no purely empirical basis for determining whether a unit of gross income should systematically attract more capital in any one business line compared to another. Indeed, even the relative ranking of business lines is uncertain, as different rankings would be achieved based on the median, as compared with the weighted average.

A further issue relating to the sample is whether it is representative of the whole population of internationally active banks. Initial testing of the results of this analysis suggests that the beta multipliers derived from the sample of 29 banks do not yield, for the overall sample of participating institutions, 12% of current minimum regulatory capital, and that as a consequence, the resulting beta estimates may be understated and so would need significant upward revision to produce capital amounts at the desired level. For the year 2000 data, the application of the median beta values for the wider sample of internationally active banks yields around 9% of current minimum regulatory capital, as compared to 12% for the more limited sample. The RMG will be reviewing the reasons for this disparity.

The need for adjustment of the betas raises the question of how, and to what extent, judgement of the Committee should be used in setting point estimates for the betas. At present, the RMG has concluded that it has no final basis for setting such estimates but would welcome a dialogue with the industry on how such judgement, drawing on industry expertise as well as supervisory knowledge, might be exercised.

The RMG is still reviewing the loss data provided in the second tranche of QIS. Although such data will prove useful in considering the overall size of the charge, the framework for operational risk, and some indication of the relative riskiness of business lines, the RMG has concerns that, in view of the relatively small number of reporting banks, it will not provide a

comprehensive basis for finalising bottom-up calibration of the charge. However, the RMG does intend to provide feedback to the industry on the results of this tranche of QIS.

Qualifying criteria and the relationship between approaches

General guidance on the spectrum of approaches

Banks are encouraged to move along the continuum of available approaches as they develop more sophisticated operational risk management systems and practices. Qualifying criteria for the use of each approach are presented below. These criteria must be fulfilled to allow a bank to use a particular approach. Banks which have fulfilled the criteria for a given approach are allowed to use that approach, regardless of whether they have been using a simpler approach previously. Internationally active banks and banks with significant operational risk exposures should be required to use a more sophisticated approach than the Basic Indicator Approach. A bank will be permitted to use the Standardised Approach for some business lines and an Advanced Measurement Approach for others, subject to a materiality requirement that at least a minimum percentage of the bank's business should be in the Advanced Measurement Approach if it seeks to use that technique. To prevent arbitrage of the capital charge, banks will not be allowed to choose to revert to simpler approaches once they have been approved for more advanced approaches.

Basic Indicator Approach

The Basic Indicator Approach is intended to be applicable to any bank regardless of its complexity or sophistication, although the Committee does not expect that supervisors will permit internationally active banks and banks with significant operational risk exposure to use such an approach. As a point of entry for capital calculation, no criteria for use of the Basic Indicator Approach are set forth in the Pillar 1 framework. Nevertheless, banks using this approach should comply with the Committee's guidance on *Operational Risk Sound Practices*, which will be published in the near future.

Standardised Approach

Banks will have to meet the following standards to be eligible for the Standardised Approach:

(i) Effective risk management and control

- The bank must have a well-documented, independent operational risk management and control process, which includes firm-level policies and procedures concerning operational risk and strategies for mitigating operational risk.

- The board of directors and senior management must be actively involved in the oversight of the operational risk management process.

- There must be regular reporting of relevant operational risk data to business unit management, senior management and the board of directors.

- Internal auditors must regularly review the operational risk management processes. This review should include both the activities of the business units and the operational risk management and control process.

(ii) Measurement and validation

- The bank must have both appropriate risk reporting systems to generate data used in the calculation of a capital charge and the ability to construct management reporting based on the results.

- The bank must begin to systematically track relevant operational risk data, including internal loss data, by business line.

- The bank must develop specific, documented criteria for mapping current business lines and activities into the standardised framework. The criteria must be reviewed and adjusted for new or changing business activities and risks as appropriate.

As with the Basic Indicator Approach, banks using the Standardised Approach should comply with *Operational Risk Sound Practices* paper.

Advanced Measurement Approaches

Banks wanting to use the AMA will be subject to a set of general criteria, qualitative standards covering their operational risk management structure, processes and environment, and quantitative standards governing internal estimates used in the AMA calculations. Annex 1 sets out proposals for these criteria. The RMG will be giving consideration to how these criteria are implemented and monitored. Further, the future role of the Committee in encouraging consistency in the application of the qualifying criteria to different types of AMA and across jurisdictions will also be reviewed.

D. Role of Pillars 2 and 3

The New Basel Capital Accord is based on three complementary pillars – minimum capital requirements (Pillar 1), the supervisory review process (Pillar 2) and the enhancement of market discipline through disclosure (Pillar 3). Set out above is a framework for Pillar 1. This section focuses on the role of Pillars 2 and 3.

Pillar 2

The January 2001 consultative paper established an overall framework for Pillar 2, based around four principles. Pillar 2 applies to all risks that a bank is facing, regardless of whether there is a minimum capital requirement. In the case of operational risk, which is in its early stages of development in both a regulatory and industry context, it is clear that Pillar 2 has an important role to play. Under the first principle of Pillar 2, a bank should establish systems to identify, measure, monitor and control the risks it faces and maintain capital accordingly. Under principles 2-4, supervisors should assess the internal capital adequacy assessments and strategies in place and require remedial actions where these are inadequate. There are a range of remedial actions that may be applied to banks, such as strengthening risk management, improving internal controls, or increasing regulatory capital.

In order to give the Pillar 2 generic 'umbrella' framework more meaning for both banks and supervisors, the Committee has drawn attention to the existing guidance it has published in the *Core Principles for Effective Banking Supervision* and in numerous risk management papers, covering specific banking risks. In order to supplement this existing body of guidance, the Committee will publish a paper on *Sound Practices for Operational Risk Management*. This will provide generic guidance to banks and supervisors on the kind of

mechanisms that form a reliable risk management framework and hence the basis for a Pillar 2 evaluation. This guidance will be widely applicable, but in order to encourage more sophisticated risk management techniques, the Committee will also draw attention to some of the more advanced techniques that sophisticated institutions may seek to use. This paper will be published in the near future for a period of public consultation.

The relationship between Pillar 1 and Pillar 2

It is important to clarify the potential boundaries and overlaps between the qualifying criteria that permit the use of the more advanced approaches to regulatory capital assessment and the assessment of internal capital adequacy assessments for operational risk, and other risk, in the context of Pillar 2.

