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European Commission

Study into the methodologies to assess the overall financial position of an insurance undertaking from the perspective of prudential supervision

May 2002

Contract no: ETD/2000/BS-3001/C/45

Foreword by the Commission Services

My ventures are not in one bottom trusted,
Nor to one place; nor is my whole estate
Upon the fortune of this present year;
Therefore, my merchandise makes me not sad.

Shakespeare, *The Merchant of Venice*, Act I Scene I

The current solvency requirements for insurance undertakings in the EU have worked well over the years and they have significantly increased the protection of policy holders in the Union. Significant developments have however taken place in the insurance market as well as in supervisory practice since the rules were created, and there is consequently a need to analyse whether the rules still serve their purpose.

In the beginning of 2000, the Commission Services together with Member States initiated a fundamental and wide-ranging review of the overall financial position of an insurance undertaking (the "Solvency II" project). One of the objectives for the project is to establish a solvency system that is better matched to the true risks of an insurance company. A future solvency system in the EU should also not be overly prescriptive, avoid undue complexity, reflect market developments (such as derivatives and ART) and, where possible, be based on common accounting principles.

A project as wide-ranging and complex as "Solvency II" necessitates a very significant amount of background knowledge and updates on market developments. In order to facilitate the work, the DG MARKT commissioned a study on the subjects involved in the Solvency II project.

The Commission Services are pleased to present this study, which was prepared by a team from KPMG under the supervision of Dr Gerd Geib and Hitesh Patel. We believe that the study presents a clear overview of the different areas pertaining to the overall solvency analysis of insurance undertakings. We also hope it will stimulate further debate with policy-makers, supervisors, the insurance industry and other stakeholders in Member States, at EU level and internationally. Please note that although the study was commissioned by the Directorate-General Internal Market, it does not necessarily represent the Commission's official view. The consultants remain responsible for the facts and the views set out in the report.

The Commission Services invite interested parties to send their comments on this study to: MARKT-C2@cec.eu.int.

Please also note that the Insurance Unit of the Commission has a website, where regularly other documents of interest can be found:

http://europa.eu.int/comm/internal market/en/finances/insur/index.htm

Brussels, May 2002

Jean-Claude Thébault
Director

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1 Introduction

1.1 Contract

1.1.1 This report sets out our findings on the *"Study into the methodologies to assess the overall financial position of an insurance undertaking from the perspective of prudential supervision."* It forms part of the initial work for the EC Solvency II project. The report has been prepared in accordance with our contract with the European Commission dated 29 December 2000, contract number ETD/2000/B5-3001/C/45. The consultant, KPMG Deutsche Treuhand Gesellschaft hereafter may also be referred to as "KPMG" or "we".

1.2 Background to prudential supervision

1.2.1 Insurance, banking and investment management together account for a significant proportion of the financial transactions effected within Europe. Many of these transactions originate from the investment of funds provided by individuals and the failure of companies operating in any of these sectors can have a direct impact on those individuals concerned. The insurance industry is of fundamental economic and social importance.

1.2.2 It has long been recognised that there needs to be some form of supervision of such entities to attempt to minimise the risk of failure. Supervision has taken many forms, including requirements for licensing of insurers, ensuring the controllers are fit and proper people to run an insurance undertaking, ensuring business is properly conducted and prudential supervision of the insurance entities. It is only the last of these areas that is covered by this review.

1.2.3 The overall financial position of an insurance undertaking is, inter alia, dependent on the quality of its management, organisational structure, systems and controls and risk management systems. These are important areas for prudential supervision. We refer to this in the course of the report, but the proposals on the sequence of the work comprising the Solvency II project in EC document MARKT/2095/99 specifically remove some of these 'qualitative' factors from the scope of the initial work.

1.2.4 The requirement for prudential supervision is not unique to insurance companies, and other financial sectors such as banking and investment management are also subject to their own supervisory regimes. There have been several European Directives (the Directives) prepared in recent decades to harmonise the form of regulation applied, by sector, across Europe, although to date there has not been an attempt to harmonise across sectors.

1.2.5 The International Association of Insurance Supervisors (IAIS) has stated its view that "*an insurance supervisor is expected primarily to protect policyholders and promote a secure and efficient market"*[1] This role should be seen as the fundamental objective underlying prudential supervision, and the methods employed should be designed with a view to the protection of policyholders.

[1] IAIS Insurance Core Principles (as approved in Cape Town on 10 October 2000)

1.3 Approaches to prudential supervision

1.3.1 These areas were first dealt with in Europe through the First Life Directive and First Non-Life Directive, and later updated by the Third Life and Non-Life[2] Directives. The IAIS guidance in these five areas, with the EU Directives requirements mapped against them, is included in Appendix 1.1. The Directives only lay down minimum requirements for:

- assets - discussed in chapter 5 of this report;
- liabilities - discussed in chapter 4 of this report;
- capital adequacy and solvency - discussed in chapter 10 of this report;
- accounting - discussed in chapter 8 of this report;
- derivatives and 'off-balance sheet' items - discussed in chapter 7 of this report;
- reinsurance - discussed in chapter 6 of this report.

1.3.2 Member States are allowed a high degree of freedom to establish more stringent rules for the undertakings they authorise. In some areas the Directives do not lay down any prescriptive requirements. The Insurance Accounts Directive[3] also allows a choice over the valuation techniques to be applied to certain balance sheet items.

1.3.3 The flexibility allowed has resulted in some countries having a solvency regime that is superequivalent, i.e. implementation of rules over and above the minimum required by the EC directives. The ability to set additional capital requirements, combined with the freedom to determine the rules governing the valuation of assets and liabilities for regulatory purposes, has led to significant differences in approach adopted towards prudential supervision between Member States.

1.3.4 There is a close link to accounting and actuarial practice, and these vary significantly both between different countries due to different local implementation of the directives and also between individual insurers in the same country in a way that is not necessarily transparent.

1.3.5 In accordance with the terms of reference, this study concentrates on the examination of the financial position of an insurance undertaking, rather than an insurance group.

1.4 Work performed

1.4.1 This report reflects our work and views on all the sections of the study. Our chapter headings follow the sequence laid out in the Terms of Reference. Aspects of the proposed changes to the banking prudential regulatory system which are of relevance to insurance have been included in chapter 3 on Risks and Risk Models.

1.4.2 We have conducted a programme of visits to insurers and rating agencies and have requested detailed information from KPMG member firms in Europe, the USA and Canada, Australia, and European insurance supervisors. This research has included a

[2] IAIS Insurance Core Principles, Directive 79/267/EEC, Directive 73/239/EEC, Directive 92/96/EEC.

[3] Directive 91/674/EEC

number of meetings with supervisors, and the sending out of questionnaires designed to gain knowledge of the differing approaches to prudential supervision beyond what is available from published sources. We have also undertaken a Risk Model Survey across a number of major European insurers.

1.4.3 These mechanisms were used to obtain views and opinions on a variety of issues within the scope of the study. The feedback received from these sources as well as the information gained from researching published information and the knowledge from other KPMG practices have been taken into account in forming our conclusions.

1.4.4 Following the submission of the draft final report to the Commission we have also benefited from written feedback from the Commission and European regulators and the views expressed by the same parties at a meeting of Member States' representatives in Brussels on 23 January 2002. We have taken account of these points and incorporated them where appropriate.

1.4.5 In view of the length of the report and the level of detail in a number of different areas we have included an Executive Summary as Chapter 2. This outlines our findings and conclusions for each part of the work undertaken according to the Terms of Reference. Appendices have been collated in one section at the end of the report and are referenced from the appropriate portions of the main text.

2 Executive summary

2.1.1 The European Commission's wide ranging review of the European solvency system for insurance undertakings (Solvency II) is a complex task. The project is intended to lead to the reform of the existing solvency rules, and this study was commissioned in order to help to inform various elements of the Commission's initial work. The study's terms of reference cover a range of issues, many of which are closely inter-related. There are many complex issues which need to be addressed. There is also a need to retain sufficient simplicity in order to produce a robust, workable, cost efficient and consistent solvency methodology.

2.1.2 The review of the existing European directives (Solvency I) is complete and directives making various amendments to the existing solvency rules, were adopted in February 2002. The Commission's two-stage review of the existing system was initiated by the Müller Report of 1997, which regarded the solvency system as generally satisfactory, but recognised certain weaknesses in the methodology and gave consideration to the need for a more risk-based approach. The current system is based on three inter-connected pillars: assets; technical provisions; and the solvency margin (based on fixed ratios). The main limitations of this approach related to the narrow scope of risks considered and the insensitivity of the capital requirements with respect to company-specific risk profiles.

2.1.3 International associations, in particular the International Association of Insurance Supervisors (IAIS), are also reviewing the supervision of insurer solvency. A report by the IAIS issued in March 2000 titled "Solvency, Solvency Assessment and Actuarial Issues" considered a wide range of possible approaches for capital requirements including Risk Based Capital (RBC), scenario-based and probabilistic approaches. The report recognised the potential for improved risk-based capital but the difficulties regarding practicality and cost were also recognised.

2.1.4 There is also a wider international context to the Solvency II project. With increasing recognition of the need for a level playing field across the financial sector globally, and an emerging trend towards convergence of prudential rules for different sectors, the need for reform of the European solvency system has become more pressing. There is pressure from capital markets for greater consistency and clarity in the measurement of solvency, and market events have created further pressures. The World Trade Center disaster has had a major impact on markets internationally, and has created solvency concerns for a number of European insurance undertakings.

2.1.5 Further pressure comes from proposed changes in international accounting. The existing solvency system has worked effectively with prudent accounting and implicit margins. The potential accounting changes (if adapted for regulatory purposes) are likely to pose significant threats to the current fixed ratio model.

2.1.6 This study has involved discussions with insurance undertakings throughout Europe. There appears to be general support for reform of the existing system, and particularly for increased consistency among Member States. The findings of the study are broadly supportive of a move to a framework which takes more account of the risks which insurance undertakings face, whilst recognising the difficulties which may be involved.

2.1.7 The following pages provide a commentary on the study. The headings used follow the chapters, which reflect the eight areas set out in the study's terms of reference.

Risks and risk models

2.1.8 Chapter 3 of the study considers the main types of risks to which an insurance undertaking is exposed, together with consideration of the usefulness of existing stress test techniques and internal risk models. Insurance is a risk business and risk management is a core process in the business. An important part of risk management involves an internal assessment of financial resources and ensuring the undertaking has enough capital to mitigate the risk of financial difficulties and insolvency. This necessarily involves assessment of the full range of risks which could impact upon the financial position of the undertaking.

2.1.9 The key question for regulators and insurers alike is: what are the key risks to the financial position of the undertaking? Insurance risk is clearly key for life and non-life business (underwriting risk, and technical provisions). Asset risk (market values, interest rates, inflation), and interaction between asset and liability risk factors, is often a significant component in the risk profile. Credit risk (mainly, but not exclusively, in relation to reinsurer security and bond portfolios) is also important. Operational risk is also a major component, often cited as a separate risk category that gives rise to a need for capital, and is frequently seen as the residual risk category. It is also important to recognise the impact of the interaction of these risks.

2.1.10 A few insurers are trying to quantify operational risk and incorporate it more explicitly into advanced models. Operational risk is usually present in, and overlaps with, other risk areas, especially underwriting. Many failures in the insurance sector have been attributed to operational risk factors, often related to a combination of management and process failures. Risk management procedures, and the overall quality of management, are critical factors and, together with adequacy of financial resources these factors are of primary importance in protecting an insurance undertaking against insolvency.

2.1.11 Being able to make a reasonable assessment of capital requirements depends on an insurer being able to understand its risk profile and the financial impact of that profile. In order to achieve this, an effective risk management framework is needed and part of this is the ability to model those risks which can be quantified. Modelling them enables the financial position to be tested under different scenarios and for management to better understand the economic capital requirements of the business. Most modelling techniques take the interaction of different risks into account.

2.1.12 In general, only some of the larger insurers have developed sophisticated methodologies and there is little consistency in approach. A feature of advanced risk modelling is that by and large it tends to be developed in house, or tailored specifically, so there are few standard models. Only a minority of models attempt to cover the full spectrum of risks; many models are partial, and used for certain areas of risk management.

2.1.13 Given the complexity and variety of risk profiles in insurance business, and the variety in the types of approaches in use, it is unlikely to be possible or desirable to impose a rigid approach. However, experience of some insurance supervisors (particularly in the US)

and in the banking sector, shows there are benefits in setting regulatory standards which encourage the industry to raise risk management standards.

2.1.14 Developments in banking regulation are helpful in providing an insight into the difficulties for regulators in placing reliance on internal methodologies in the capital adequacy process. They also help to indicate the type of conditions which must be met before regulators can rely on models and other methodologies. In order for internal models (and other methodologies) to be of significant use to supervisors in assessing capital requirements, various conditions would be necessary, but three are fundamental:

- models must be relied on by senior management in running the business; they must be a basis for decision making. This has proved a sticking point in the banking sector, especially in certain risk areas where the reliability of models cannot easily be tested (and management do not rely on them);
- it must be possible to quantify the risks involved and provide a value as a result;
- it must be possible to validate the models – this means there has to be an appropriate form of internal but independent testing.

2.1.15 The discussion in Chapter 3 of the risks faced by insurance undertakings, and the comparison to risks faced by banks, indicates that there is generally greater complexity and diversity of risks to insurance business. Accordingly, validation of risk models used by insurance undertakings is likely to prove more difficult. It is possible to make assessments of a model's design, internal integrity, consistency and logic, but the more complex models involve considerable judgement in assumptions.

2.1.16 Risk models could serve a useful purpose for insurance regulators but there are many difficulties involved. Increasing complexity of models is invariably accompanied by increasing data requirements, cost and communication issues, but with enhanced benefits in terms of predictive power of insolvency[4]. There are considerable practical issues related to the quality and ease of use of models. In many cases, the necessary data for representing current exposures and estimating reliable exposures is not available. This requires a high degree of judgement, both in the assumptions made and in the interpretation of the results. These practical issues impose some limitations to the usefulness of such models for regulatory purposes.

2.1.17 The study makes reference to the role of senior management in insurance undertakings, to ensure adequate risk management systems are established and maintained. This is an area where broad standards could be incorporated in a future system, recognising the pivotal role of senior management and providing added incentives for insurance undertakings to advance their risk management approaches. A key incentive could lie in permitting capital requirements to be based on internal methodologies (such as probabilistic models), which could lead to lower capital requirements, compared to a factor based industry wide system.

[4] The extent to which various alternative solvency methodologies include predictive power to identify potential insolvencies is dealt with in chapter 10.

Technical provisions

2.1.18 A key area where modelling techniques and stress testing can provide significant benefits is the area of technical provisions. This is one of the three pillars of the existing European system and of fundamental significance in any assessment of the financial position of an insurance undertaking.

2.1.19 Chapter 4 includes a description of the main methods in use for the determination of non-life technical provisions. It considers differences between Member States and reflects on the need for, and possibility of, harmonisation at the European level. The focus of the chapter is on non-life provisions, but life technical provisions are considered briefly also, although outside the terms of reference of the study.

2.1.20 The analysis highlights the judgement and inherent uncertainty involved in establishing technical provisions. Although the concept of prudence is common throughout Member States, it is interpreted in different ways by insurance undertakings. As there is no quantitative assessment or disclosure of the degree of prudence adopted, this lack of consistency is opaque to prudential supervisors (and also to users of financial statements).