The qualifying criteria are minimum standards of effective risk management (identification, measurement, monitoring and control) and validation of data that a bank must meet in order to avail itself of a particular regulatory capital assessment methodology. A bank must meet these standards on an initial and on-going basis. The supervisor may well wish to use the supervisory review process to assess compliance with these criteria, but they form an integral part of the first pillar.

In contrast, the Pillar 2 framework provides supervisors with a basis for assessing a bank's internal capital adequacy in relation to its risk profile and the regulatory minimum requirements applied to the bank. This is based on an assessment of the particular risk profile and risk management arrangements the bank demonstrates. A significant part of this exercise involves an assessment of the risk management systems of the bank and in that sense, it is linked to the qualifying criteria under Pillar 1. While by design, Pillar 2 does not provide a formulaic approach to the assessment of capital needs in the supervisory review process, supervisors will engage in a regular dialogue to compare review criteria and techniques and thus help promote a level playing field across jurisdictions.

Pillar 3

In the January 2001 Consultative Package the Committee set out disclosure requirements and recommendations applying to operational risk. The Transparency Group of the Basel Committee has been considering the extent to which the proposals set out in January might be streamlined whilst remaining relevant. This is particularly important in the operational risk area, where initial industry feedback suggested strong opposition to publication of operational risk loss data.

As a result of this streamlining exercise, the Transparency Group's current proposals for operational risk disclosure requirements are set out below:

Qualitative disclosures	The approach(es) for operational risk capital assessment that the bank qualifies for.
	The operational risk management objectives and policies, including: • strategies and processes; • the structure, and organisation of the risk management function; • the scope and nature of risk reporting and/or measurement systems; and • policies for hedging and/or mitigating risk and strategies and processes for monitoring the continuing effectiveness of hedges/mitigants.
	Description of the AMA used by the bank.
Quantitative disclosures	Operational risk capital charge per business line (if available).

This framework of disclosure will apply to all banks. There remains a question of whether the RMG will attach additional disclosure requirements to the more advanced approaches for operational risk. One candidate could be the size of any potential qualitative adjustment to a Pillar 1 capital charge. This would reveal whether the adjustment regime was being properly applied in different jurisdictions and would also prompt an explanation from the bank for its particular adjustment. Other relevant disclosure could relate to the 'floor' in the AMA, for instance, whether a bank's operational risk capital charge is either above or at the level of the floor.

E. Insurance

One important theme in the comments received from the financial industry on the January Consultative Package was the issue of insurance as an operational risk mitigant. Commenters cited both long-standing types of insurance contracts (such as bankers blanket bonds) that have an extensive history of protecting banks against operational losses from events such as fraud and employee theft, and new insurance products intended to provide coverage of some of the emerging forms of operational risk. Citing the existence and possible expansion of the use of such insurance products, representatives of both the banking and insurance industries urged that the risk-mitigating effects of insurance be recognised in the regulatory capital calculations for operational risk. It was partly in response to these comments that the Committee decided to reduce the overall level of the operational risk capital charge.

The RMG also recognises that arguments have been put forward for the explicit recognition of robust and comprehensive insurance of operational risk, and it is currently of the view that if such recognition of insurance is permitted, it should be limited to those banks that use AMA. This reflects the quality of risk identification, measurement, monitoring and control inherent in the AMA and the difficulties in establishing a rigorous mechanism for recognising insurance where banks use a simpler regulatory capital calculation technique. The RMG does not at this stage intend to specify the exact technique by which insurance is captured under the AMA, as to do so would contradict the flexibility inherent in the AMA concept. However, there are a number of issues which do warrant consideration, including:

- If an explicit, formulaic treatment is developed, what standards should be in place for qualifying insurance companies and insurance products, and what is an appropriate formula for recognition of insurance that is risk-sensitive but not excessively complex?

- How is it possible to differentiate between commonly used insurance products, with which both banks and supervisors have extensive experience, and innovative, untested products that may be developed to provide coverage for emerging operational risks?

The RMG feels that however banks in the AMA capture insurance, there should be a limit on the overall impact of insurance risk mitigation on the final capital amount. The limit recognises that in some cases, insurance may provide less than perfect coverage of operational risks, due to factors such as delays in payment or legal challenges of contractual terms. In addition, the limit helps ensure that the remaining capital charge provides an adequate cushion for residual risk. For these reasons, the RMG proposes that the capital reduction stemming from the impact of insurance be included within the floor of 75% of the standardised capital charge.

Recognition of any insurance contract would be subject to a set of qualifying criteria intended to ensure that the policy will provide coverage of operational risk losses with a high degree of certainty. Although the RMG has yet to develop specific criteria, these would likely cover issues such as the timeliness of payment following loss events, the certainty of coverage (that is, contingencies in the terms of the contract that might open the possibility that certain losses would not be covered), and issues surrounding length of contract and policy renewal. Qualifying criteria might also establish standards concerning the insurance companies issuing the policies, such as minimum acceptable credit or claims payment ratings, use of and policies surrounding reinsurance, or regulatory oversight. The RMG plans to consult with the banking and insurance industries as work on developing these qualifying criteria progresses. Work remains to be done to refine a potential treatment for insurance under the operational risk capital charges. The RMG plans to study the various alternatives and to consult further with banking and insurance industry representative over the coming months.

Annex 1

Qualifying Criteria for Advanced Measurement Approaches for Operational Risks

Set out below is the RMG's initial proposal for a set of criteria for the Advanced Measurement Approaches (AMA). In a number of instances, additional criteria will be developed to supplement those outlined below. In particular, the RMG envisages that additional specificity and clarity will be required in areas such as standards for the use of external data, covering for instance scaling, comparability and coverage. Another example is insurance, where criteria on the speed and certainty of payment, as well as the solvency of the counterparty are likely to apply. Furthermore, a number of issues, notably the assessment of correlations between risk types and the treatment of insurance, are set out in the criteria as a reflection of current thinking and to encourage discussion, rather than as a definitive statement of acceptance of a particular feature of the AMA regime.

1. General Criteria

1. The use of the AMA will be conditional upon the explicit approval of the bank's supervisory authority or authorities.

2. The supervisory authority will only give its approval if at a minimum:

   - it is satisfied that the bank's risk management system is conceptually sound and is implemented with integrity;
   - the bank has, in the supervisory authority's view, sufficient staff resources in the use of AMA in the major business lines as well as the control and audit areas;
   - the bank's AMA is based on a rigorous analysis of internal and external data;
   - the bank regularly conducts scenario analysis along the lines discussed below.

3. Supervisory authorities will have the right to insist on a period of initial monitoring of a bank's AMA before it is used for supervisory capital purposes.

4. In addition to these general criteria, banks using internal methodologies for capital purposes will be subject to the qualitative and quantitative standards detailed in sections 2 and 3 below.

2. Qualitative Standards

It is important that supervisory authorities are able to assure themselves that banks using the Advanced Measurement Approaches have operational risk management systems that are conceptually sound and implemented with integrity. Accordingly, the supervisory authority will

specify a number of ***qualitative standards*** that banks would have to meet before they are permitted to use the AMA for operational risk capital. Banks must comply with the following qualitative criteria:

(a) The bank must have an independent operational risk management function that is responsible for the design and implementation of the bank's operational risk management system. The operational risk management function should be responsible for codifying firm-level policies and procedures concerning operational risk management and controls; for the design and implementation of the firm's operational risk measurement methodology; for the design and implementation of a risk-reporting system for operational risk; and for developing strategies to identify, measure, monitor and control operational risk.

(b) The board of directors and senior management must be actively involved in the operational risk management process.

(c) The bank's internal operational risk measurement system must be closely integrated into the day-to-day risk management processes of the bank. Its output must be an integral part of the process of monitoring and controlling the bank's operational risk profile. For instance, this information should play a prominent role in risk reporting, management reporting, internal capital allocation, and/or risk analysis. In addition, the bank must develop techniques for allocating operational risk capital to major business lines and for creating incentives to improve the management of operational risk throughout the firm.

(d) There must be regular reporting of operational risk exposures and loss experience to business unit management, senior management, and to the board of directors. To qualify for the AMA, the bank must track its internal loss experience in a manner consistent with the regulatory framework set out in Annex 2. As part of this process, the bank must track operational risk losses related to its market and credit activities (e.g. fraud in credit cards). The Committee does not plan to double count these losses for the purpose of determining the regulatory capital charge.

(e) The bank must engage in a regular program of scenario analysis, particularly as regards very infrequent but extreme events that could cause substantial losses. The results of these scenario analyses must be part of the process of evaluating the bank's economic capital allocations for operational risk and part of the broader process of managing operational risk exposures (for instance, part of the process of contingency planning for rare, but severe, operational risk events).

(f) The bank must have a routine in place for ensuring compliance with a documented set of internal policies, controls and procedures concerning the operational risk measurement system. The bank's risk measurement system must be well-documented, for example, through a risk management manual that describes the basic principles of the risk measurement system and that provides an explanation of the empirical techniques used to measure operational risk.

(g) Internal and/or external auditors must perform regular reviews of the operational risk management processes and measurement systems. This review must include both the activities of the business units and of the independent operational risk management function.

(h) The validation of the operational risk measurement system by external auditors and/or supervisory authorities must, at a minimum, include the following:

- Verifying that the internal validation processes are operating in a satisfactory manner; and

- Making sure that data flows and processes associated with the risk measurement system are transparent and accessible. In particular, it is necessary that auditors and supervisory authorities are in a position to have easy access, whenever they judge it necessary and under appropriate procedures, to the system's specifications and parameters.

3. Quantitative Standards for Internal Operational Risk Measures

The minimum regulatory capital requirement for operational risk under the AMA will be based on an estimate of operational risk exposure derived from a bank's internal risk measurement system, subject to a floor. This section describes a series of ***quantitative standards*** that will apply to internally generated operational risk measures for purposes of calculating the regulatory minimum capital charge.

(a) The capital charge will equal the greater of (1) the risk measure generated by the bank's internal operational risk measurement system using the supervisory soundness standards discussed below and (2) a floor equal to 75 percent of the Standardised Approach capital charge for operational risk.

(b) The bank must be able to demonstrate that the risk measure used for regulatory capital purposes reflects a holding period of one-year and a confidence level of 99.9 percent.

(c) The internal risk measurement system must capture the impact of infrequent, but potentially severe, operational risk events. That is, the internally generated risk measure must accurately capture the "tail" of the operational risk loss distribution.

(d) Any internal operational risk measurement system used for regulatory capital purposes must be consistent with the scope of operational risks defined by supervisors. In particular, the risk measurement system must reflect the following definition of operational risk: "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events." This definition includes legal risk, but excludes strategic and reputational risk.

(e) Any internal operational risk measurement system used for regulatory capital purposes must be supported by loss database systems that are consistent with the definition of operational risk given in (d) above. To be eligible for use in the Advanced Measurement Approaches, a bank must collect historical internal loss data and exposure indicators in a form that is consistent with the business line/event type categories specified by supervisors. Although these categorisations need not be used in the bank's internal operational risk measurement system, the bank must be able to map its loss data categorisations into the supervisory categories and to provide loss data, along with relevant exposure indicators, grouped on this basis to supervisors.

(f) The bank must have an appropriate systems information infrastructure capable of identifying and gathering comprehensive operational risk loss data necessary to create the loss database described in (e) above and to support appropriate analytics. Systems must be able to gather data from all appropriate sub-systems and geographic locations, subject to a *de minimis* limit, to be determined by the

Committee. Missing data from various systems, groups or locations must be explicitly identified and tracked.

(g) The bank must develop specific criteria for assigning loss data to particular business lines and risk types. In particular, procedures must be in place that assign losses arising from an event in a centralised function (e.g. an information technology department) or an outsourced activity that affects more than one business line.

(h) The bank must also have procedures in place to scale internal loss data when circumstances – such as a significant merger/disvestiture or the acquisition/sale of a significant new business line – have altered the size of the bank's operations. These procedures must be clearly documented and subject to independent review on a periodic basis.

(i) The bank must establish procedures for the use of external data as a supplement to its internal loss data. The use of external loss data would be appropriate in instances where a bank has experienced only a limited number of loss events for a given business line or event type or when there is reason to believe that the bank is exposed to infrequent, yet potentially severe, losses that may only be captured through use of information covering a large number of institutions. External loss data may also be useful in assessing the plausibility of internally generated scenarios. The bank must establish criteria for identifying such situations. In addition, they must specify procedures and methodologies for the scaling of external loss data or internal loss data from other sources. These conditions and practices must be regularly reviewed, documented, and subject to periodic independent review.

(j) The bank must periodically review its methodologies and data inputs, considering historical data, developments that could alter the relevance of historical data, and emerging industry practice.

(k) The bank must identify clearly those exceptional situations in which judgement overrides may be used, to what extent they are used, and who is authorised to make such decisions. The conditions under which these overrides may be made and detailed records of the changes must be clearly documented and subject to independent review.