2.1.21 The accounting rules in the European Insurance Accounts Directive are taken to be an appropriate starting point in the analysis. There is a difference between the 'prudent' provisions required in Member States and the concept of 'best estimate' (including a provision for risk and uncertainty) which is likely to be required under the forthcoming International Financial Reporting Standard (IFRS) for insurance contracts. In order to produce consistent and reliable 'best estimate' provisions, many insurance undertakings will need to refine and improve their methodologies. The expected accounting changes are significant because they are likely to remove excessive prudence in technical provisions. However, the important issue from the prudential supervision standpoint is that the uncertainty inherent in technical provisions needs to be taken into account, and supervisors need to be able to identify and assess the extent to which this is done.

2.1.22 Regardless of accounting principles, prudential supervisors need to assess the ability of insurance undertakings to withstand adverse future claims movements. In order to make a proper assessment of the financial position of an insurance undertaking it is necessary to understand the range of possible outcomes and probabilities within which such safety margins are established and maintained. In addition, sensitivity analysis on key risk factors and assumptions could provide valuable information. It is difficult to obtain such understanding in the absence of at least rudimentary stress testing. Disclosure of ranges of possible outcomes under various assumptions is not common practice, but this type of information would be more useful to prudential supervisors than point estimates.

2.1.23 A sound and consistent accounting basis using best estimates and provisions for risk and uncertainty is an important feature in establishing technical provisions. Although usually based on actuarial techniques, the process of establishing provisions ultimately requires management judgement. Best practice would suggest that, certainly for areas where more judgement is required, more than one method should be used and the results compared, as part of the decision making process. In most cases, supervisors could benefit from encouraging insurance undertakings to produce documentation (for private reporting to the supervisor) of the provisioning process, including the rationale for judgemental decisions and key assumptions made. There are other elements, generally not present in

the current system, which would enhance the ability of supervisors to assess the strength of technical provisions. These include disclosure of:

- the methodologies applied and assumptions made in determining claims provisions;
- the likely range of outcomes and the expected probabilities of different outcomes (notwithstanding that there may sometimes be methodological difficulties associated with this);
- the sensitivity of the calculations to changes in assumptions;
- more details of run-off development.

2.1.24 The study notes the existence of variability in the practices adopted within different Member States in the supervisory review of technical provisions, and in the type of information requested. In looking for best practice, the study notes the use of external actuarial reports by some insurers for their non-life business, and indicates that this may be an appropriate route for higher risk entities. There may be resource implications for supervisory authorities, which need to ensure they have sufficient skills at their disposal to engage effectively in the supervisory review process.

2.1.25 The importance of other supervisory tools, including inspection visits, should not be overlooked. No matter how detailed the documentation of technical provisions, and how they have been arrived at, there are important qualitative factors (particularly the quality of management and the subjectivity in determining provisions) which supervisors can only assess from close interaction with the insurance undertakings they supervise.

2.1.26 The study considers discounting of claims provisions. Discounting is consistent with the asset liability model (best estimate basis plus a provision for risk and uncertainty and after discounting) put forward in the International Accounting Standards Board (IASB) Draft Statement of Principles (DSOP) for the forthcoming IFRS on Insurance Contracts. The transparency of information available to supervisors would be improved if prudence, rather than being reflected in undiscounted outstanding claims provisions, is reflected either in the capital requirement or in the provision for risk and uncertainty. It should be noted that changing from an undiscounted basis to a discounted basis usually involves re-evaluation of gross provisions and the settlement profile. It is not necessarily the case that discounting will always result in a reduction in technical provisions.

2.1.27 Currently very few Member States permit discounting of claims provisions, and in those which do, it is applied infrequently in practice. If regulators were to require discounting, they would also need to require additional information, including the confidence levels at which technical provisions and the provision for risk and uncertainty were set. Greater consistency in this area would reduce the scope for arbitrage for certain types of financial reinsurance arrangements.

2.1.28 The study also considers the existence of statutory catastrophe and equalisation provisions, which provide additional safety margins in volatile areas of non-life business. Where amounts are set aside in financial statements and regulatory returns to equalise fluctuations in future claims experience, these are usually treated as provisions for regulatory purposes (that is as a liability rather than as a component of capital). These provisions are in addition to the requirement to set up outstanding claims provisions for liabilities arising out of insurance contracts in so far as they can be reasonably foreseen.

2.1.29 The study discusses inconsistencies between Member States in the implementation of requirements for insurance undertakings to establish and maintain equalisation reserves. It is important to recognise the impact of future catastrophes and adverse claims experience in the solvency system. This should be reflected in the minimum capital requirement rather than in liabilities. However, there needs to be consistency between Member States in the method used within the solvency margin methodology.

Assets

2.1.30 Chapter 5 of the study considers insurance assets. It discusses variations in regulatory valuation methods between Member States which make comparisons between undertakings difficult. The risk profiles of insurance undertakings often include significant risks on the assets side of the balance sheet, and the study includes consideration of the use by insurers of stress and resilience tests in their risk management processes, to assess and monitor the volatility in insurance assets.

2.1.31 High level standards for assets supporting insurance liabilities (and the solvency margin) related to safety, yield, spread and marketability of assets are widely applied and are probably a prerequisite in any system. However, the EU Third Directives do not contain prescriptive rules on the detailed bases to be applied in dealing with assets. Accordingly, various approaches have been adopted by individual Member States. Requirements in some states are superequivalent to the directives, and implicit capital charges have been built into the regulatory system through prudent valuation of assets (at the lower of historic cost or net realisable value). This also makes it difficult to compare the true financial strength of insurance companies throughout the EU.

2.1.32 Since the directives were enacted, there have been a number of developments in supervision in other sectors, and in valuation methodologies. Companies now have far more sophisticated tools available to them, and these developments should enable improvements to be made to the solvency system.

2.1.33 The study identifies a need for harmonisation of the approach adopted across Member States. An impetus for change could be provided by change in accounting requirements if insurance undertakings are required to comply with IFRSs. In most cases, a market or fair valuation of assets would improve transparency and enable the true financial strength of undertakings to be more readily determined. The impact on liability valuations of any changes in the valuation of assets will need to be addressed.

2.1.34 For certain assets, notably unlisted securities and subsidiaries and participating interests, valuation on a fair value basis may be difficult. However, there are a number of alternative valuation bases available (for example, cost, amortised cost and market value) and the relative benefits of these should be considered and guidelines developed for valuing such assets. A move to fair value basis could also lead to taxation issues for insurance undertakings in some Member States.

2.1.35 Most Member States have widened the scope of non-allowable assets. This has either been through the non-recognition of additional categories of asset, application of more restrictive admissibility limits or application of admissibility rules to other assets. The main alternatives if harmonisation is to be achieved are: either to have a common non-allowable list, removing or reducing the ability of individual Member States to widen

this, or to replace the existing system with a system that takes account of the risks arising from the assets held by an insurance undertaking.

2.1.36 The study includes discussion of these alternatives and indicates that a possibly superior system could be a risk based approach. This could include some form of risk based capital charges for assets. There are various alternative methodologies available, including Risk Based Capital (RBC), Value at Risk and a modification of the approach adopted in the banking sector. The relative benefits of each system warrant detailed examination, beyond the scope of this study. Whatever basis is decided upon would need to have the benefits of relative simplicity in application, to avoid being cost prohibitive for smaller insurance undertakings. Ideally, such a system should be limited to consideration of the key investment risk areas: market risk; credit risk; mismatch risk; interest rate risk; concentration risk; and liquidity risk. Furthermore, it should always be recognised that there will always be a need for other prudential rules together with the supervisory review process to support the capital system. This applies equally to risk based systems as it does for a fixed ratio approach.

2.1.37 An advantage of a system of capital charges is that it can achieve the same result as placing restrictions on holdings of assets whilst allowing greater investment freedom. It may be beneficial either to retain restrictions on exposure to individual counterparties (covering all assets where the risk of counterparty default is borne by the insurance company) or to include some capital concentration charges in the model. The use of explicit capital requirements enables management and supervisors to better understand the risks to the insurer arising from its holding of certain assets and may reduce the need for additional stress or resilience tests.

Reinsurance

2.1.38 Chapter 6 deals with a number of issues related to reinsurance and its integration in a future harmonised solvency system. In the current system, a reduction for reinsurance is built into the calculation of the solvency margin requirement. The chapter includes discussion of the limitations of this method, and comments on its continuing relevance. It discusses different supervisory approaches to the assessment of an insurer's reinsurance arrangements.

2.1.39 An insurer's reinsurance programme forms a major part of its core risk management processes, and information on an undertaking's policies and procedures in relation to reinsurance can provide vital information to prudential supervisors on how the undertaking perceives and manages its risks in this area.

2.1.40 The study discusses several areas for improvement in relation to both the way in which reinsurance is taken into account in the solvency margin requirement and in supervisory techniques to assess a cedant's reinsurance arrangements. It is recognised, however, that there are difficulties in producing methodology which adequately takes reinsurance arrangements into account.

2.1.41 It is important that any supervisory system recognises that the insurance undertaking's own risk management procedures in relation to ceded reinsurance are of central importance. Management's analysis of gross exposures and the use of stress tests is likely to provide evidence of the adequacy of a reinsurance programme to react to adverse

scenarios. Management must assess the effectiveness of the arrangements put in place to control both current and future risks and the security of amounts due to the insurance undertaking under reinsurance contracts. The study indicates that there is considerable variation among prudential supervisors in the extent to which they make assessments of the strength of management control and processes in this area.

2.1.42 There are a number of limitations in the way in which credit for reinsurance is permitted under the EU fixed ratio system. The main issue is that the approach does not take proper account of the appropriateness, coverage and quality of the reinsurance programme.

2.1.43 In considering reinsurer security supervisors are likely to have regard to whether the reinsurer is supervised in the jurisdiction in which it operates. In a future harmonised system of reinsurer supervision it should be possible for insurance undertakings and prudential supervisors to draw greater comfort as to reinsurer security. However, as the World Trade Center disaster has illustrated, the financial position of reinsurers can change very rapidly and the prudential supervisor must consider all available information.

2.1.44 Supervision of reinsurers themselves would not however result in any reduction in the procedures which the supervisor would need to apply to the actual reinsurance programme as this is specific to the individual insurer.

Advanced risk reduction techniques

2.1.45 Over the past two decades there have been many developments in non-traditional methods by which insurance undertakings are able to control or reduce risk. Chapter 7 highlights the increasing complexity and variation of products and techniques in use by insurers to manage and control the risks which they face. It includes discussion of the issues which arise for prudential supervisors, and considers supervisory responses to such developments.

2.1.46 The use of alternative risk transfer products can produce significant financial impacts, which can be difficult to assess unless accounting treatments are appropriate and disclosures are sufficient. It is important to separate those contracts which provide genuine risk mitigation from those which seek to create regulatory arbitrage through financing and other arrangements.

2.1.47 In the area of Asset Liability Management (ALM), portfolio diversification, and derivatives, there is a need to consider these techniques in conjunction with an undertaking's risk management approach; where techniques are properly controlled they can be valuable tools in the mitigation of the risks they are designed to address.

2.1.48 The current European solvency system generally does not cope well with such products and techniques, which in many cases did not exist when the system was first devised. Some Member States have introduced rules or guidance on the treatment of certain alternative risk transfer products in regulatory returns and for solvency purposes. In some cases, for example, detailed disclosure of information is required about reinsurance arrangements which involve limited transfer of insurance risk, in order to assess the impact upon assets and liabilities, premiums and claims, and results. The accounting treatment of such arrangements is important, and an assessment of the impact on the financial position of an insurer is usually possible in those states which have accounting

rules in place to ensure that the substance of transactions is properly reflected (together with adequate disclosure).

2.1.49 A review of supervisory approaches indicates that supervisors tend to take an individual approach to reviewing significant unconventional transactions. The supervisory review of such arrangements and methods is important because the effects of transactions and the reasons behind them are not always obvious. Also, the underlying approach to risk mitigation and risk management usually needs to be understood, in order to gain a sound understanding of the effects. In the case of advanced ALM techniques, it would be necessary to review risk modelling, stress and scenario testing, to assess the impact that such techniques have on the undertaking's financial position.

2.1.50 Many of the products and techniques are designed to mitigate risks. For example, it is not unusual for insurers to use derivative products as part of their hedging strategy. Provided that the use of such products is controlled by the supervisory system, it would seem appropriate, in a future solvency system, to reflect the fact that some products can limit downside risk and to give appropriate credit in the solvency margin calculation. For example, in a system which included capital charges on assets, the use of recognised risk mitigation techniques could result in reduced charges.

2.1.51 As with other areas of this study, the appropriate supervisory approach is unlikely to be based on the impact on the solvency margin alone (however determined). Supervisory review of risk management procedures also forms an important part, and public disclosure of information also has a role.

Future accounting changes

2.1.52 Accounting is fundamental to any solvency system as accounting requirements drive the net assets position in the financial statements which is usually the starting point for the solvency system. Under the current European system, changes in accounting rules for technical provisions will also impact on the calculation of the solvency margin requirement.

2.1.53 Chapter 8 considers the impact that changes in accounting standards could have on insurance assets and liabilities and on the solvency margin system. It focuses upon international accounting developments.

2.1.54 The chapter concludes that preparing financial statements in accordance with International Accounting Standards (IAS) will provide greater transparency and more useful information to users, with technical provisions based on explicit assumptions, current information and best estimate information. However, the study is concerned with prudential supervision, and the key question that will need to be addressed is the extent to which accounting changes should be replicated in the assessment of an insurer's solvency position.

2.1.55 As indicated in other chapters, regulations in Member States are in many cases super-equivalent to the underlying insurance directives. This may cause difficulties in assessing the relative financial strength of insurance companies across the EU. Inconsistencies in the measurement of assets and liabilities for solvency purposes has implications for the competitive position of insurance undertakings. With the growth in global financial

groups, there may be advantages in harmonising the approach to regulatory supervision, and removal of the many options by use of IAS compliant regulatory reporting may be a means of achieving this.

2.1.56 Use of IAS within the regulatory system would mean that most financial assets would be included at fair value (although use of amortised cost for some bond portfolios could still occur). The Insurance Contracts DSOP recommendations on the use of entity-specific or fair value methodology for determining technical provisions have been drawn to match the valuation rules of other financial instruments as closely as possible. Compliance with IAS may enable some of the effects of the mismatch of assets and liabilities to be seen.

2.1.57 Some subjectivity will be included in the determination of technical provisions, but subjectivity already exists under the current rules. The DSOP recommendations for prospective valuations on reasonable, explicit assumptions and best estimates will ensure that the full range of possible outcomes is considered. Whilst the provisions are 'best estimate' numbers, a higher confidence level can be allowed for through the provision for risk and uncertainty. Regulators will need to assess the level at which this is set (that is, how much of the probability distribution curve should be covered when determining insurers' solvency).

2.1.58 It is important to recognise that companies should ideally have systems which can be used to determine the provisions for risk and uncertainty in order to price new business. The lack of such systems in most insurance companies internationally supports observations made in the study that risk assessment and measurement systems are generally not well developed and are still evolving.

2.1.59 The introduction of a new accounting standard which requires stochasitic modelling to produce best estimates and consideration of the full range of outcomes is likely to be complementary to the assessment required to determine adequacy of capital. It will also require companies to have a better understanding of their risk appetite in pricing new business in order to determine provisions for risk and uncertainty.

2.1.60 Adoption of IAS within the regulatory system will remove a certain amount of implicit capital that currently exists in the valuation of both assets and technical provisions. It is important to recognise that the actual solvency position of the company will not necessarily be affected merely through changes in accounting requirements, but a mechanism needs to be determined to replace these implicit amounts of capital with an explicit capital charge. This will require some amendment to the existing solvency margin requirements to ensure that capital required to be maintained is not distributed.

2.1.61 In addition, IAS 39 (Financial Instruments: Recognition and Measurement) and the DSOP may result in some contracts (which do not meet the definition of insurance) currently included in technical provisions being reclassified. This will mean that the current formula used for calculating the solvency margin requirement will no longer capture any risks associated with these contracts, unless they are moved back to technical provisions for solvency monitoring purposes. A solvency requirement based on risks to which such contracts are exposed (for example, credit and operational risk) may be more appropriate.