(l) Internally generated operational risk measures used for regulatory capital purposes must be based on a minimum historical observation period of five years. That said, the appropriate historical observation period for certain business lines or event types could be longer than five years, for instance, when the frequency of loss events is low. In these cases, the risk estimates must be based on longer historical observation periods. However, during an initial transition period, a three year historical data window might be accepted for all business lines and event types.

(m) The bank must regularly conduct validation of any parameters (e.g., loss rates, risk indicators, or scale indicators) used in its internal loss measurement systems in order to ensure that the inputs to the regulatory capital charge are reliable. Similarly, the bank must validate the risk estimates produced by the operational risk measurement system by comparison to subsequent loss experience or other techniques. The validation approaches must be well-documented and suitable for review by supervisors and internal and external auditors.

(n) The bank will be permitted to recognise empirical correlations in operational risk losses across business lines and event types, provided that it can demonstrate that its systems for measuring correlations are sound and implemented with integrity. In

the absence of specific, valid correlation estimates, risk measures for different business lines and/or event types must be added for purposes of calculating the regulatory minimum capital requirement.

(o) The bank will be allowed to recognise the risk-mitigating impact of insurance in the measures of operational risk used for regulatory minimum capital requirements. Eligible insurance contracts must meet criteria specified by supervisors. The precise method used will be subject to bank discretion as long as it is well-documented and subject to review and approval by internal and external auditors.

(p) Banks may use qualitative adjustments or scorecards as a means to allocate and adjust operational risk capital and to recognise in a forward-looking manner possible improvement or deterioration in the firm's operational risk exposure and/or control environment, subject to standards that address the structure, comprehensiveness, and rigour of the adjustment.

Annex 2

Business line/event types classification

BUSINESS UNITS	LEVEL 1 BUSINESS LINES	Internal Fraud	External Fraud	Employment Practices and Workplace Safety	Clients, Products & Business Practices	Damage to Physical Assets	Business Disruption and System Failures	Execution, Delivery & Process Management
INVESTMENT BANKING	Corporate Finance (including Municipal/Gov't Finance and merchant banking)							
	Trading & Sales							
BANKING	Retail Banking							
	Commercial Banking							
	Payment and Settlement							
	Agency Services and Custody							
OTHERS	Asset Management							
	Retail Brokerage							

Detailed loss event type classification

Event-Type Category (Level 1)	Definition	Categories (Level 2)	Activity Examples (Level 3)
Internal Fraud	Losses due to acts of a type intended to defraud, misappropriate property or circumvent regulations, the law or company policy, excluding diversity/ discrimination events, which involves at least one internal party.	Unauthorised Activity	Transactions not reported (intentional) Trans type unauthorised (w/monetary loss) Mismarking of position (intentional)
		Theft and Fraud	Fraud / credit fraud / worthless deposits Theft / extortion / embezzlement / robbery Misappropriation of assets Malicious destruction of assets Forgery Check kiting Smuggling Account take-over / impersonation / etc. Tax non-compliance / evasion (wilful) Bribes / kickbacks Insider trading (not on firm's account)

Event-Type Category (Level 1)	Definition	Categories (Level 2)	Activity Examples (Level 3)
External Fraud	Losses due to acts of a type intended to defraud, misappropriate property or circumvent the law, by a third party	Theft and Fraud	Theft/Robbery Forgery Check kiting
		Systems Security	Hacking damage Theft of information (w/monetary loss)
Employment Practices and Workplace Safety	Losses arising from acts inconsistent with employment, health or safety laws or agreements, from payment of personal injury claims, or from diversity / discrimination events	Employee Relations	Compensation, benefit, termination issues Organised labour activity
		Safe Environment	General liability (slip and fall, etc.) Employee health & safety rules events Workers compensation
		Diversity & Discrimination	All discrimination types
Clients, Products & Business Practices	Losses arising from an unintentional or negligent failure to meet a professional obligation to specific clients (including fiduciary and suitability requirements), or from the nature or design of a product.	Suitability, Disclosure & Fiduciary	Fiduciary breaches / guideline violations Suitability / disclosure issues (KYC, etc.) Retail consumer disclosure violations Breach of privacy Aggressive sales Account churning Misuse of confidential information Lender Liability
		Improper Business or Market Practices	Antitrust Improper trade / market practices Market manipulation Insider trading (on firm's account) Unlicensed activity Money laundering
		Product Flaws	Product defects (unauthorised, etc.) Model errors
		Selection, Sponsorship & Exposure	Failure to investigate client per guidelines Exceeding client exposure limits
		Advisory Activities	Disputes over performance of advisory activities
Damage to Physical Assets	Losses arising from loss or damage to physical assets from natural disaster or other events.	Disasters and other events	Natural disaster losses Human losses from external sources (terrorism, vandalism)
Business Disruption and System Failures	Losses arising from disruption of business or system failures	Systems	Hardware Software Telecommunications Utility outage / disruptions

Event-Type Category (Level 1)	Definition	Categories (Level 2)	Activity Examples (Level 3)
Execution, Delivery & Process Management	Losses from failed transaction processing or process management, from relations with trade counterparties and vendors	Transaction Capture, Execution & Maintenance	Miscommunication Data entry, maintenance or loading error Missed deadline or responsibility Model / system misoperation Accounting error / entity attribution error Other task misperformance Delivery failure Collateral management failure Reference Data Maintenance
		Monitoring and Reporting	Failed mandatory reporting obligation Inaccurate external report (loss incurred)
		Customer Intake and Documentation	Client permissions / disclaimers missing Legal documents missing / incomplete
		Customer / Client Account Management	Unapproved access given to accounts Incorrect client records (loss incurred) Negligent loss or damage of client assets
		Trade Counterparties	Non-client counterparty misperformance Misc. non-client counterparty disputes
		Vendors & Suppliers	Outsourcing Vendor disputes

Annex 3

Calibration of the Basic Indicator and Standardised Approaches: Empirical Evidence

This annex provides an overview and discussion of the empirical work done in support of the calibration of the Basic Indicator and Standardised Approaches (BIA and TSA) for operational risk capital.

Background and Data

In its January 2001 consultative paper, the Committee, working through the RMG, proposed three methods for assessing minimum regulatory capital for operational risk. This annex presents an analysis of the Quantitative Impact Survey (QIS) results for the two simpler methods: the Basic Indicator and Standardised Approaches.[9] Specifically, the analysis below is based on responses supplied by banks to the QIS concerning their overall minimum regulatory capital requirements, as well as information about internal capital allocations for operational risk and gross income, both in the aggregate and by business line. The analysis does not include any assessment of operational risk losses; this information was provided in later portions of the QIS. As such, the analysis below represents a "top-down" exercise that has not yet been benchmarked against actual loss experience. The RMG will undertake this benchmarking over the coming months.

The QIS survey, which is available on the BIS website, asked banks to provide information concerning their minimum regulatory capital, internal economic capital allocations, and gross income, both in the aggregate and, in some cases, broken down by risk type (credit, market, operational and other) and business line. In the business line breakdowns, banks were asked to divide data into eight broad categories: Corporate Finance, Trading and Sales, Retail Banking, Commercial Banking, Payment and Settlement, Agency Services and Custody, Retail Brokerage, and Asset Management. Banks were asked to exclude any insurance and non-banking activities from the figures. The survey covered the years 1998 to 2000.

Overall, more than 140 banks provided some information on the operational risk section of the QIS. These banks included 57 large, internationally active banks (called "type 1" banks in the survey) and more than 80 smaller institutions ("type 2" banks) from 24 countries. Nearly all responding institutions were able to provide basic information about minimum regulatory capital requirements, risk-weighted assets and aggregate gross income for at least some of the years covered by the survey. Somewhat fewer institutions (about 100) provided more detailed data about gross income by business line, while a more limited number provided data on economic capital allocated for operational risk. Specifically, about 60 institutions provided information about overall economic capital for at least one sample year, while 50 institutions provided data breaking out economic capital by risk type and 31 institutions were

[9] The work in this annex does not directly address calibration of the AMA, though calibration of the BIA and TSA will affect AMA calibration both by establishing the general level of the capital charge and through the AMA floor, which will be based on the TSA.

able to provide operational risk capital figures broken out by business line. Banks able to provide this greater degree of detail were predominantly, though not exclusively, "type 1" institutions.

The survey asked banks to provide certain data according to a standard set of definitions. In particular, banks were asked to provide minimum regulatory capital figures and risk-weighted assets according to the definitions built into the current Basel Accord and to provide gross income based on a definition supplied in the QIS documentation: net interest income (interest received minus interest paid) plus net fees and commissions (fees and commissions received minus fees and commissions paid) plus net trading income plus gross other income, excluding operational risk losses and extraordinary items. Banks were given the leeway, however, to report gross income consistent with local GAAP standards.

The survey did not impose standard definitions for the economic capital figures reported, either in terms of degree of prudential coverage (for instance, the holding period and loss percentile implicit in the figures) or of the methodology for calculating the figures. Banks were, however, asked to give a brief explanation of how they calculated the economic capital figures. In terms of the operational risk portion of economic capital, banks were asked to provide figures consistent with the Committee's proposed definition of operational risk. In particular, banks were asked to exclude strategic and business risk from the estimates.

Overall Capital for Operational Risk

The first step in the analysis of the QIS data was to gain some insight about the appropriate overall level of the operational risk capital charge. The RMG used the data provided in the QIS to gain some understanding of the role of operational risk capital allocations in banks and the relationship to minimum regulatory capital for operational risk.

The RMG examined the relationship between economic capital allocated to operational risk and both overall economic capital and minimum regulatory capital (keeping in mind the caveats about the economic capital figures discussed above). This was done by calculating the ratio of operational risk economic capital to overall economic capital and to minimum regulatory capital for the banks that provided a breakdown of economic capital into risk types for 2000.[10] These results are summarised in Table 1 below:

[10] Although 50 banks in total supplied some information about economic capital by risk type, only 40 of these provided data on economic capital for operational risk.

Table 1

Ratio of Operational Risk Economic Capital to Overall Economic Capital and to Minimum Regulatory Capital

	Median	Mean	Minimum	25th Percentile	75th Percentile	Maximum	Number
Operational Risk Capital/ Overall Economic Capital	0.150	0.149	0.009	0.086	0.197	0.351	41
Operational Risk Capital/ Minimum Regulatory Capital	0.128	0.153	0.009	0.074	0.170	0.876	41

Note: Minimum regulatory capital is calculated as 8 percent of reported risk-weighted assets.

The results suggest that, on average for banks in the sample, operational risk capital represents about 15 percent of overall economic capital, though there is some amount of dispersion around this figure. Operational risk capital appears to represent a rather smaller share of minimum regulatory capital, somewhat over 12 percent for the median bank in the sample.

These results suggest that a reasonable level of the overall operational risk capital charge would be about 12 percent of minimum regulatory capital. This figure is slightly below the typical figure for banks in the sample, which is appropriate if there is a desire to calibrate regulatory capital to a somewhat less stringent prudential standard than internal economic capital. That said, a figure in the range of 12 percent is not out of line with the proportion of internal capital allocated to operational risk for many banking institutions in the sample (about half the sample had ratios of operational risk capital to overall economic capital that fell within plus or minus 50 percent of this 12 percent level).

Basic Indicator Approach

Under the Basic Indicator Approach, regulatory capital for operational risk is calculated as a percentage (the "alpha") of a bank's gross income. It was first assumed that the capital charge under the BIA is based on an overall level of 12 percent of minimum regulatory capital, as suggested by the analysis described above.[11] The data reported in the QIS concerning banks' minimum regulatory capital amounts and gross income was then used to calculate individual alphas for each bank for each year (1998 to 2000) it is in the sample. Specifically, the calculation was:

[11] If a different overall calibration level were ultimately selected, the analysis described in this section could be adjusted to reflect that new level simply by multiplying the reported figures by the ratio of the new calibration level to 12 percent. For example, if the new calibration level were X percent of minimum regulatory capital, then all the figures reported above should be multiplied by X/12).

$$\alpha_{j,t} = \frac{0.12 * MRC_{j,t}}{GI_{j,t}},$$

where $MRC_{j,t}$ is minimum regulatory capital for bank j in year t and $GI_{j,t}$ is gross income for bank j in year t. Minimum regulatory capital is calculated as 8 percent of a bank's risk-weighted assets for the year in question.