2.1.62 The study indicates that there would be benefits in replacing the current system with a system that considers all the risks to which an insurer is exposed. This could involve some form of risk based capital system. Such a system has the advantage that all the capital requirements are captured in one explicit figure, which could then be compared with the net assets as disclosed in the financial statements. This could result in greater alignment between financial statements and regulatory reporting and could lead to improved consistency and comparability between different companies and Member States. Supplementing the financial statements by increased disclosure of the risks faced and how they are dealt with within the model would, in our view, enhance the information provided to supervisors.

The role of rating agencies and market mechanisms

2.1.63 Chapter 9 of the study considers the role of rating agencies and other market mechanisms. It includes discussion of the methodologies and processes used by rating agencies to rate insurance undertakings, and considers whether any other market mechanisms could be harnessed for use by prudential supervisors in a future system.

2.1.64 Discussions with insurers and supervisors indicated that the use to which supervisors put rating agencies in the current system is generally appropriate. Supervisors make informal use of rating agencies and the limitations of published ratings are generally well recognised. The information which ratings provide is supplementary to other public and private information which supervisors obtain.

2.1.65 The study includes discussion of the risk based models which rating agencies themselves use. However, these are generally viewed by supervisors as too complex compared to the type of risk based system which could be applied for wider supervisory purposes.

2.1.66 Enhanced disclosure in public information is often seen as beneficial, in terms of increased transparency and clarity of the financial position of insurance undertakings. Other areas of the study identify the types of disclosures which could be beneficial to prudential supervisors, particularly information regarding stress testing of technical provisions and investments, and non-financial disclosures regarding risk management processes. The latter is consistent with an emerging trend for enhanced corporate governance disclosures. However, it should be noted that risk management concepts are more advanced in some Member States than in others.

Solvency margin methodologies

2.1.67 Chapter 10 comprises a comparative analysis of the advantages and disadvantages of solvency margin (or equivalent) methodologies currently used in major non-EU countries, compared to the European system. The study focuses upon the US RBC system, but also considers the Canadian and Australian systems. Solvency assessment is a wider issue than just determining capital requirements. Supervisory review and disclosure are also important components.

2.1.68 The study recognises the tension between certain of the regulatory objectives for a solvency margin methodology. For example, there are evident benefits in the simplicity of the European fixed ratio approach; it is easy to codify and apply, and its results are

easy to understand. Moreover, the rigidity of the fixed ratio approach leaves no room for subjectivity.

2.1.69 As the Müller Report recognised, the scope of risks taken into account by the approach is narrow and the approach is not sensitive to the capital requirements with respect to company-specific profiles. The structural weaknesses in the approach mean that it cannot be developed to address these issues.

2.1.70 The US RBC approach goes some way to addressing these issues in that it aims to incorporate all relevant risks, although the approach does have limitations. Further improvements can be achieved by incorporating the advanced approaches of internal risk models. Insurance supervisors in Canada and Australia are encouraging insurance companies to develop internal risk models to determine their capital requirements. However, supervisors should recognise the subjectivity inherent in using risk modelling for regulatory purposes to determine capital requirements. This will require a certain level of scrutiny and understanding of such models by prudential supervisors.

2.1.71 As indicated elsewhere in the study, there is a need to give more recognition to risk profiles of insurance undertakings in a future system. The approach should take into account diversity both in terms of the nature of the business undertaken and the size of undertakings and how implementation of the methodology might work in practice.

2.1.72 This is particularly important in view of the fact that apparent benefits in more sophisticated solvency margin methodologies may be undermined by the practicalities of implementation. For example, data requirements can greatly increase with a more complex approach, particularly in relation to scenario based and probabilistic approaches. If data is not available or not collected, approximations may be used which may cast doubt on the validity of the risk assessment.

2.1.73 In determining the components for a future solvency system, a broad risk categorisation will need to be agreed upon. As a minimum, risk categories in a risk based system should include:

- underwriting risk (exposures less reinsurance);
- market risk;
- credit risk.

2.1.74 Further consideration is required to determine whether it is feasible to include specific capital requirements for:

- operational risk;
- asset liability mismatch risk.

2.1.75 Such risks are difficult to quantify and may be better addressed by other prudential rules and supervisory review. Developments in the banking sector may assist in considering the way forward.

Conclusions

2.1.76 This study covers the major areas which need to be addressed in a future European system. It is important that the system deals with these areas in an explicit and transparent approach. The choice of solvency methodology is one part of the overall system of prudential supervision. It needs to be supplemented by other supervisory activities and complementary requirements. Further, there is much to be gained from enhanced public disclosure, not only of financial information including scenario analysis, but also of risk management approaches.

2.1.77 The study includes discussion of the three pillar approach proposed by the Basel Committee for banking. Although beyond the scope of the study, the conclusion to Chapter 10 suggests a possible approach for insurance, based on the findings of the study and drawing from the Basel proposals:

A possible three pillar approach for insurance undertakings

Pillar I	**Pillar II**	**Pillar III**
Financial Resources	Supervisory Review	Market Discipline
Minimum capital requirements set for firms generally using a risk based approach assessed by reference to underwriting information, assets and liabilities in the financial statements. Options for firms to graduate to scenario approaches and internal (probabilistic) models. Group solvency requirements taking account of additional risks at group level. Other prudential rules (assets and liabilities).	Assessment of the strength and effectiveness of risk management systems and internal controls including review of: - exposures (including the reinsurance programme); - internal risk models; - stress testing of technical provisions and assets; - fitness and propriety of senior management; - asset /liability mismatch. Additional capital charges in individual cases.	Disclosures recommendations and requirements create transparency by allowing market participants to assess key information on scope of application, capital, risk exposures, risk assessment and management processes, and capital adequacy of the insurance undertakings. Disclosures on risks: - risks; - key sensitivities and scenario analysis on assets and technical provisions.

2.1.78 The difficulties in achieving such fundamental reform should not be underestimated. The study indicates in several places that there are considerable difficulties involved in arriving at a suitable risk based approach. Any solution will need to be sufficiently flexible to recognise the considerable heterogeneity in the European insurance industry. Variations among Member States must also be taken into account, particularly in the extent to which risk management approaches have advanced and are embedded within the insurance sector.

2.1.79 Indeed, given the diversity in size, nature and complexity of insurance undertakings across Europe, a 'one size fits all' approach to risk modelling may not be achievable, nor necessary desirable. A workable and durable solution may comprise several approaches to financial resources, based on a uniform risk based approach but with incentives for

undertakings to move onto scenario based and advanced model (probabilistic) approaches. Given the significant practical difficulties of probabilistic approaches, scenario based approaches could play a major part in a future system, with both technical and practical advantages.

2.1.80 The study demonstrates the need to reform the solvency margin system in favour of an approach which produces greater consistency in measurement, takes account of significant risks, and does not impose an overly prudent capital requirement on insurance undertakings. Consistent implementation will be essential to ensure that insurance undertakings do not suffer competitive disadvantages as a result of unjustified variations in capital requirements between Member States.

3 Risks and risk models

3.1 Terms of reference

3.1.1 *"Identify the main types of risks that an insurance undertaking is exposed to, and make an assessment of the general importance of the different risks. The consultant should comment on the usefulness of existing stress techniques in this regard, and on the internal risk models used by leading financial market players (insurance and non-insurance) and make an assessment of risk for insurance undertakings from a cross-sectoral perspective".*

3.2 Introduction

3.2.1 Whilst most institutions attempt to run their operations by avoiding and controlling most of the internal and external risks they are exposed to, the nature of an insurance operation is to accept risks faced by its policyholders in exchange for a premium. In this context we can define risk as the potential for unexpected financial loss.

3.2.2 An insurer needs to manage the risks it accepts from its policyholders in order to make profits. Key elements of this risk management process include the pooling and diversification of risks, controlling exposures and obtaining appropriate reinsurance protection.

3.2.3 In the life insurance industry the types of products usually offered range from pure protection products to investment related savings products. The duration of the contract is usually for a long period (contract periods typically range from one year to over 40 years). The sum assured (the amount payable on death) is normally fixed in the terms of the contract. In some types of product the duration of the policy and the benefits are fixed in advance, for example fixed annuity policies. In other cases the sum assured is known but the duration of the policy is unknown and depends on how long the policyholder lives. The main risks faced by life insurance companies are: pure underwriting risk driven by mortality, morbidity and longevity; investment or market risk; underwriting management risk; credit risk; matching risk; and provisioning risk.

3.2.4 In non-life insurance an insurer normally underwrites contracts covering risks over a short period, typically one year. The claims payable by the insurer and the timing of these payments are unknown when the contract is written. In some lines of business there might be a limit to the number of losses that the insurer would cover or an aggregate maximum amount covered by the policy.

3.2.5 The main risks in a non-life insurance operation are: pure underwriting risk (random fluctuations of losses or experience) and operational risks related to underwriting management (risks in relation to the company's own underwriting procedures); credit risk (particularly in relation to reinsurance recoveries); reinsurance risk (in relation to the reinsurance programme); provisioning risk (claims) and jurisdictional and legal risks.

3.2.6 This chapter examines the various risks faced by insurers and analyses some of the approaches which insurers have developed for assessing and monitoring their significant risks. In considering which risks are of greatest significance in avoiding insolvency, the

chapter reviews reasons behind insurance company failures in different parts of the world. An important development in the area of risk management by insurers is the use by some of the larger insurers of increasingly sophisticated risk modelling techniques. The chapter considers the benefits and limitations of the main types of model. Comparisons are made to the banking sector, and the chapter includes observations on the ways in which prudential regulators have attempted to harness some of the modelling techniques used by banks for prudential supervision purposes. The conclusion to the chapter draws on the experience of the Basel Committee in developing a new framework for the assessment of a bank's capital adequacy, and indicates possible ways in which prudential regulators in the insurance sector could move towards a more risk based approach.[5]

3.3 Classification of risks

3.3.1 Many studies have described in detail the risks that insurance companies are exposed to. For example, a recent paper presented to the Institute of Actuaries[6] in London provides a detailed risk classification for non-life insurance companies. The Müller Report[7] also presents a detailed classification of risks for life and non-life insurance companies.

3.3.2 It is not an objective in this chapter to discuss previous risk classifications but rather to provide a classification and description of various risks faced by insurance companies at various levels and how they manifest in different areas of the insurance operation. We classify the exposure to risk at three different levels:

- risk arising at the entity level;
- risks faced by the insurance industry (systematic risks);
- risks faced by the economy (systemic risks).

3.3.3 The following tables summarise the main differences and similarities between life and non-life insurance for the main types of risk discussed above. These risks are discussed in more detail in Appendix 3.1.

Risks at company level

3.3.4 The following table summarises the main risks faced by insurance undertakings at individual entity level. It is not necessarily an exhaustive list. The complete range of risks faced by any one undertaking will depend upon its individual circumstances.

[5] See also chapter 10.
[6] Ryan, J.P., Archer-Lock, P.R., Czernuszewicz, A.J., Gillott, N.R., Hinton, P.H., Ibeson, D., Malde, S.A., Paul, D. and Shah, N. (2001). Financial Condition Assessment. Institute of Actuaries and Faculty of Actuaries. Presented to the Institute of Actuaries, March 2001.
[7] The Müller Group Report (1997).

Entity level risks: life and non-life

Risk	Life insurance	Non-life insurance
Pure underwriting	Severity and frequency of claims due to changes in anticipated mortality, morbidity and longevity.	Severity and frequency of claims due to random events such as natural perils, fire, pollution, crime, war, terrorism, and others.
Underwriting management	Poor underwriting through selection of bad risks and inappropriate product design.	Poor underwriting through selection of bad risks and inappropriate product design. Losses due to under pricing and under-provisioning, management decisions to expand, inexperience and accumulation and concentration of large losses.
Credit	Default risk on investments and premium debts from intermediaries.	Default risk on investments and premium debts from intermediaries. Reinsurance default is the main driver of credit risk. Failure of major reinsurers will have a high financial impact in the overall loss experience for insurance companies.
Reinsurance	The reinsurance programme is generally of lower importance in life than in non-life.	The purchase of insufficient cover can lead to financial difficulties in the event of unexpected claims or major losses. Failure of reinsurers to respond as anticipated.
Operational	Fraud, mis-selling, IT issues, systems and control failures and management failures are the main drivers of operational losses. Process failures in key business cycles.	Fraud, inadequate reinsurance programme, IT issues, systems and control failures and management failures are the main drivers of operational losses. Process failures in key business cycles.
Investment	Poor investment resulting from inappropriate mix of investments, overvaluation of assets, excessive concentration of assets in investment type products. A significant proportion of the investment risk is borne by the policyholder.	Poor investment performance resulting from inappropriate mix of investments, overvaluation of assets, excessive concentration of assets. Unlike life insurance a far greater proportion of investment risk is borne by the shareholder.
Liquidity	Inability to liquidate assets when needed or having to accept lower price.	Inability to liquidate assets when needed or having to accept lower price.
Matching	Mismatch of assets and liabilities due to cashflow, currency and timing risks.	Matching risk is not usually a major issue for non-life insurers due to the short duration of the contracts. For long tail business the claims profile may need to be matched. Matching is required where there is exposure to different currencies.
Expenses	Expense overruns more likely with longer term contracts.	There is normally less risk of expense overruns due to the short term nature of contracts. However, the company may be exposed to higher claims settlement expenses such as legal costs.
Lapses	Lower level of policies in force results in lower recovery of fixed costs. Where upfront commission is paid then it may be difficult to recover with respect to lapses.	Less of an issue than for life due to the short duration of contract. Lower than budgeted level of premiums will impact on profitability. Where upfront commission is paid then it may be difficult to recover with respect to lapses.
Provisioning	Inadequate levels of provision could lead to the company's financial position being presented in a better light than it actually is. This could result in inappropriate underwriting and other management decisions being made.	Inadequate levels of provision could lead to the company's financial position being presented in a better light than it actually is. This could result in inappropriate underwriting and other management decisions being made.

Source: KPMG

Risks faced by the insurance industry (Systematic risks)

3.3.5 Systematic risks are driven by external factors that affect the whole insurance industry. In most cases the insurance company is unable to influence events, but may be in a position to control risks.

Systematic risks: life and non-life

Risk	Life insurance	Non-life insurance
Jurisdictional and legal	Implications of court decisions affecting policyholder liabilities. This is not a significant risk for life insurance companies.	Legal risk has had a higher impact for non-life insurers due to court decisions with respect to liability claims.
Market changes	Implications of changes in consumers' attitude and competitor behavior.	Implications of changes in consumers' attitude and competitor behavior. Implications of the insurance cycle. At times when premiums rates are low there is a higher risk of insurers entering into uncompetitive contracts.

Source: KPMG

Risks faced by the economy (Systemic risks)

3.3.6 Systemic risks are related to local or global economic or social factors that will indirectly have an impact on the insurance industry. In most cases the insurance company is unable to influence events but may be in a position to control the risks.