Given these calculations, the distribution of alphas across banks in the sample was reviewed. In examining the results, one "outlier" observation was dropped where the alpha was very large, since this observation tended to skew the results. Two observations where reported gross income for the bank was negative were also dropped. Finally, all observations where the bank did not report gross income for a given year were dropped. These results are reported in Table 2 below:

Table 2

Analysis of QIS data: Basic Indicator Approach
(Based on 12% of Minimum Regulatory Capital)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Median	Mean[7]	Weighted Average	Standard Deviation	Weighted Average Standard Deviation	Minimum	25th Percentile	75th Percentile	Maximum	Number
Individual Observations										
All Banks	0.190	0.221	0.186	0.135	0.120	0.019	0.137	0.246	0.831	355
Type 1 Banks	0.168	0.218	0.183	0.136	0.121	0.048	0.136	0.225	0.659	151
Type 2 Banks	0.205	0.224	0.220	0.134	0.111	0.019	0.139	0.253	0.831	204
Bank Averages										
All Banks	0.193	0.221	0.183	0.132	0.117	0.020	0.138	0.244	0.678	126
Type 1 Banks	0.170	0.219	0.179	0.133	0.118	0.056	0.140	0.224	0.547	53
Type 2 Banks	0.203	0.222	0.220	0.132	0.108	0.020	0.137	0.247	0.678	73

Table 2 presents the distribution in two ways. The top panel of the table reports the distribution treating all observations individually; that is, each bank enters the distribution once for every year it is in the sample (a maximum of three years). In the bottom panel, in contrast, alphas for each bank are averaged across the years so that each bank enters only once. A comparison of the top and bottom panels suggests that the results are not significantly affected by this difference.

The first three columns of the table contain information about the median, mean, and weighted average[12] values of the alphas. The median values range between 17 and 20 percent, with somewhat higher values for the smaller "type 2" banks than for the large, internationally active "type 1" institutions. Both the average and weighted average figures tend to be somewhat higher than these median values, reflecting the presence of some large individual alpha estimates. However, in both cases, the figure for "type 1" banks was lower than the figure for "type 2" banks.

[12] Using gross income to weight the individual alphas.

The remaining columns of the table present information about the dispersion of the alphas across institutions. Clearly, there is a fair amount of dispersion in the estimates, especially when comparing minimum to maximum values. That said, the middle portion of the distribution is fairly tightly distributed, with the difference between the 25th and 75th percentiles (the "middle" 50 percent of the distribution) being less than two-to-one.

These results suggest, then, that an alpha in the range of 17 to 20 percent would produce regulatory capital figures approximately consistent with an overall capital standard of 12 percent of minimum regulatory capital. Of course, given the use of a single regulatory alpha and the dispersion of estimated alphas, there would be variation in the relationship between minimum regulatory capital and the BIA capital requirement across individual banks.

Standardised Approach

Under the Standardised Approach, the minimum regulatory capital requirement for operational risk will be calculated by dividing a bank's operations into eight separate business lines. For each business line, the capital requirement will be calculated as a certain percentage of gross income for that business line. The individual business line capital charges are summed to form the bank's overall operational risk capital charge.

The approach used here was to estimate betas by business line for individual banks and then to examine the distribution of those betas across the sample banks. In making these calculations, the QIS data concerning the distribution of operational risk economic capital and gross income across business lines was used. As with the BIA, the baseline assumption was that the overall level of operational risk capital is 12 percent of minimum regulatory capital. Then, information about the distribution of operational risk economic capital was used to distribute this regulatory capital amount across business lines. This business line regulatory capital figure was then divided by business line gross income to arrive at a bank-specific beta for that business line.[13] This approach can be summarised in the following formula:

$$\beta_{j,i} = \frac{0.12 * MRC_j * OpRiskShare_{j,i}}{GI_{j,i}},$$

where $\beta_{j,i}$ is the beta for bank j for business line i, MRC_j is minimum regulatory capital for bank j, $OpRiskShare_{j,,i}$ is the share of bank j's operational risk economic capital allocated to business line i, and $GI_{j,i}$ is the volume of gross income in business line i for bank j.

In total, just over 30 banks reported data on both operational risk economic capital and gross income by business line. However, in checking the gross income data, inconsistencies caused some banks' data to be dropped from the sample. In particular, the sum of gross income across business lines was compared with reported aggregate gross income for the bank as a whole. In some cases, these were not equal. The sum of the business line gross income was sometimes less than the aggregate figure, perhaps because the bank did not fully distribute its gross income across the business lines. In other cases, the sum of the business line figures exceeded the aggregate figure, perhaps reflecting centralised costs that were not fully distributed. In either event, the fact that the two figures disagreed called the

[13] Note that the QIS survey only requested business line operational risk capital figures for 2000, so the estimates reported below reflect data for just this one year.

accuracy of the business line data into question. For that reason, any bank where the difference between the two figures exceeded 20 percent was eliminated. This brought the total number of institutions in the sample down to 29.

Finally, for each business line, only those banks that had reported activity in that business line were included. For example, if a particular bank had activities in six of the eight business lines, then it was included in the analysis only for those six business lines. Since the 29 banks in the sample had different mixes of business activities, this resulted in a different number of observations across the business lines. Negative beta estimates, which would result from negative reported gross income for a business line, were also eliminated.[14] Finally, a few, large "outlier" beta estimates that exceeded one were dropped, since these estimates tended to be very large as compared to the bulk of the distribution and accordingly tended to skew the results. The results of this analysis are reported below in Table 3:

Table 3

Analysis of QIS data: the Standardised Approach
(Based on 12% of Minimum Regulatory Capital)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Median	Mean[7]	Weighted Average	Standard Deviation	Weighted Average Standard Deviation	Minimum	25th Percentile	75th Percentile	Maximum	Number
Corporate Finance	0.131	0.236	0.120	0.249	0.089	0.035	0.063	0.361	0.905	19
Trading & Sales	0.171	0.241	0.202	0.183	0.129	0.023	0.123	0.391	0.775	26
Retail Banking	0.125	0.127	0.110	0.127	0.066	0.008	0.087	0.168	0.342	24
Commercial Banking	0.132	0.169	0.152	0.116	0.096	0.048	0.094	0.211	0.507	27
Payment & Settlement	0.208	0.203	0.185	0.128	0.068	0.003	0.100	0.248	0.447	15
Agency Services & Custody	0.174	0.232	0.183	0.218	0.154	0.056	0.098	0.217	0.901	14
Retail Brokerage	0.113	0.149	0.161	0.073	0.066	0.050	0.097	0.199	0.283	15
Asset Management	0.133	0.185	0.152	0.167	0.141	0.033	0.079	0.210	0.659	22

The first three columns of the table present the median, mean, and weighted average values of the betas for each business line, while the remaining columns of the table present information about the dispersion of the betas across the sample.

Turning first to the column presenting the median values, there is some amount of variation in the levels of the estimated betas across business lines. The smallest beta (0.113, for the Retail Brokerage business line) is just over half the size of the largest beta (0.208 for Payment and Settlement). As with the results for alpha under the BIA, the mean values tend to be greater than the median and the weighted average, again reflecting the presence of some large individual beta estimates in some business lines.

[14] There were only three such observations.

However, there does not appear to be a consistent relationship between the size of the weighted average values – which give more weight to betas from institutions with larger amounts of activity in a particular business line, as measured by the gross income they derive from that business line – and the median values. The weighted averages are sometimes smaller than the median values (for Corporate Finance, Retail Banking, and Payment and Settlement), sometimes larger (for Trading and Sales, Commercial Banking, Retail Brokerage, and Asset Management), and sometimes fairly close (for Agency Services and Custody).

In fact, looking across the three measures of "central tendency" for the beta estimates produces somewhat divergent rankings of the relative size of the betas across business lines. Table 4 below presents these size rankings across the three measures, with "1" representing the smallest beta and "8" representing the largest. While there is some amount of agreement across the rankings (Retail Banking tends to be ranked low, while Trading and Sales, Payment and Settlement, and Agency Services and Custody tend to be ranked high), there is also considerable disagreement in the placement for some business lines (Corporate Finance and Retail Brokerage).[15] Further, in some of these cases, the numerical size of the difference in "typical" beta values across the three measures is quite large. For Retail Brokerage, for instance, the weighted average beta is more than 40 percent larger than the median value (see Table 3).

Table 4

Size Rankings Across Three Measures of "Typical" Beta by Business Line

	Median	Mean	Weighted Average
Corporate Finance	3	7	2
Trading & Sales	6	8	8
Retail Banking	2	1	1
Commercial Banking	4	3	3
Payment & Settlement	8	5	7
Agency Services & Custody	7	6	6
Retail Brokerage	1	2	5
Asset Management	5	4	3

The disparity in the estimates of "typical" beta by business line is also reflected in the measures of dispersion reported (see columns (4) to (9) of Table 3). The standard deviations of the betas within some business lines are large relative to their "typical" values, suggesting a fairly wide degree of dispersion across observations. This dispersion is also evident in examining the middle 50 percent of the distribution (the difference between the 25th and 75th percentiles). For some of the business lines, the middle 50 percent of the betas span a range of three to one and higher (Corporate Finance and Trading and Sales).

The key question that this dispersion raises is whether we can really distinguish different beta values across business lines. That is, although the specific estimates of "typical" beta vary across business lines, are these differences meaningful? The evidence discussed above suggests that they might not be. In fact, statistical tests for equality of the means and

[15] Using pairwise Spearman tests of the independence of the rankings, we cannot reject that the rankings are independent of each other. However, the relatively small number of observations may lower the power of these tests.

medians do not reject the hypothesis that these figures are the same across the eight business lines at conventional confidence levels.[16]

This conclusion is further supported visually by Figure 1, which graphs the distribution of betas by business line. For each business line, the height of bar represents the number of beta estimates falling within the numerical range indicated across the horizontal axis (0 to 0.1, 0.1 to 0.2, 0.2 to 0.3, and so on). All graphs are presented with the same scale, so they can be compared directly across business lines.

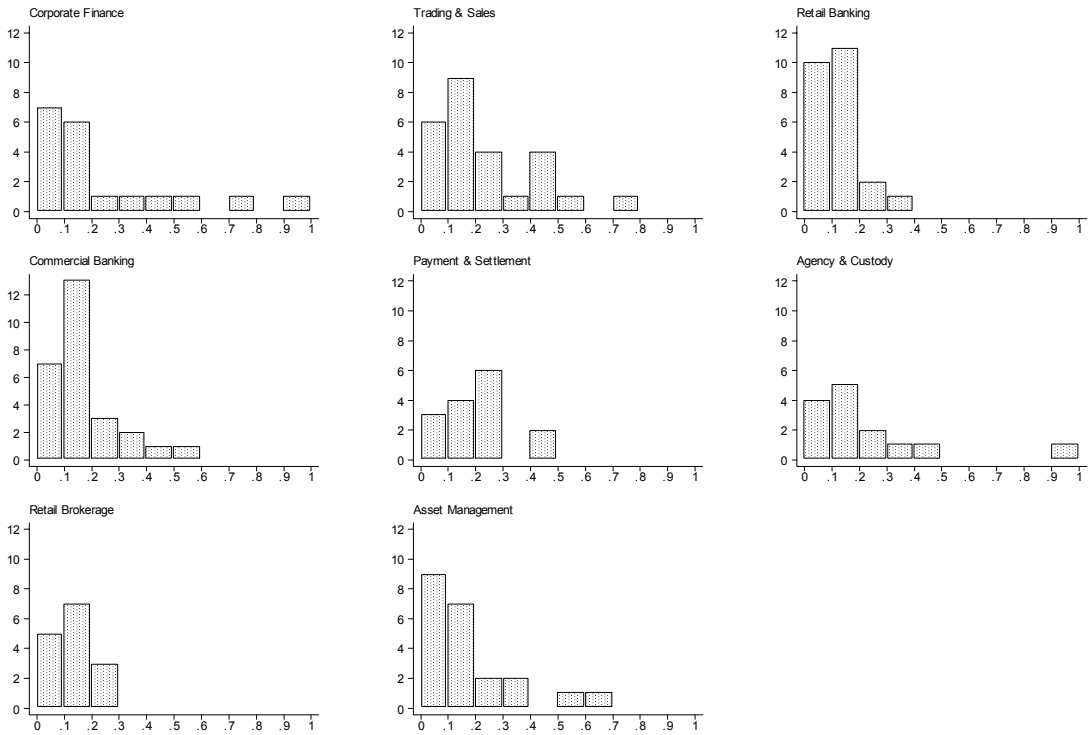
Figure 1 shows that the distribution of individual estimated betas across business lines tend to overlap one another. For most of the business lines, the bulk of the distribution falls in the same approximate range (roughly, between 0.0 and 0.2), with the primary differences across business lines appearing in the presence or absence of a few large estimated betas. The one exception to this statement appears to be Payment and Settlement, which has a significant portion of the distribution in a slightly higher range (from 0.2 to 0.3). For the remainder of the business lines, however, a high portion of the betas appear to fall into a similar range.

Of course, much of this analysis is complicated by the relatively small number of observations, which makes distinguishing meaningful differences across business lines very difficult. It is possible that if more observations were available, significant differences across business lines would emerge more clearly. Alternatively, the dispersion that is observed in the individual beta estimates within business lines could reflect differences across banks in the quality and calibration of their internal economic capital measures. In addition, banks may be applying very different definitions of what constitutes an operational risk loss, some including operational risk losses related to credit and market risk activities, with others excluding such losses from their definition. Moreover, reported gross income figures may lack comparability as the definition of gross income is not common to all jurisdictions. As a result, it is difficult to determine whether the dispersion we observe is driven primarily by the relatively small sample sizes or by important differences in the way the economic capital allocations are performed at the various institutions responding to the QIS. In the latter case, the core data underlying this exercise – the distribution of operational risk economic capital across business lines – could introduce uncertainty about the beta estimates even with larger data samples.