Systemic risks: life and non-life

Risk	Life insurance	Non-life insurance
Market value fluctuation of investments	Variability in the market value of investments, particularly depreciation of investments due to market conditions. In investment type products a significant proportion of the investment risk is borne by the policyholder.	Variability in the market value of investments, particularly depreciation of investments due to market conditions. Unlike life insurance all investment risk is borne by the shareholder.
Environmental changes	Death and health related claims as a result of natural perils (e.g. floods, windstorms and pollution) increase mortality and morbidity experience.	Increased frequency and severity of losses due to natural perils (e.g. floods, windstorms and pollution).
Social/political changes	Increased longevity has negative implications for the cost of annuities but positive implications for term assurance. Increase in mortality due to new diseases (e.g. AIDS) and demographic changes.	Increased losses due to social behavior (e.g. crime and theft). Change in insureds' attitude to making compensation claims from liability insurers.
Economic cycle	Downturns in the economic cycle will increase the number of contract terminations (surrenders and lapses) due to inability to pay premiums. Impact on investments.	Increases in the unemployment rate will increase the number of losses due to theft and crime. Recession will reduce the levels of premium income due to insurance cycle. Impact on investments.
Inflation rate	Increases in the inflation rate will directly affect the payments for long term contracts if benefits are linked to inflation. It will also increase medical expenses claims for certain policies. Impact on expense base.	Inflation will have a high financial impact in losses related to long-tail claims (e.g. legal cost for claim settlement) and claims inflation (e.g. motor insurance). Impact on expense base.
Interest rate	Interest rate is a key risk driver in life insurance since it affects the valuation of assets and liabilities.	Short term changes in interest rate will impact the rate of return on investments if investments are not held to maturity. Due to the short duration of non-life insurance contracts interest rate is not a major risk driver.
Exchange rate	Potential losses where there are significant foreign liabilities which are not matched by investments in the same currency. In investment type products a significant proportion of the exchange rate risk is borne by the policyholder.	Potential losses where there are significant foreign liabilities which are not matched by investments in the same currency. This risk is more significant in non-life insurance than life insurance.
Technological changes	Higher payment experience as a result of increases in longevity as a result of curing of diseases. Higher claims due to health hazards (critical illness). Impact on operational risk if IT systems fail.	New technologies increase the number of losses due to system failures (e.g. IT systems), health hazards and employers liabilities claims, and development of new cars, ships and airplanes. It also impacts on the efficiency of distribution channels. Impact on operational risk if IT systems fail.

Source: KPMG

3.3.7 It should be noted that there are many different ways of categorising risks. An insurer's approach will depend upon the nature, scale and complexity of its business. Some of the larger insurers, operating formalised risk management processes, divide their financial risks into business risks and operational risks. Business risks may, for example, include:

- non-life insurance risks (comprising principally risks arising from underwriting, such as pricing risks, prospective claims risks, and reserving risks);
- life insurance risks (such as lapse risks, yield risks);
- credit risks (including reinsurance security);
- investment and asset/liability matching risks (including market risks and liquidity risks).

3.3.8 Our discussions with some of the largest European insurers indicated that not all insurers who have developed risk models place the same degree of importance on risk categorisation. For some, the way in which risks are categorised drives the approach to risk assessment and risk management. Insurance risk, in particular, and the way in which it is identified, categorised and monitored is a key consideration.

3.3.9 Given the complex nature of insurance business, it may not be possible (nor is it necessarily desirable) to impose a single definitive risk classification system upon the industry. A classification which works well for one company may not necessarily work well in another. This does not, however, preclude the possibility of a high level categorisation and broad framework for a risk based capital approach.[8]

3.3.10 Operational risk is often treated as a separate category and is sometimes seen as the residual risk category, after other risks, more easily separable and quantifiable, have been categorised. Management failure is usually seen as a significant component of operational risk, but it includes the risk of process failure in the significant business cycles (pricing, underwriting, claims, provisioning, investments and risk modelling, for example). From the viewpoint of prudential supervisors, the quality of management is a major risk factor.

3.3.11 The difficulties in producing a coherent risk classification are highlighted when insurance companies and banks come together in business combinations (the similarities and differences are discussed later in this chapter). In such situations difficulties are often encountered in reconciling different concepts of risk. This is partly due to the different time horizons involved, but also because the interrelationships between different risks in an insurance business make it difficult to consider risk categories in isolation from one another.

[8] Refer to the conclusion to chapter 10.

3.3.12 Some of the insurers who have developed stochastic risk models have tended to focus less on the categorisation of risks, but more on identifying those risk factors which can be quantified and give rise to a need for capital. This does not mean that other risks are not dealt with, but that they are dealt with in different ways. Risks which originate from external sources (economic factors) are generally not under the direct control of an insurer, and give rise to a requirement for capital. Risks which do not arise from external sources can usually be managed, to a greater or lesser extent, by internal control systems (but may still give rise to a capital need to provide a buffer against uncertainty). The classification of risk earlier in this chapter into entity level, systematic and systemic risks serves to illustrate this point. Risks in the systematic and systemic categories are by definition caused by external factors, whilst risks at the entity level are generally to a greater extent within a company's control.

3.4 Assessment of risks faced by insurance undertakings

Impact of key risks

3.4.1 The following table summarises how the key risks referred to above impact on the financial position of an insurance company:

The financial impacts of key risks

Key Risk:	**Financial impact:**
Underwriting risk	Premiums, claims experience, technical provisions, reinsurance
Credit risk	Debtors, reinsurance recoveries, investments
Reinsurance risk	Claims recoveries, technical provisions
Matching risk	Investment return, investments
Provisioning risk	Claims experience, technical provisions
Jurisdictional and legal risk	Claims, technical provisions
Interest rate risk	Investment return, investments, technical provisions

Source: KPMG

Interaction of key risks

3.4.2 The interrelationships between risks is of critical importance in estimating the potential impact.[9] Therefore, the risks to which an insurance company is exposed should not be viewed in isolation. This is a critical factor when compiling an aggregate view of an insurer's risk profile.

[9] For an analysis of the extent to which solvency margin methodologies take into account the interrelationships between risks refer to chapter 10.

3.4.3 Systematic and systemic risks are not independent and do often impact across lines of business and across assets and liabilities, creating significant dependence effects. The impact of social, technological, market changes and economic performance are often linked.

3.4.4 For life insurance an economic recession can affect lapses, reduce business sales, and prevent sufficient recovery of fixed expenses. An economic slowdown is likely to lead to reduced investment returns leading to adverse asset liability mismatches for with-profit products.

3.4.5 For non-life insurance, a recession can affect renewals and reduce new business. Decreasing investment value can result in lower investment returns, and increased unemployment can have a strong impact on claims frequencies in many lines of business. Further interaction is introduced through the effect of inflation, which has an impact on claims amounts, and is significantly correlated with interest rates and equity prices.

3.4.6 By the use of modelling techniques the larger insurers have come to understand more about how significant areas of risk are interrelated.

The risk profiles of insurance undertakings

3.4.7 The risk classification given above presents a general overview of internal and external risk factors that any insurance company is exposed to. However, the degree of exposure differs considerably across companies depending on the types of product written, the reinsurance programme and investment strategy.

3.4.8 Set out below is a summary of those characteristics which affect the risk profile of an insurer.

Size (pooling of risk)

3.4.9 Large insurers experience an overall risk reduction due to diversification which enables them to pool risks whereas smaller insurers have by definition a smaller portfolio of risks and are therefore less diversified. Further discussion of the key concept of diversification and pooling of risks is included in chapter 7 of the study.

Age

3.4.10 Organisational age has been identified as a key factor for insurers' insolvency. In recent insolvency studies in the United States, younger companies experienced a higher rate of insolvency due to inexperience, poor underwriting management and rapid expansion into new lines of business. Older companies might experience a higher accumulation of long tail claims that were written up to 50 years ago and that have only materialised in the last two decades. However, they might be better able to cope with losses on long tail products as they will have accumulated more capital.

Lines of business

3.4.11 Insurance companies divide their operations into different lines of business. The main lines of business for non-life business are usually personal and commercial lines. Personal lines are generally (but not always) less risky than commercial lines. Non-life insurers may experience higher frequency of claims in personal lines but the amounts of each loss will be much lower than for commercial lines.

3.4.12 The duration of the contracts or development of losses also has to be taken into account when building the risk profile of an insurance company. Short tail claims generally tend to be smaller and easier to quantify and therefore this type of business is generally considered to be less risky.

3.4.13 Companies specialising in single lines of business (monoline companies) are likely to have a different risk profile to companies that write multiple lines of insurance. By writing different lines of business, companies reduce risk by diversifying premiums (during insurance cycles) and losses (during major events). For example, insurers specialising in property insurance have higher exposure to single events due to their accumulation of risk in the same territory. However, monoline insurance companies often build up a specialised understanding of risk.

3.4.14 The risk profile of a life insurer will be significantly affected by the proportion of protection and savings business.

Financial flexibility

3.4.15 If the insurance company is part of a strong financial group this is seen as an advantage in terms of having access to extra capital when this might be required. In commercial markets insurers with a higher level of capital may seek to charge high premiums in return for offering increased security.

Global insurers

3.4.16 International companies experience risk reduction due to geographical diversification of risks. However, such companies may have higher exposure to exchange rate, jurisdictional and political risk.

Composites

3.4.17 Typically composite companies operate as separate entities, but it is possible that they may be able to reduce risks as a result of diversification from the combination of long term and short term business.

3.4.18 However, if the insurer offers its life and non-life products to the same customers, it is possible for a company to increase its exposure to certain types of events. For example, a major catastrophe may cause claims in life insurance policies as well as motor and property insurance.

Assessment of general importance of risks for solvency

3.4.19 In order for regulators to be able to predict a company's solvency difficulties, they need to be aware of the potential impact of the main risks to which the company is exposed and the extent to which those risks are managed and controlled by the company's internal risk management processes.

3.4.20 For life insurance, few cases of insolvency have occurred outside the United States. A number of Japanese companies are experiencing difficulties, particularly in the low interest rate, low inflation economy. Some companies in Europe may also be experiencing similar difficulties. For non-life insurers, in many cases the severity of the financial difficulties has meant that by the time the problems have been recognised, no corrective measures could have been applied to prevent insolvency.

3.4.21 Various studies have been undertaken in different jurisdictions around the world into the main causes of insolvencies within the non-life insurance industry. Some of the studies have attempted to develop models that could help supervisors to improve current methods to assess the financial position of insurance companies and therefore predict, and possibly prevent, insolvency. Some of these insolvency studies have analysed historical data from companies that have become insolvent to test the predictive power of the models developed.[10]

3.4.22 The studies show that in most insolvencies, the cause has not been due to a single factor, but rather to a combination of both internal and external factors. A frequent reason for insurance company failure is a combination of poor quality of management and inadequate risk management procedures dealing with the key risks to which the company is exposed. This highlights the need for adequate internal models to assist in the risk management process.

3.4.23 Risk management procedures, and the overall quality of management, are critical factors and, together with adequacy of financial resources these factors are of primary importance in protecting an insurance undertaking against insolvency.

[10] See chapter 10 for further discussion on the extent to which solvency margin methodologies have predictive power to identify potentially insolvent companies.

3.4.24 Based on the conclusions of the various studies reviewed and our own findings, the following table sets out our view of the relative importance of the risks described above. It should be noted that this is a generic view, and the general importance of risks classification will vary by individual company, dependent on its business activities and the quality of its management.

The relative importance of risks facing insurance undertakings

	Importance of Risk[11]	
Risk	**Life Insurance**	**Non-life Insurance**
Underwriting (Insurance) :		
Pure underwriting	✓✓✓	✓✓✓
Lapses	✓✓	✓
Environmental changes	✓	✓✓
Social changes	✓	✓✓
Economic cycle	✓	✓
Inflation rate	✓✓	✓✓
Reinsurance	✓	✓✓✓
Jurisdictional and legal	✓✓	✓✓✓
Technological changes	✓	✓✓
Market:		
Exchange rate	✓	✓✓
Asset/Liability mismatch	✓✓✓	✓✓
Liquidity	✓✓	✓
Market price	✓✓	✓✓
Interest rate	✓✓✓	✓✓
Credit:		
Reinsurer security	✓✓	✓✓✓
Asset portfolio	✓✓✓	✓✓
Concentration risk	✓✓	✓✓
Operational:		
Underwriting management	✓✓✓	✓✓✓
Expenses	✓✓	✓
Provisioning	✓✓✓	✓✓✓

Notes:

✓ Low importance

✓✓ Moderate importance

✓✓✓ High importance

Source: KPMG

[11] This table illustrates the difficulty in arriving at a standard classification of risks for an insurance undertaking. However the table reflects a broadly acceptable categorisation. Risks posed by the economic cycle, for example, could have a significant impact upon both underwriting and asset values.

3.4.25 Not all of the high risk areas identified above are controllable by an insurance company. For example, an insurance company will have little influence over changes in regulation and legal requirements. Whilst they may be able to amend charging structures or premiums to take account of such changes, this may not be achievable in the short term.

3.4.26 The reasons for our conclusions on some of the most significant risks to potential insolvency are given below:

Life insurance

Pure underwriting

3.4.27 The duration of life insurance contracts is generally for very long periods. The estimates made in the pricing of the contracts at the outset are critical to the ultimate outcome. The underwriting assumptions made are therefore of vital importance for the success of the company and for future solvency.

Underwriting management

3.4.28 Poor underwriting decisions are likely to have a significant effect on a company's profitability, since the premiums charged are unlikely to be commensurate with the level of risk undertaken. The risk of poor underwriting decisions can be exacerbated in periods of rapid growth or expansion into new areas of the market.

Matching

3.4.29 If the life insurer is not properly matched it could be exposed to significant risks from changes in interest rates and asset values. Matching is a vital part of life insurance business where a significant amount of assets are held to cover future benefits and liabilities.

Provisioning

3.4.30 The assessment of life insurance technical provisions is based on actuarial assessments with respect to liabilities that will be settled a long time in the future. Therefore there is normally a significant amount of uncertainty which is present in calculating the provisions. Assumptions are required to be made with respect to future interest rates, lapse rates and mortality, morbidity and longevity experience. There is a wide range of outcomes which need to be carefully considered in arriving at the provisioning levels.

3.4.31 If a life insurer is under provided, the available capital will be overstated. This could lead to inappropriate business decisions being made, for example a greater allocation of surplus than would be prudent, which could ultimately lead to difficulties when the liabilities need to be settled.

3.4.32 Provisioning for life companies will also be closely linked to interest rate changes (see below) and the two risks are therefore linked.

Interest rate

3.4.33 Changes in interest rates can significantly affect the valuation of liabilities. Insolvency studies have highlighted that the impact of changes to interest rate is a major risk. It will also affect the relative values of equities and gilts, and this could therefore have a significant influence on the value of a life insurer's investments and hence its available capital.

3.4.34 Changes in interest rates can also have a significant effect on policyholders. For example, if interest rates were to increase, they would experience an increase in the cost of borrowing, which in turn could lead to decisions to lapse or surrender their policies.

Non-life insurance

Pure underwriting

3.4.35 Pure underwriting risk covers the risk of mis-estimation of the loss distribution, the risk of losses deviating adversely from those expected (frequency and/or severity) and the risk of unpredictable changes in risk factors.

3.4.36 The nature of non-life insurance means that it is often difficult to predict the outcome of events with any degree of certainty. In addition, random events that can have a significant effect are often widespread in their effect, for example floods or pollution will affect a number of policyholders at the same time.

Underwriting management

3.4.37 Management will attempt to mitigate the above exposures through their underwriting management procedures. Poor underwriting decisions are likely to have a significant effect on a company's profitability, since the premiums charged are unlikely to be commensurate with the level of risk undertaken. The risk of poor underwriting decisions can be exacerbated in periods of rapid growth or expansion into new areas of the market.

Jurisdictional and legal

3.4.38 Non-life insurers can be particularly exposed to changes in the law and regulation, as these can result in increased costs to the insurer. This will affect different types of non-life policies to a greater extent than others, for example, liability claims will be affected by changes in legislation or court decisions. Such changes will usually affect all policies of the same class equally, thereby increasing their impact.

Reinsurance

3.4.39 Reinsurance is the main mechanism for non-life insurers to mitigate their exposures. This is therefore closely linked with the underwriting management risk. The extent and quality of reinsurance purchased will establish the level of protection available to a non-life insurer. The purchase of insufficient cover can lead to financial difficulties in the event of major unexpected claims.