[16] The test of the hypothesis that the means are equal has a p-value of 0.178, while a test of the hypothesis that the medians are equal has a p-value of 0.062. While these figures, especially for the test of the medians, are near conventional confidence levels, they provide at best weak evidence for differences across business lines.

Figure 1

Dispersion of Beta Estimates by Business Line



Annex 4

Advanced Measurement Approaches

In recognition of the range of internal approaches currently under development in the banking industry, the Committee has adopted the concept of the Advanced Measurement Approaches (AMA), in which a bank's internal mechanism for assessing operational risk capital may be accepted by the supervisor, subject to a set of common criteria (see Annex 1). A common theme in the AMA is that the approaches are rooted in loss data collection and verification in a form that is consistent with the frameworks set out in Annex 2. Banks may develop a range of approaches, which, if consistent with the common criteria, may be approved by supervisors.

There are a number of approaches at different stages of development at a range of institutions and the RMG has engaged in active discussion with the industry in order to gain an understanding of these approaches. Whilst the AMA offers flexibility on the types of approaches accepted, the RMG has observed that there are three broad types of approach currently under development, which may be broadly categorised as follows: internal measurement approaches (IMA), loss distribution approaches (LDA), and scorecard approaches. This section briefly sets out the RMG's current understanding of the main features of these approaches. It does not imply that this is the final form of these approaches, nor that these will necessarily be approved under the AMA. Furthermore, there is explicit recognition by the RMG that alternative approaches may emerge. In developing their methodologies, firms may combine different elements of the three stylised approaches described below.

Internal Measurement Approaches

In this type of approach, banks generate estimates of operational risk capital based on measures of expected operational risk losses. That is, the approach assumes a fixed and stable relationship between expected losses (the mean of the loss distribution) and unexpected losses (the tail of the loss distribution). This relationship may be linear – implying the capital charge would be a simple multiple of expected losses – or non-linear – implying that the capital charge would be a more complex function of expected losses.

The IMA calculations are generally based on a framework that divides a bank's operational risk exposures into a series of business lines and operational risk event types. In such a framework, a separate expected loss figure is calculated for each business line/event type combination. Typically, expected losses are calculated by combining estimates of loss frequency and severity for various business line/event type combinations, based on internal and, where appropriate, external loss data, along with a measure of the scale of business activities for the particular business line in question. While these elements can be specified in a variety of ways, in general they can be described as follows:

- **PE**: The probability that an operational risk event occurs over some future horizon.
- **LGE**: The average loss given that an event occurs.

- **EI**: An exposure indicator that is intended to capture the scale of the bank's activities in a particular business line.

Combining these parameters, the IMA capital charge for each business line i/event type j combination ($K_{i,j}$) would be:

$$K_{i,j} = \gamma_{i,j} * EI_{i,j} * PE_{i,j} * LGE_{i,j} = \gamma_{i,j} * EL_{i,j}.$$

In this formula, a linear relationship between expected losses and the tail of the distribution is assumed, and the parameter $\gamma_{i,j}$ translates the estimate of expected losses (EL) for business line i/event type j ($EL_{i,j}$) into a capital charge. The γ for each business line/event type combination would be specified by banks (possibly via consortia) and subject to acceptance by supervisors. The overall capital charge is generally calculated as the sum of the capital charges for individual business line/event type cells.

Loss Distribution Approaches

Under loss distribution approaches, banks estimate, for each business line/risk type cell, or group thereof, the likely distribution of operational risk losses over some future horizon (for instance, one year). The capital charge resulting from these calculations is based on a high percentile of the loss distribution. As with internal measurement approaches, this overall loss distribution is typically generated based on assumptions about the likely frequency and severity of operational risk loss events. In particular, LDAs usually involve estimating the shape of the distributions of both the number of loss events and the severity of individual events. These estimates may involve imposing specific distributional assumptions (for instance, a Poisson distribution for the number of loss events and lognormal distribution for the severity of individual events) or deriving the distributions empirically through techniques such as boot-strapping and Monte Carlo simulation. The overall capital charge may be based on the simple sum of the operational risk "VaR" for each business line/risk type combination – which implicitly assumes perfect correlation of losses across these cells – or by using other aggregation methods that recognise the risk-reducing impact of less-than-full correlation.

This method differs from internal measurement approaches in one important respect: it aims to assess unexpected losses directly rather than via an assumption about the relationship between expected loss and unexpected loss. That is, internal measurement approaches estimate a single parameter of the overall loss distribution, expected losses, and assume that the relationship between expected and unexpected loses (essentially, the shape of the loss distribution) is fixed regardless of the level of expected losses and how the various components of expected loss – frequency, severity, and scale – are combined. In contrast, the loss distribution approaches allow this distribution to vary with both the level of expected losses and with variation in its components. Thus, there is no need for the determination of a multiplication (gamma) factor under this approach. At present, several kinds of loss distribution approach methods are being developed and no industry standard has yet emerged.

Scorecard Approaches

In this approach, banks determine an initial level of operational risk capital at the firm or business line level, and then modify these amounts over time on the basis of 'scorecards'

that attempt to capture the underlying risk profile and risk control environment of the various business lines. These scorecards are intended to bring a forward-looking component to the capital calculations, that is, to reflect improvements in the risk control environment that will reduce both the frequency and severity of future operational risk losses. The scorecards may be based on actual measures of risk, but more usually identify a number of indicators as proxies for particular risk types within business units/lines. The scorecard will normally be completed by line personnel at regular intervals, often annually, and subject to review by a central risk function.

In order to qualify for the AMA, a 'scorecard' approach must have a sound quantitative basis, with the overall size of the capital charge being based on a rigorous analysis of internal and external loss data. In some cases, scorecard approaches are based on initial estimation methods that are similar to those used in internal measurement or loss distribution approaches. Where the scorecard approach differs from these approaches is that it relies less exclusively on historical loss data in determining capital amounts. Instead, once the size of the capital charge has been determined, its overall size and its allocation across business lines may be modified on a qualitative basis. Nevertheless, historical loss data must be used to validate the results of scorecards, with adjustments to capital size or allocation based upon such results.

At present, a range of scorecard approaches are in development with some banks already operating a system of economic capital allocation based on such an approach. However, as with the other approaches, no industry standards has emerged.