Provisioning

3.4.40 Provisioning on non-life policies is made difficult because of the risks referred to above. The adequacy of provisioning is likely to be determined to a certain extent by the adequacy of the underwriting management and the random events described under pure underwriting. As explained under life insurance, inadequate provisioning will lead to an overstatement of available capital and potentially inappropriate business decisions being made. Provisioning risk tends to be greater for longer term business (life and long-tail non-life business) where there are significant time periods involved before claims crystallise.

3.4.41 Historically, regulators have been concerned primarily with quantitative measures in assessing an insurer's solvency position. The difficulty with this is that once the solvency requirement has been breached, it is often too late to restore the company to a solvent position. Solvency measures tend to concentrate on only a few of these risk areas, primarily those related to underwriting. As can be seen from the table above, several other factors can be critical to the solvency of an insurance company and these are mainly of a qualitative rather than quantitative nature. This may mean that alternative assessments will need to be developed by supervisors to assist them in their regulation of insurance companies.

3.5 Causes of insolvencies in the insurance industry

United States

3.5.1 Redman and Scudellari (1992)[12] analysed the main causes of insolvency cases identified in the US property and casualty insurance market. From a survey of various past studies, including the AM Best insurance report in 1990, the main causes of insurers' insolvency identified were: accumulation of large losses; under pricing; under provisioning for past claims; incompetence of management; fraud; rapid and uncontrolled growth and expansion to new territories and new business; extreme dependence on reinsurance recoveries; and inappropriate reinsurance programmes. Many insolvency cases appeared after the insurance cycles of the 1970s and 1980s where overstatement of asset values was a major cause of insolvency. Poor management and lack of experience were causes of insolvency in many young companies. Catastrophe losses were found to be a cause of insolvency in very few cases and where this did occur, it was not the sole cause of insolvency, rather it was a part of a combination of the other factors mentioned above.

3.5.2 Ryan, et al (2001)[13] analysed the relative importance of each risk factor based on a recent report by the rating agency A. M. Best in 1999[14] where they analysed 683 cases of insolvency in the United States of America in the years between 1969 and 1998. In this

[12] Redman T.M. and Scudellari, C.E. (1992) A new look at evaluating the financial condition of property and casualty insurance and reinsurance companies. *Casualty Actuarial Society.*
[13] Ryan, J.P., Archer-Lock, P.R., Czernuszewicz, A.J., Gillott, N.R., Hinton, P.H., Ibeson, D., Malde, S.A., Paul, D. and Shah, N. (2001). Financial Condition Assessment. Institute of Actuaries and Faculty of Actuaries. Presented to the Institute of Actuaries, London, March 2001.
[14] Best, A. M. (1999) Insolvency: will historic trends return? Special report.

report they classified the reasons for insolvency by underwriting risks, asset risks and other risks. From the cases analysed 42% were due to underwriting risk which was split:

- insufficient provisions and premiums (22%);
- rapid growth (14%);
- catastrophe losses (6%).

3.5.3 Asset risks accounted for only 9% of the causes of insolvency, with the main reasons identified being overvaluation of assets (6%) and reinsurance failure (3%). Other risks that contributed to the company failure were its subsidiaries, significant change to its core business, fraud, and other non-identifiable risks.

European Union

3.5.4 The Müller Group Report[15] analysed the main identified causes of insurance insolvencies in the European Union. The main reasons can be summarised as follows:

3.5.5 Operational risks:

- operational failure related to inexperienced or incompetent management;
- fraud;
- detrimental transactions involving entities belonging to the same group.

3.5.6 Underwriting risks:

- inadequate reinsurance programme and failure to recover from reinsurers;
- higher losses due to rapid growth;
- uncoordinated growth, excessive operating costs;
- poor underwriting process (e.g. under pricing).

3.5.7 Provisioning risks:

- the long-tail nature and settlement pattern for non-life insurers;
- insufficient provisions.

3.5.8 Other:

- imprudent investments;
- lack of capacity of intervention by supervisors.

Other studies

3.5.9 Insolvency cases in other countries have also been analysed in order to identify the causes of insolvency. In Australia, for example, the identified reasons for failure of a major non-life insurer were under-provisioning (in particular for long-tail liability classes);

[15] The Müller Group Report (1997): Solvency of insurance undertakings. *Conference of Insurance Supervisory Authorities of The Member States of The European Union.*

concentration in long-tail portfolios at a significantly lower price than the market price and in lines where many insurers had decided to stop writing business; inexperienced management; excessive expansion; aggressive accounting for financial reinsurance; and accounting policies which capitalised assets that were not readily realisable.

3.5.10 For life insurers the causes of insolvency are less complex and they usually relate to inappropriate assessment of the sensitivity of the mathematical provisions to interest rate changes and mismatching risk.

3.5.11 Given the incidence of insurers' insolvencies many academic researchers have attempted to develop or implement statistical models in order to improve the predictive power of supervisors' solvency regimes. Some of the proposed models are summarised below, which mainly consider which variables have a significant impact in predicting insolvency.

3.5.12 A study produced by Kim, Y-D *et al*[16] uses dynamic statistical models to predict insolvency for life and non-life insurers. The study was based on historical data from US life insurers between 1987 to 1990 and between 1984 to 1990 for non-life insurers. From the results obtained, the authors concluded that for non-life insurers the variables that are statistically significant in predicting insolvency are: the age of the company[17], premium growth, investment performance, underwriting results, expenses, loss reserves, realised and unrealised capital gains and reinsurance recoveries. For life insurance the variables identified are: the age of the company, investment performance, realised and unrealised capital gains and the net operating margin.

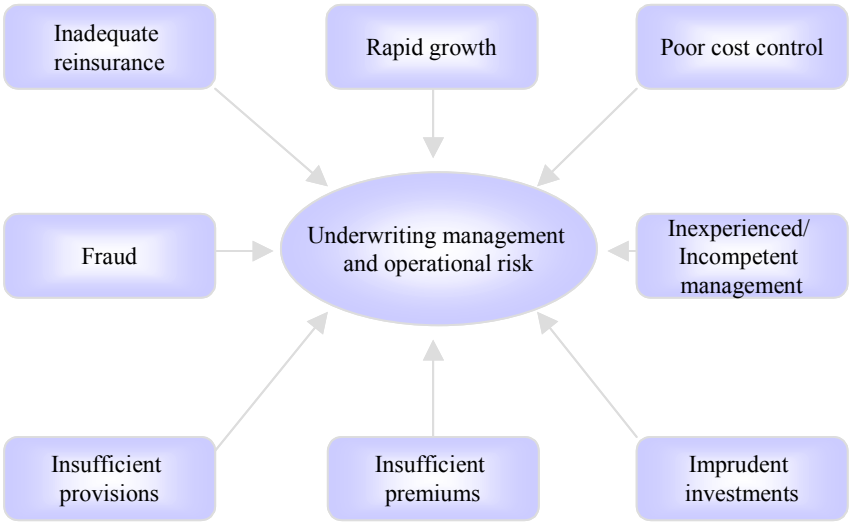
[16] Kim, Y-D., Anderson, D.R., Amburgey, T.L. and Hickman, J.C. (1995) The Use of Event History Analysis to Examine Insurer Insolvencies. *The Journal of Risk and Insurance*, Vol. 62, No. 1, 94-110.

[17] It should be noted that the age of the company was relevant as this affected whether or not the companies were exposed to asbestos pollution and health hazard policies that were written in the 1950s to 1970s.

Summary

3.5.13 The key factors identified as the main causes of insolvency for non-life insurers from these studies can be viewed diagrammatically as follows:

Causes of insolvency



Source: KPMG

3.5.14 From the insolvency studies we have reviewed, it is evident that the key risk factors that have contributed significantly to the insolvency of non-life insurers are poor underwriting management and operational risk factors associated with underwriting. Inappropriate risk models to price insurance products can lead to insufficient premiums which, of course, increases the risk of failure. The lack of control and limitation of exposure and accumulation of certain risks has led to financial difficulties for insurance companies. For incurred claims, or incurred but not reported claims, insufficient knowledge and imprudent assessment of the future development of claims has been the main cause of understating the technical provisions (with its consequent implications for capital adequacy), especially for long-tail business such as employers' liability and pollution related claims.

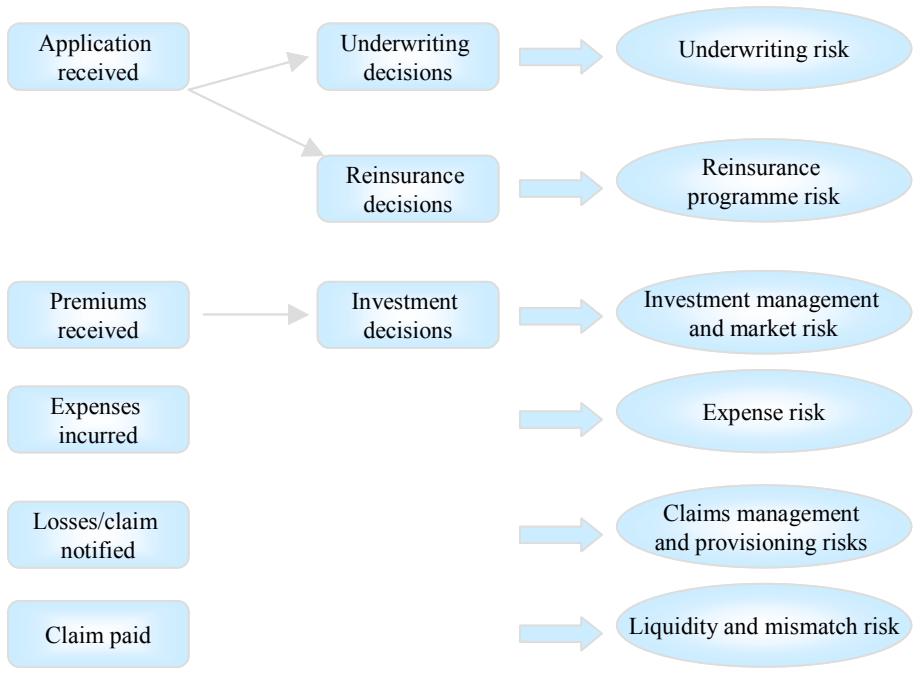
3.6 Internal risk models used by insurance companies

3.6.1 The area of risk modelling in the insurance sector is one of considerable diversity. Generally, models can be found in the larger companies, where they have been developed for a number of purposes. It is important to distinguish between the use of risk models and a company's overall approach to risk assessment and risk management. Risk modelling is usually restricted to those risks which can be quantified, and should be considered in the context of an insurer's overall approach to risk management.

3.6.2 Stochastic modelling techniques of various kinds have been in existence for many years, but more advanced models have only begun to emerge in recent years, and the area is rapidly developing. However, it mainly remains the preserve of the largest insurers, especially those which operate in multiple territories, and of catastrophe reinsurers. Several large insurers with established risk modelling techniques were visited for this part of the study and all reported that their models have brought significant business benefits. In most cases, techniques have been developed in the absence of any real regulatory pressure, but there is evidence that insurance regulators can exert a positive impact in raising standards of risk management generally. Below we explore the types of models in existence, their strengths and weaknesses, and consider the factors which drive the development of modelling techniques.

3.6.3 An effective risk management process should cover all key elements of the business cycle and, most importantly, adequately manage the risks to which the company is exposed. Consideration of the wider risk management practice, systems and controls is beyond the scope of this study. The main features of the business cycle are underwriting, investment management, claims management, control over expenses, and the reinsurance (and for reinsurers, retrocession) programme. The relationship between the business cycle and some of the risks arising from it can be summarised as follows:

The insurance business cycle and risk



Note: operational risk (process failure, management failure) will be present at every stage in the business cycle

Source: KPMG

3.6.4 The insurance industry has a long history of using certain types of quantitative models within its business. These models have traditionally been used for pricing and provisioning, but also for the assessment of solvency and capital requirements. The focus has been primarily on the estimation of expected values, rather than on the deviation of actual experience from these expected values. Models have been developed for specific purposes and have not covered all of the risks to which an insurer may be exposed.

3.6.5 Over the last decade, improvements in information technology have meant that computer models can be used to simulate all the major operational functions of an insurer using a single, integrated model. Such models can mainly be described as Dynamic Financial Analysis (DFA). In the context of this study we will use the term DFA for any internal models that aims at modelling the total insurance enterprise risk.

3.6.6 The change in modelling has been partly regulator led in some countries, for example the United States and Canada, where Dynamic Financial Analysis and Dynamic Capital Adequacy Testing (DCAT) are regulatory requirements. However, in some other countries, it is only the larger insurance companies, including some non-regulated reinsurance companies, that operate such models.

3.6.7 Technological improvements have resulted in an increasing use of more complex and sophisticated models. The main (but by no means widespread) development has been an attempt to model the total performance and risk profile of a company, for the purpose of capital allocation. The need for management to have more timely and accurate information and a better assessment of the business performance and risk profile has been a key driver behind the development of such models. They may be used to evaluate a company's underwriting and investment strategies, or for capital adequacy and capital allocation purposes. By optimising the use of capital, management seeks to focus on both economic and risk-adjusted capital.

3.6.8 There is very little consistency between the models currently employed; most models have been developed internally by companies. Even where models have been developed and provided by third parties, little standardisation exists. In such cases, the providers (consultants, reinsurance companies, brokers) use their own proprietary models, adjusted to the specific needs of the client.

Scope of risks considered

3.6.9 Insurance risk models attempt to cover a wide range of risks. Those risks which are of an explicit nature (such as financial or economic risks) are capable of being modelled. Such risks include underwriting, investment, matching, interest rate and inflation rate risks and to a lesser degree credit, economic cycle and insurance cycle risks.

3.6.10 Trend risks, such as jurisdictional and legal risk, premium rate fluctuation, market changes, social changes, environmental changes, economic cycle or technological changes, are not omitted completely, but are usually considered implicitly, by adjusting model input and parameters in order to reflect the risk.

3.6.11 Other internal and operational risks that are difficult to quantify, such as underwriting management, operational, liquidity and general business risks, are usually omitted.

3.6.12 The table summarises the scope of risks which are typically considered by DFA models.

Risks included in internal risk models in insurance companies[18]

Risk	Explicitly	Implicitly	Omitted
Pure underwriting	✓		
Underwriting management			✓
Provisioning[19]		✓	
Credit	✓		
Operational			✓
Investment	✓		
Liquidity			✓
Matching	✓		
General business			✓
Jurisdictional and legal		✓	✓
Reinsurance[20]			✓
Premium rate fluctuation	✓	✓	✓
Market value fluctuation	✓		
Market changes		✓	✓
Social changes		✓	✓
Environmental changes		✓	✓
Interest rate	✓		
Exchange rate	✓	✓	✓
Inflation rate	✓		
Economic cycle	✓	✓	✓
Technological changes		✓	✓

Source: KPMG

3.6.13 Those areas where the company's management has a greater understanding of the company's exposure (such as underwriting) are capable of being modelled. Areas where it is more difficult to assess the financial impact are not usually modelled. Three of the large insurers we visited have begun to address this in operational risk.

Typical models

3.6.14 Internal models for risk assessment can be classified as static or dynamic[21] and as deterministic or probabilistic[22]. The most commonly used internal models fall into three main categories;

[18] Note – the comments above relate to several models which have been considered and therefore variables may be explicitly or implicitly included in some models and omitted in others.
[19] Provisioning risk is usually reflected in a DFA model, but not always explicitly.
[20] The reinsurance risk refers to the counterparty risk only in this context. The effect of reinsurance protections is explicitly modelled in most applications.

- static deterministic stress-testing;
- dynamic deterministic analysis using a financial model (deterministic DFA);
- dynamic probabilistic analysis using a financial model (probabilistic DFA).

3.6.15 Static models only consider the financial position of the insurance company at a specific point in time. Dynamic models incorporate variation over time. Deterministic models mainly refer to those scenario tests that can help assess the financial impact of certain events. The probability of such events occurring is included in probabilistic models.

3.6.16 Within the life insurance industry the main types of model in use are static and dynamic deterministic models (due to the traditionally deterministic modelling of mortality). The long term nature of the liabilities has resulted in more dynamic and financial aspects being considered in life insurance models. The strong links between assets and liabilities and the matching and localisation requirements have led to a common use of asset liability modelling and management techniques. More recently, there has been a trend towards probabilistic modelling (motivated primarily by the need to capture the asset variability).

3.6.17 The use of probabilistic models is more prominent in non-life insurance, but dynamic and financial aspects may have only been taken into account implicitly. More recently, a trend has begun towards the use of probabilistic DFA modelling.

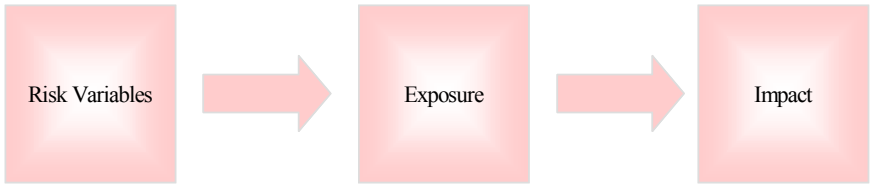
[21] Static: only considering one point in time. Dynamic: taking the development over a period of time into account.

[22] Deterministic: only considering the effects of one specific scenario without explicit consideration of likelihood and not aiming to span the range of all possible scenarios. Probabilistic: aiming to take a wider range of scenarios and their likelihood into account.

Static deterministic stress-testing

3.6.18 In the simplest form of internal risk models, the impact of risk is calculated by applying specific risk variables to company specific exposures. The impact can be calculated explicitly in a standardised way:

Static deterministic stress-testing



Source: KPMG

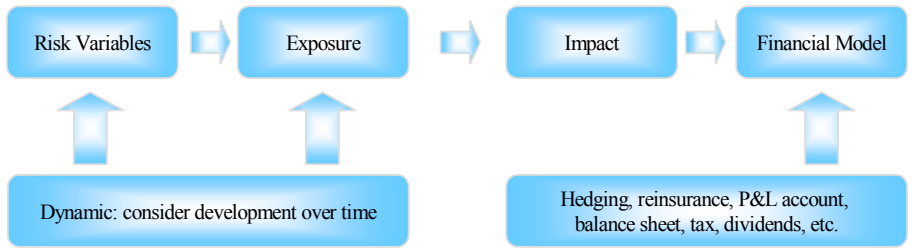
3.6.19 An example in life insurance is the calculation of the impact of certain interest rate levels on insurance liabilities. In this case, the items in the model are represented as follows: insurance liabilities are the exposure, and interest rate is the risk variable. An example in non-life insurance is the consideration of specific loss ratio levels (risk variable) applied to premium amounts (exposure). Both of these examples enable the insurance company to estimate their capital requirements. Assets are incorporated in the stress test by assuming specific percentage changes in market value.

3.6.20 These models allow a simplistic assessment of the effect of adverse development in several risk variables. One of the main disadvantages of this method is that these models do not make any allowance for the probabilities of the tested risk variable occurring. They also do not take any account of a longer time frame as they apply only at the point of time tested. This latter concern is addressed by dynamic models.

Deterministic DFA

3.6.21 In a deterministic DFA model, the calculation of impact is extended by considering the development of the risk variables and exposure over time. In addition, a financial model is applied that explicitly incorporates the effect of hedging and reinsurance and translates the impact into financial items. This can be incorporated in static deterministic stress-testing, but only by making judgmental or approximate adjustments.

Deterministic DFA



Source: KPMG

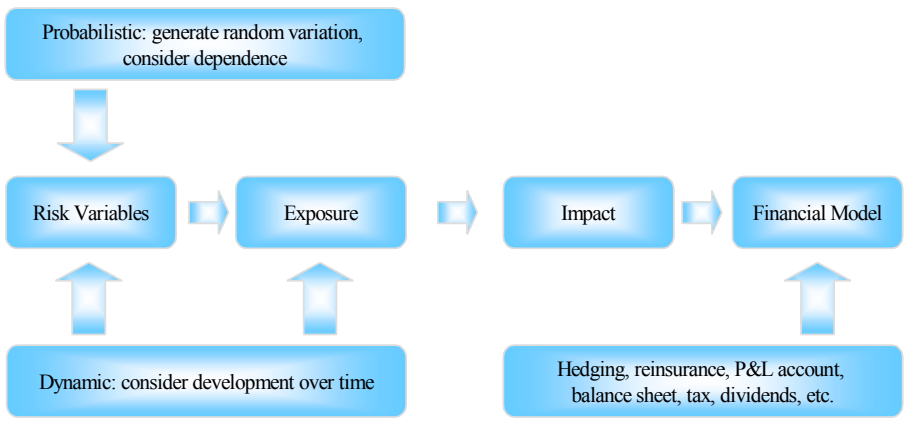
3.6.22 Advanced dynamic scenario-based (deterministic) approaches that incorporate a financial model can often be found in the life insurance sector. The techniques do not always consider the full liability portfolio (often separate models are applied for portfolio segments) where they work on a policy by policy basis rather than on the aggregate of all policies. They enhance the risk assessment that a company undertakes (compared to the static deterministic stress-testing model discussed above) by including the following:

- explicit testing of growth and trends of exposure and risk variables over time;
- explicit consideration of the time horizon;
- consideration of cash flow effects;
- ability of refined modelling of liabilities (risk periods, provision development etc.);
- consideration of financial effects (tax, dividends);
- improved consideration of matching and liquidity.

Probabilistic DFA

3.6.23 Probabilistic DFA attempts to cover the full range of variation of risk variables. The levels of the risk variables are sampled from statistical distributions in a simulation procedure. This method considers a wider range of outcomes, the likelihood of adverse development and the interaction of risk variables.

Probabilistic DFA



Source: KPMG

3.6.24 A description of these components and further discussion of the economic and insurance drivers is contained in Appendix 3.2.

3.6.25 Probabilistic models are increasingly being used by the largest undertakings in the non-life insurance sector. The following advantages of this model over the deterministic DFA are achieved:

- consideration of the full range of risk variable variation;
- ability to apply probabilistic risk measures;
- consideration of risk interaction (improved recognition of size and diversification effects);
- consideration of impact, size and likelihood.

Life versus non-life trends

3.6.26 The life insurance industry has tended towards deterministic models and the non-life insurance industry towards probabilistic models. The life insurance industry has (so far) put less effort into the development of enterprise wide risk models.

3.6.27 The life industry models for individual classes are often not integrated into a total risk model, but there is a trend towards holistic modelling. Life models commonly take assets and liabilities into account, even at a product level, and are of a more financial nature. Some degree of standardisation can be observed in life insurance liability modelling with the application of commercial modelling packages that include a variety of standard modules and are used for multiple purposes, such as pricing and provisioning.

3.6.28 Modelling in the life insurance industry is often deterministic. The use of scenario-based stress tests and of dynamic models with explicit cash flow considerations is common in the life insurance sector, but is less common in the non-life sector.

3.6.29 Due to the nature of the liabilities, matching, liquidity, credit risk, asset liability interaction and financial hedging are more important for the life sectors than the non-life sectors. This is clearly reflected in the risk models and their application.

Benefits of internal risk models

3.6.30 In certain countries methods have evolved partly as a result of regulatory requirements. In many cases though, management of insurance companies has come to appreciate the benefits of modelling techniques, and has begun to use them as a valuable management tool. One of the main reasons behind this may be that the financial statements of a company present a retrospective view of their financial position at a specific point in time, whereas the use of models can enable management to assess the prospective financial condition of an insurer as a dynamic business entity.

3.6.31 Models also have the advantage of combining all the major aspects of an insurance company's operations (underwriting, investments, pricing, tax, assets, liabilities, etc.) into an integrated model, which can provide a valuable insight into an organisation's future operations, results, and capital requirements. DCAT, for example, involves an analysis of the operations, the business plan and projected cash flows of a company, including the use of models to project possible future operating conditions and the impact of these on capital adequacy.

3.6.32 Scenario testing helps to evaluate the outcomes of financial decisions together with possible changes either within the company or externally (such as political or economic changes). It also provides information on alternatives, identifying those with the most significant risks and those with the greatest rewards. This can also help companies prepare strategies to combat threats to their financial position and appropriately target their development plans.

3.6.33 The models help management to gain a better understanding of the impact of current events on future performance. They are particularly beneficial in evaluating the interaction of decisions on all aspects of the company's activities and of the consequences of alternative business strategies on achieving planned performance. These should focus on major risk scenarios, including what can happen when more than one thing goes wrong at the same time, as can often occur.

3.6.34 The use of such models can significantly expand the information available to support management decisions, including:

- explaining why results varied from the results planned and illustrating the vulnerable areas where future results might differ from the current plan;
- analysing target markets for growth;
- modelling the impact of reserve development or large loss experience;
- modelling significant shifts in premium volume, decreasing or increasing by region or by line;
- determining the catastrophic loss a company can sustain, and comparing this result to its current exposure calculations.

3.6.35 If the models are appropriately developed, the increased awareness of the events that can cause a capital strain is likely to lead management to strengthen their monitoring of areas where the company is most exposed. No financial model is perfect, but this can be a first step to understanding the impact of adverse risks, and how to manage them.

3.7 Limitations of models

3.7.1 The difficulties involved with implementation and maintenance of DFA models for a large and complex insurance company are significant and should not be under-estimated. The application of internal models is often motivated by strategic and performance measurement purposes and is not always embedded in a structured risk management framework. More often, such models are being used to communicate capital adequacy to financial analysts, rating agencies and regulators. There are considerable practical issues that impose problems and limitations to the usefulness of such models for regulatory purposes.

3.7.2 Difficulties can arise in the following areas:

- ease of use;
- validation;
- communication;
- subjectivity and judgement;
- data;
- processes and systems;
- cost.

3.7.3 The main practical issue is the quality and ease of use of these models. Typically companies use a financial model that is not connected to the main accounting system, although some are able to use the same system that they use for budgeting and financial planning. For example, the Canadian experience was that the implementation of DCAT models was normally done by establishing a stand-alone computer model, most often using microcomputer templates, rather than by major system changes to extend the existing main accounting and statistical systems.

3.7.4 Some of the models used are proprietary and may not be sufficiently scrutinised by the undertakings using them. This can cause problems where the adequacy of the different models for specific purposes is not well understood by decision makers within a company. Indeed, communication within an organisation is a major issue in the development and use of a complex model. Some models may include ad-hoc adjustments, approximations and implicit considerations of risks.

3.7.5 It must be recognised that a high degree of professional judgement is required, both in the assumptions made and in interpretation of the results. In Canada, the actuarial profession has established guidance on which adverse scenarios should be considered by the appointed actuary for DCAT modelling.[23]

3.7.6 The benefits of the models considered rely on the fact that they take more risk factors into account. This can only be achieved by a more complex model structure and by a considerably increased parameter and input requirement.

3.7.7 In many cases the necessary data both for representing the current exposure and for estimating reliable parameters is not available. The application of these models therefore requires reliance on subjective approximations and assumptions.

3.7.8 As many of the systems are internally developed, there is a danger that the spreadsheet models used can be error prone and difficult to validate. If such models are to be used for regulatory purposes, then some validation of the model design, implementation and application process by a third party may be required.

3.7.9 Due to the complexities of some of these models, there is a danger that the expertise in their use is concentrated in a small group of people. Adequate documentation needs to be

[23] DCAT: Dynamic capital adequacy testing.

maintained, although the nature of the models can make it difficult to produce this at an early stage.

3.7.10 The implementation of a full-scale risk model for a large and complex insurance company is likely to require a significant amount of development effort. The ongoing maintenance and analysis will mean that the company will need to employ sufficient specialist staff for this purpose.

3.8 Country experience

3.8.1 As stated above, internal risk modelling is widely used in some parts of the world. The most advanced countries are largely those where the regulators have initiated the use of such models, although the benefits of these methods have often now been recognised by management of the insurance companies themselves. Countries where modelling is required or encouraged to be used are set out below. In some cases, supervisors have initiated the formal recognition of models; in others, models are reviewed as part of the overall supervisory review process.

Australia

3.8.2 Currently, there are only a limited number of general insurance companies that are using internal models to monitor their solvency as part of risk management. As the industry moves closer to the new Australian Prudential Regulatory Authority (APRA) regulatory guidelines, there is expected to be a requirement for more sophisticated methods of risk assessment to be developed. The Australian system is considered further in chapter 10 of this study.

3.8.3 Australian life insurers are further advanced in developing sophisticated methods of risk assessment and risk management as they are subject to risk weighted solvency and capital adequacy requirements.

3.8.4 The new general insurance solvency standard allows for internal models to be approved[24], although it is likely that the number of companies that will be able to build a comprehensive internal model will be limited. It is expected that a number of companies will build models that look at small parts of the overall risk model and will use the regulator's model for the rest. Some general insurers are developing interactive models to determine the capital that a business requires taking account of its risk profile, asset exposures and levels of catastrophe reinsurance protection purchased. These models are being developed to be consistent with the regulator's requirements.

[24] Note – the use of an internal model in the Minimum Capital Requirement (MCR) calculation is dependent on a number of conditions, set out in APRA's Guidance Note 110.2. the criteria include the ability of the model to address '*all material risks to which the insurer could be reasonably expected to be exposed… commensurate with the relative importance of those risks'.*

Canada

3.8.5 All life insurers have been required to prepare annual dynamic financial analysis reports (DCAT) since 1993 and file them with the federal regulatory authority. A similar requirement has applied to federally licensed property and casualty insurers since 1999.

3.8.6 These reports model the impact on future financial condition of various possible adverse developments with regard to both assets and liabilities, including off-balance sheet exposures. DCAT is done on a deterministic scenario-testing basis, rather than on a probabilistic or stochastic basis. Examples of adverse risk factors modelled include investment losses, market value declines, investment income decline, claims cost trends, policy lapse rates and expense levels. "Compound" adverse scenarios, in which more than one factor is adversely affected simultaneously, may be modelled where warranted – for example, a general economic downturn might result in both reduced investment income and increased policy lapse rates.

3.8.7 The primary measure of "future financial condition" is the projected capital adequacy score, the MCCSR (minimum continuing capital and surplus requirements) for life insurers and MAT (minimum asset test) for property casualty insurers.

United States

3.8.8 The development of Dynamic Financial Analysis (DFA) is emerging as an important trend in measuring and managing non-life business. In addition, traditional cash flow modelling is used by the more sophisticated companies to measure risk profiles. Many mid-size companies focus their risk analysis separately on liabilities and assets. Risk-based capital based on the National Association of Insurance Commissioners (NAIC) is calculated by all companies for regulatory purposes.

3.8.9 Modelling in the life insurance sector is much more sophisticated. Cash flow testing is required by the New York regulators, and adopted by some other states, in addition to risk-based capital.

3.8.10 The risk based capital model used by US regulators is described in chapter 10 of the study.

Netherlands

3.8.11 Traditionally, insurance companies have invested less in actuarial or risk management systems for their non-life business than they have for life business. The Pensioen- & Verzekeringskamer (PVK) has, after consultation with all interested parties, issued a guidance paper in 2001 which presents the direction of the future supervisory system. This will be based on measuring assets and liabilities on fair value with explicit measurement of prudence and mismatch. Adequacy testing will have to be performed both on the balance sheet date and on a dynamic basis.

3.8.12 For life business the larger companies do use risk management models. Scenario analyses have been performed for several years. At least one large Dutch insurance company publishes the outcome of its scenario analysis in its financial statements.

Companies also perform resilience testing and have models based on the calculation of embedded value that are used for asset-liability management.

Spain

3.8.13 In Spain, whilst not a formal requirement, many insurers use internal risk models, developed to greater or lesser degrees. In general, models are partial in nature and do not cover the entirety of risks. Whilst the Spanish insurance supervisor analyses models, difficulties are noted in relation to verification of the level of reliability, congruency with accounting data, lack of harmonisation, and limited level of application as a management tool at business unit level. Nevertheless the Spanish supervisor is working on the development of an early warning system based on insurers' internal models.

Other EU Member States

3.8.14 Most supervisory authorities tend to make use of models, where they are encountered in insurance undertakings, at least to provide supplementary information as part of the overall supervisory review process. In Denmark, for example, insurers have to notify details of their internal risk modelling techniques to the supervisor. Based on these notifications together with its programme of inspection visits, the supervisor examines the techniques used.

3.9 A survey of risk models

3.9.1 The application and design of risk models in insurance is a wide and heterogeneous area and it is therefore not easy to produce an overview. We conducted a limited questionnaire survey of some of the major insurance and reinsurance groups in Europe. Twelve companies participated in the survey. An analysis of the results is provided in Appendix 3.3. In addition, we also visited several large European insurers to discuss with them their experiences in developing and using models. The main points arising from the survey were:

- the key problems in the use of more sophisticated models are data and the difficulty of quantifying certain risks;
- across the companies that responded, there was significant variation in the types of models used;
- there appears to be a limited trend (among the respondents, which are some of the largest insurers) towards the use of probabilistic DFA models for the purpose of capital adequacy and overall risk assessment;
- a range of methods are in use when it comes to assessing and monitoring the aggregate risk profile of the firm; eight out of the twelve respondents claimed to have an aggregate view of risk, two by using an integrated aggregate model, two by using a stand-alone model (not integrated with sub-models), and two by taking an aggregate view of risk without the use of an aggregate risk model;
- there appeared to be a strong preference among respondents to develop risk modelling capabilities in-house, and this reinforces the view that there is very little industry-wide standardisation.

3.9.2 Several of the insurers visited were in the process of developing more advanced models, recognising the limitations of existing modelling techniques. One insurer, for example, had used a retrospective probabilistic aggregate model for a number of years, but was developing a more advanced, prospective DFA model. The original model was developed to make assessments of capital requirements, and was used in the business to make capital allocations and set return targets to business units. The model was used as a key management tool. However, certain weaknesses were recognised; the model ran on a net (of reinsurance) basis and did not respond quickly enough to changes in the business. Accordingly, the DFA model in development would operate on a gross basis, with the ability to simulate different reinsurance structures.

3.9.3 One insurer also was in the process of developing a more advanced DFA model, for planning and pricing purposes, and was aiming to build an integrated model for risk, accounting and solvency, which would include the quantification of operating risks. A distinction was made between the use of the DFA model for prospective and planning purposes, and the use of the Standard & Poor's model for retrospective assessments of risk based capital.

3.9.4 A key point recognised by the companies visited was the importance of modelling asset and liability risks in an aggregate model. In fact, one insurer noted that it had discovered asset liability matching risk relationships through improved modelling.

3.9.5 The key difficulties noted by the companies visited invariably included data. The data requirements for a complex DFA model are significant; accordingly there are significant costs involved in developing such models. However, another significant difficulty noted by another company was the communication and people issues surrounding the acceptance of a model as a key part of the management process. This highlights the fact that the analytical, quantitative approach is still new to the industry (apart from the largest undertakings) and management is not accustomed to operating in such a framework.

3.10 Potential implications of changes in banking regulation

3.10.1 Developments in the banking sector are worthy of consideration, as there are similarities in the risk factors to which banks and insurers are exposed. There are however some notable differences between these two sectors. Insurance companies' traditional business is the acceptance of insurance risks in return for premiums with an anticipation of paying claims. They accept an obligation to provide protection on the occurrence of a specified uncertain event. As a result, insurance liabilities are subject to significant uncertainty as the outcome of the contract is difficult to predict. Retail banks also face a number of risks, but their main business is to accept deposits from customers and invest these funds to earn a margin. For their traditional banking business, the main risks are typically on the assets side of the balance sheet.

A comparison between the risks relating to the different sectors of the financial services industry

3.10.2 Below we consider some of the key financial risks facing different product types as a prerequisite to considering whether the risk methodology techniques applied in the banking sector could usefully also be deployed in the insurance sector.

Insurance underwriting risk

3.10.3 The principal risk in non-life insurance business is that claims incurred will be greater than expected. In balance sheet terms, this is the risk that the provisions will be insufficient to meet claims payable. This is also the principal risk for life protection business and for annuities.

3.10.4 In the banking sector the principal risk is that losses will be greater than expected. Whilst the liabilities of a bank are generally fixed and known there is generally no concept of dynamic provisioning in the banking market which would create provisions for future losses or claims. Additional uncertainty exists in banks where they write derivatives or option contracts. There are now well established mathematical processes for estimating the risk, by measuring the price volatility of the underlying instrument or exchange rate.

Expense risk

3.10.5 Although all businesses are subject to expense risk, it is of much greater significance for life insurance business because of the long-term nature of the contracts. Life insurers may find themselves contractually obliged to administer policies, sometimes on a loss-making basis, for many years.

3.10.6 For unit-linked life business, the principal risk is that administration costs will exceed the charges that can be made on policies. Although the contract terms usually permit life offices to increase the charges, the extent to which they may do so can be limited by regulatory, contractual or other restrictions. Expense risk is generally lower for with-profit business where any expense over-runs are substantially borne by policyholders.

3.10.7 In general banks are able to cover their susceptibility to expense risk by adjusting the margin between interest paid and interest received, except where there is any contractual undertaking or service agreement which prevents them from doing so.

Credit risk

3.10.8 Credit risk is clearly fundamental to banks' lending business. Equally, insurers hold bond portfolios which are subject to credit default risk albeit investment grade strategies mean that this risk is not as acute as it may be in the banking market where higher default risk is normally taken. Nevertheless insurance companies are exposed to migration risk (downgrading of bond portfolios) which affects fund volatility and asset values. Insurance companies with high yield debt portfolios will have higher default risk. Additional credit risk of relevance to insurers relates to their reinsurance arrangements and deposits held with banks and similar counterparties. Credit risk is of course of fundamental importance to insurers underwriting credit insurance.

Lapse risk

3.10.9 Regular premium life contracts are typically priced so that the costs of selling the contract and setting it up are recouped out of margins on future premiums. The policyholder has the right to discontinue paying the premiums. If this occurs in the early period of the policy, the margins received may be insufficient to cover the costs incurred. There are

similarities here to mortgage lending by banks, although the use of lock-in clauses of various types provides some protection against losses arising on early cancellation.

3.10.10 The effect of lapses can have very different implications for insurers, for example, increased lapses on protection products may increase short term profitability. On the other hand, lapses of unit linked type products will adversely affect profitability as it may not be possible to recover acquisition costs.

3.10.11 Banks tend not to be susceptible to lapse risk of similar proportions to life insurers, but they are exposed to the potential for borrowers refinancing. This 'optionality' in loan agreements can result in the net present value of margin payments being less than the cost of acquisition of new business.

3.10.12 Banks also carry the risk of a liquidity shortfall due to the withdrawal or non renewal of deposits. This is considered separately under liquidity risk.

Market risk

3.10.13 Market risk is of greatest significance to a bank's trading activities and for with-profit life business. Where banks are holding investments for trading purposes, any fall in the value of those investments will have a direct impact on the bank's shareholder funds. Where banks have an obligation to deliver securities which they do not hold at an agreed price, they will incur a loss if the price of those securities rises. In addition, changes in market value also affect the value of any derivative products held as the market value is derived from the value of the underlying security.

3.10.14 In the case of with-profit business, the life insurer is exposed to the risk that the value of investments held to meet policyholder liabilities might fall below the level of benefit guaranteed to policyholders. In most cases where the insurer is able to meet the guaranteed benefits, most of the reduction in investment values will normally reduce the value of future surpluses available for distribution. Thus, a significant proportion of the risk is borne by policyholders rather than shareholders. The nature of the risks facing banks' trading activities and with-profit life business is very different because of the timescales involved. In practice, a with-profit life insurer will only be subject to loss if market values fall and remain low for a number of years. By contrast, a bank's trading activities are affected by daily fluctuations in value.

3.10.15 General insurance and life protection business are also subject to market risk. However, in practice, insurers typically match their liabilities with low-risk fixed interest investments. For unit-linked life business, the investment risk is borne primarily by the policyholder. However, some of the charges are based on a percentage of the value of the fund, so that the income of the life insurer is indirectly affected by falls in market values.

Liquidity risk

3.10.16 Liquidity risk primarily affects the lending and borrowing activities of banks who will lend money in the expectation that depositors will not require immediate access to their funds. If the level of withdrawals exceeds expected levels, banks may not have the liquid funds available to meet requests for withdrawal by depositors. Similar considerations apply to all banking liabilities.

3.10.17 Insurance business is also subject to liquidity risk in the event that claims incurred are higher than anticipated or that claims are notified sooner than expected. Matching of assets and liabilities is crucial in life assurance business where the liabilities are settled over a very long period.

Summary of risks

3.10.18 The table below summarises the significance of the different types of risk as they relate to each product type:

Significance of risk types

Risk	Non-life, life protection and annuity	Unit-linked life	With-profit life	Commercial Banking (lending and borrowing)	Investment Banking (trading)
Underwriting (insurance) risk	Major	Minor	Minor	Negligible	Nil
Expense risk	Minor	Major	Minor	Minor	Minor
Credit risk	Moderate	Moderate	Moderate	Major	Moderate
Lapse risk	Negligible	Major	Moderate	Minor	N/A
Market risk	Minor	Minor	Major	Minor	Major
Liquidity risk	Moderate	Minor	Minor	Major	Minor

Source: KPMG

3.10.19 There are similarities between the balance sheets of insurance companies and banks, consisting largely of financial assets and liabilities. Some of the risks which banks and insurers are subject to are similar, but their relative importance can vary significantly. As shown above, for banks and life insurers writing savings related products (namely with-profits and unit linked products), the asset based risks are generally the more significant risks affecting the business. For other insurance business, the underwriting risk is usually the most significant. Thus, whilst there is a commonality of risk categories applicable to both the banking and insurance sectors, the relative importance of these can vary quite significantly.

Risk modelling techniques used in the banking sector

3.10.20 In the banking sector, models are in use both for risk management and for determining regulatory capital requirements in connection with trading risks. Given that prudential regulators are interested in those risks which give rise to the need for capital, models which quantify such risks are potentially useful for regulatory purposes. The main categories of risks for which banks need to hold capital are market (trading) risk, credit risk and operational risk. Market risk can be modelled using statistically based Value at Risk (VaR) models, which generally use past observations of price volatility to forecast the future risk of loss. Prior to the development of VaR models, a number of banks used models under the first European Capital Adequacy Directive (CAD1); these models also modelled market risk, but on a more piecemeal basis than VaR models.

3.10.21 A range of methodologies is used to manage credit risk, including internal gradings and associated expected loss systems. Proposals are currently being finalised at the

international level (Basel) to enable these systems to be used for regulatory capital purposes.

3.10.22 Operational risk is difficult to model for capital purposes, but this is a rapidly developing area, in the light of developments in the new Basel Capital Accord.

3.10.23 Banking regulators have developed a number of requirements, in order for internal models which assess capital requirements to be useful for regulatory purposes. There are various requirements but three are of critical importance:

- first, the model should provide a quantified measure of risk using objective parameters;
- second, the model should be an integral part of the approach to risk management, and used in the business as a basis for making decisions. If it is not used in such a way, it would be difficult for regulators to assign sufficient credibility to the model to be able to recognise it in the capital setting process;
- third, the model should be subject to independent back testing for validation purposes, (see below).

3.10.24 These, and other requirements, are listed in more depth in Appendix 3.4. Model approaches which cannot meet these criteria are not generally recognised for regulatory capital purposes.

3.10.25 As discussed earlier, the range of risks that insurance companies and banks are exposed to are similar, although the importance of individual risks differs. Due to the different risk profiles, many of the banking models cannot be readily applied to the insurance sector, although the methodology - that of using institutions' own internal risk systems - potentially could. There may also be lessons to be learnt from the experience of regulators in the banking sector, in attempting to develop a regulatory approach which harnesses the systems used within the industry.

3.10.26 The approach taken by banking regulators in connection with risk models has generally been to allow flexibility and innovation. By imposing basic requirements, and requiring a model to be an effective predictor of risk, the approach has been to approve techniques already in use and proven in a business, and used by management as effective risk management tools.

3.10.27 Below we explore these areas further, with an examination of the techniques used in the areas of market risk (VaR models), credit risk and operational risk.

Value-at-Risk models and techniques for testing

3.10.28 VaR models for calculating market risk have proved to be useful to regulators, and this has been possible for a number of reasons: they are objective, being based on market prices; they give a quantified result, a number for value at risk; and they are capable of being tested.

3.10.29 VaR models are used as a tool to track the day to day risk of loss on trading portfolios of a bank. A model will generally look at the portfolio as a whole, but can be used to assess the risk of a portfolio and the performance of individual business units. There is a range of techniques available for calculating VaR. The Regulators do not define the technique to be used, thereby allowing flexibility and innovation in the market. However, whilst allowing flexibility, a modelling approach can only be used for capital purposes if it is shown to work as a good predictor. To show this, two key validation techniques are used:

- back testing is used to assess the performance of the model; that is that the predictive nature of the model is proved to be correct from subsequent experience. Besides being best practice in the use of VaR models, back testing is a regulatory requirement under the Basel Market Risk Amendment; a sliding scale of additional capital requirements is imposed if the model fails to predict the exposure correctly;
- stress testing of models is a technique used to assess the vulnerability of a portfolio to various movements in prices and exchange rates, and in the case of options, changes in volatility.

3.10.30 It should be noted that whilst a number of the more sophisticated banks have VaR models which are recognised for regulatory capital purposes, they are by no means universal, and not all models are able to meet the exacting standards for recognition. Certain publications have discussed the technical disadvantages of VaR as a risk measure in some financial areas.[25]

3.10.31 The key tests currently used by banks are summarised below.

Back testing

3.10.32 In terms of the ability of regulators to accept the use of models in the assessment of capital adequacy, the process of back testing is of fundamental importance. Back testing involves the comparison of the VaR model outputs against corresponding actual profit and loss account experience. Usually this would need to be done against the separate profit and loss accounts of each sub-portfolio of assets that contains material specific risk. In the UK for example, the Financial Services Authority (FSA) requires, as a minimum, specific risk back testing for the traded debt portfolio and the equity portfolio separately.

3.10.33 In order to demonstrate that a model is capable of being subject to back testing, a bank needs to have a reliable process for analysing exceptions identified by such testing. Historical data must be available over (in the UK case) the previous 250 days, and the regulator defines a limit for the number of exceptions, beyond which the model will be rendered unacceptable. Comparisons are made daily, using a rolling 250 day period, and regular reports are made to the regulator (monthly in the UK).

[25] Value-at-risk does not satisfy the property of sub-additivity which is desirable for assessing certain risks, for example when pricing insurance risks.

3.10.34 The length of the back testing period is to some extent arbitrary. In order to test the efficiency and accuracy of a VaR model a run of data is required to compare the expected results predicted by the model with the actual outcome. Models typically are updated and refined over time, so a period of several years would not be a realistic test because the model will have been modified over such a period. On the other hand, a period of a few weeks does not give a sufficiently long run of observations to provide a statistically significant test. 250 observations is a compromise and conveniently represents about a year's data.

3.10.35 Banking regulators tend to focus on back testing to assess a bank's internal model, although it is only one way of assessing the model's quality. Whilst back testing can be used to prove that a model continues to remain valid based on past movements in market prices, the predictive power of this tool does have limits, particularly in relation to unexpected market events. Consequently, back testing usually needs to be accompanied by stress testing of various types.

Simple sensitivity test

3.10.36 This test helps to determine the impact on the portfolio of a move in a particular market risk factor. It is used to determine the short term impact. Some predefined values of a specific market risk are applied to test the impact on the portfolio's value. For example, if the portfolio is sensitive to interest rate changes, then the interest rate might be changed by say +/-100 basis points or other predetermined values.

Scenario analysis

3.10.37 This test is conducted by applying simultaneous movements in different market risk factors, reflecting an event that may occur in the foreseeable future, such as, for example, an oil crisis. The test applies a fixed scenario across all markets, and tests the model against this scenario. The test may reveal that a model does not work well in a particular situation. This type of test is most useful for determining the long term effect or impact of events, and is currently one of the most commonly applied stress tests used by risk managers. The technique is commonly used in assessing risk on options portfolios where the risk of changes in the price of the underlying instrument or exchange rate can be tracked simultaneously with changes in their volatility. The technique is particularly important for options portfolios because the risk of loss is not linearly related to the change in the underlying price or exchange rate. A survey presented in a report by the Bank of International Settlements indicates that most institutions intend to perform further research into the applications of scenario analysis.

3.10.38 Scenario testing may be based on historical scenarios, replicating market events that have occurred in the past. A fundamental problem however, is the question of how far back one should consider historical data, and the extent to which capital should be held for events likely to occur only once in say, 30, or 50 years. Scenario tests are also carried out using hypothetical scenarios, which could help to assess the impact of plausible events or changes that have not occurred historically.

Maximum loss approach

3.10.39 This stress test studies the impact of a combination of extreme market movements that could potentially have the greatest detrimental impact on the institution. It appears that only a few firms are currently using the maximum loss approach since the choices of possible combinations of shocks is somewhat arbitrary and probabilities of different combinations cannot be assessed to provide an expected maximum loss under each of these combinations.

Extreme value theory

3.10.40 Extreme value models are based on mathematical and probabilistic models that provide methods to assign probabilities to the tails (very low or high values) of the distribution curve of a particular kind of risk factor. There are two main types of models that extreme value theory covers:

- the distribution of the maximum value of a sequence of random observations;
- the distribution of the excesses over a high threshold.

3.10.41 Recently there has been more co-operation between academic researchers and practitioners in order to promote the use and applications of extreme value methods as a risk management tool.[26] Even though these models are based on very technical and theoretical results, the statistical methods to fit these underlying distributions are not difficult to implement and there are many statistical software packages available that facilitate the implementation of extreme value models to given data.[27]

3.10.42 The advantage of using an extreme value technique is that it not only provides a useful tool to assess the impact of certain extreme scenarios, but it also attaches probabilities to those scenarios which allows the risk managers to assess the expected loss or impact of extreme events. In the survey presented by the Bank of International Settlements (BIS), it was found that a small number of firms are implementing the use of extreme value theory as a better alternative to risk management. There are still many issues regarding the use of extreme value models in practice; for example the dependence between different factors that affect the underlying distribution, multiple extremes, time dependent observations and the interdependence between observations and events is also questionable. In addition, since extreme value models are used for the tail of the distribution, the results are subject to higher uncertainty and volatility, both in parameters and models.[28]

Usefulness of stress tests

3.10.43 Scenario tests are currently used by risk managers mainly in the decision making process and business planning. Risk managers recognise the usefulness and limitations of these stress techniques and they are focusing their efforts on improving and developing internal

[26] See, for example, McNeil, A. (1999) Extreme value theory for risk managers. Working paper, EHT Zentrum.
[27] For example, Xtremes is a specialised software for extreme value methods.
[28] In practice, this is a significant problem facing regulatory agencies allowing the use of models to determine capital requirements: determining the extent of the long tail and determining what is a reasonable risk to require protection against.

risk models and stress tests as part of an integrated risk management process. The main advantages and disadvantages of the stress test techniques currently in use are summarised below.

Advantages

- stress tests help risk managers to assess the financial impact and exposure to certain events that are likely to occur;
- by varying the parameters of the test, they are able to assess which factors have the greatest impact and therefore are potentially the most damaging to the value of a portfolio;
- the results of these stress techniques are mainly used to help management prevent any financial difficulty that might arise once an event has occurred;
- stress tests are very useful in the business planning process and capital allocation process.

Disadvantages

- stress tests help to assess the financial impact of likely events but they do not provide the probability of occurrence of such events, except for the Extreme Value Models which are based on probabilistic models;
- the assumptions within the scenarios may be arbitrary, and this may be problematic because the assumptions have to be appropriately validated;
- although historical scenarios are very simple to replicate, they do not necessarily reflect the impact of future events;
- the number of independent variables is generally too great to test every one independently. Therefore there must in practice be some approximations applied, for example by dividing the yield curve into three broad zones of short, medium and long term interest rates rather than considering the impact on each bond individually taking account of its individual coupon and maturity;
- hypothetical scenarios may be appropriate to represent future events, but the assumptions may be too extreme and even unrealistic;
- scenario tests only consider the financial condition of the company at one point in time and do not reflect any change in the mix of business or market movements over a period of time. It would provide more useful information if stress tests were performed at short regular intervals of time.

3.10.44 Stress test techniques estimate exposure to or impact of certain events, but they do not quantify probabilities of such events occurring. The computational cost of implementing stress tests is a significant disadvantage. At present, market risk and credit risk cannot be incorporated into a single model in a systematic way and this limits the usefulness of models. Many banks are focusing their efforts on developing tests and models that will enable market and credit risk to be incorporated. Another limitation of stress tests is that some secondary risks cannot be easily incorporated in the scenario generating models and therefore their impact cannot be quantified. Also, to be meaningful, stress testing needs to cover both sides of the balance sheet.

3.10.45 The limitations of stress test techniques explain further why the primary focus of banking regulators tends to be on back testing of models, with stress tests of various types providing useful additional information as to the validity and sensitivities of a model.

Credit risk portfolio models

3.10.46 Credit risk is a major concern for banks and regulators. Historically it has been the principal cause of bank failures and generally remains so, even for banks whose main business lines involve trading activities. However, progress in the development of portfolio credit risk modelling has been far slower than the development of VaR models. Credit risk models are used to varying extents by banks, but regulators are not yet close to being able to recognise models in the capital setting process. It should also be noted that insurance companies seldom use sophisticated risk models to measure their exposure to credit risk.

3.10.47 Difficulties faced by regulators in recognising portfolio credit risk models in the capital setting process are found in each of the three basic requirements for model recognition referred to earlier. In particular, regulators have found that such models, where they exist, are not usually used as an integrated part of the risk management process; in other words, management do not rely on the models. A key reason for this lies in another of the basic requirements: back testing of credit risk models is problematic.

3.10.48 Compared to VaR models which are based on daily market movements and detailed records of prices over long periods, credit risk events are fewer and less frequent, especially during periods of economic prosperity. In order to capture enough data for meaningful statistical analysis, it is usually necessary to cover a period which includes recessionary conditions. The nature of credit risk also contributes to the data problem; whilst it is possible for a bank to move in and out of market risk by transactions in securities, the contractual source of credit risk (loans etc) means that it is generally more difficult to make quick adjustments to portfolio credit risk.

3.10.49 Given the relatively low frequency of credit risk events (and an event is usually the downgrading of a loan), there are difficulties in identifying meaningful correlations for the purposes of portfolio credit risk modelling.

3.10.50 The Basel proposals do not extend to the use of portfolio models which consider correlations between different customers and natural offsets which may exist. From a regulatory perspective, there is an aspiration to expand the scope of credit risk modelling to this end but currently there are no plans to do so. Nevertheless, some advanced banks are doing higher level modelling to arrive at their own estimates of economic or risk capital.

Types of models in use

3.10.51 Some credit risk models used by banks are based on actuarial principles and use statistical techniques to model the frequency of the events that could cause credit defaults as well as the severity of such losses. In such models, the general assumptions are sometimes simplified, for example the causes of default are not always analysed and therefore it is not necessarily clear which credit losses correspond to which events.

3.10.52 Credit risk models exist at two levels:

- models which help banks predict customer and transaction level risk;
- models which help banks to view portfolio level risk.

3.10.53 Correlations between default events that lead to credit losses are incorporated in some of the models but lack of data means that proxies have had to be found (for example, in the equity markets). Accordingly, when the frequency of independent default events is incorporated in the loss distribution a clear definition of "an event" needs to be addressed. The correlation between lines of business (for example, retail and corporate) is not always incorporated when the capital allocations to different lines of business are considered. When the correlation between lines of business is favourable, a capital benefit can be assessed by combining portfolios or lines of business, as the capital charged for the combined portfolio would be lower than the sum of the capitals if the portfolios are considered separately.

3.10.54 The time or risk horizon considered varies from bank to bank and for different portfolios. The time horizon could be assumed constant (for management purposes and capital allocation), or the time to maturity or run-off might also be considered (for long term financial assessment).

3.10.55 More sophisticated models, such as Credit Risk+[29], assess some uncertainty factors that affect the modelling process. Uncertainty mainly refers to the randomness of frequency and severity of credit losses. This factor will always be present, even when assumptions and models are correctly specified. The degree of uncertainty is reflected in the variance of historical loss, the risk horizon, and the confidence level in the model.

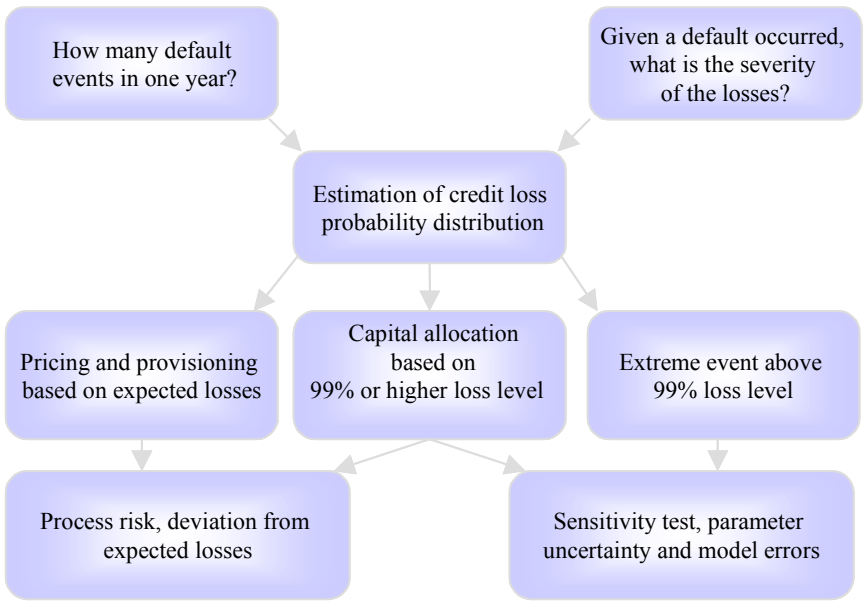
3.10.56 Parameters are estimated using credit loss observations (level (1) above) and these estimates are therefore subject to standard errors. The impact of parameter uncertainty can be addressed by carrying out a sensitivity test on the input of parameter estimates or alternatively, by putting a wider distribution around the estimates. It is important to carry out a sensitivity test for the largest losses where very few observations are available and hence more uncertainty exists.

3.10.57 Some portfolio credit risk models are based on modelling events. In the case of credit, the event is the downgrading a loan, and the model is based around the probability of such an event. It may be possible to apply a similar modelling technique to insurance, but this would depend first on the insurer having a sound basis for grading assets for credit risk (principally this would relate to recoveries due, and to become due, from reinsurers).

[29] Credit Risk+ is a credit risk model developed by Credit Suisse First Boston.

3.10.58 Credit risk models can be demonstrated diagrammatically as follows:

Credit risk models



Source: KPMG

Usefulness of credit risk models

3.10.59 Regulators and risk managers consider that internal credit risk portfolio models can be useful to assess and manage the overall credit risk of a financial institution. These models could contribute at various stages of the business cycle, for example in establishing limits and reserves, risk-performance base pricing, deal structuring, management decision process, and capital allocation and requirements.

3.10.60 For regulators, the use of such risk models may, in the future, be a more comprehensive approach to assess credit risk since these models will adjust better to the firm's risk profile and could help to maximise the efficiency of capital allocation.

3.10.61 However, there are significant difficulties in using internal credit risk models to set the regulatory requirements, not least of which is the limited availability of data related to credit losses. There is no industry-wide approach to measure credit loss, and therefore different methodologies may not be consistent with regulatory requirements. The time horizon may also differ from bank to bank, as can parameter estimation and model specification depending on their portfolio mixture. If used for determining regulatory capital, there is a particular problem in considering what time horizon should be considered.

3.10.62 Credit cycles typically have lasted about seven years from one trough to another. If capital is required to be held throughout the cycle at a level which would cover expected losses at the worst point in the cycle, there is a risk that the banking system becomes over capitalised and potentially inefficient economically particularly for credit risks that have a shorter maturity than the next expected downturn. On the other hand, if capital requirements are increased only at the point at which the downturn begins there is a real risk that the regulatory response of requiring more capital to meet the perceived increase in risk will exacerbate the economic situation. Banking Supervisors are well aware of this problem of procycliality but have not as yet found an easy solution to the problem.

Internal credit grading systems

3.10.63 The Basel Committee, in developing the new capital accord for the banking sector, could not find a way of enabling recognition of portfolio credit risk models for regulatory purposes. However, the conclusion which was drawn was that the internal grading systems used by banks could, under certain conditions, be recognised in the capital setting process. This type of approach could be of interest in the insurance sector, where models are not so widely used.

3.10.64 The internal grading process is not a statistical model, but an internal methodology. However, the basic requirements for model recognition are equally valid for certain internal methods. There is a requirement for back testing, and although the Basel conclusion was that a period of at least 12 years would be needed to include recessionary conditions, a period of seven years would be accepted, with transitional provisions at the outset meaning that banks would need to demonstrate testing against two years of data for a grading system to be accepted when the new Basel Accord becomes effective (as anticipated) in 2005.

3.10.65 There are many different types of internal grading system in use by banks, but they do tend to be used as an integral process in the business, in contrast to many of the portfolio credit risk models in use. The inclusion of internal gradings in the regulatory capital process has created a significant driver of change. In particular, certain criteria are specified, such as a minimum number of grades, a minimum amount of data for back testing, and the type of data required (the mix of internal, external and statistical data).

Operational risk models

3.10.66 In line with the new proposal presented by banking regulators under the Second Basel Accord, banks will have to set aside extra capital for operational failures. One of the considerations of the proposal is the use of internal risk models to establish the capital requirement for operational risk. However, there is a significant problem in setting standards in this area, because there are very few banks which have operational risk models in use, and those models that do exist often do not quantify risk or are not used in an integrated way in the business. Accordingly, the BIS has had (and continues to have) trouble defining its approach because of the risk that it will be leading the market, and in effect imposing a single approach. The preferred, and logical approach would be to encourage risk management standards to advance by following market developments with suitable regulatory responses.

Types of models in use

3.10.67 So far, some banks have used operational risk models to assess their own risk exposure to internal failures, but these models have not, by and large, been used for regulatory purposes. Under the new Basel Accord, the current proposals describe advanced measurement approaches, under which banks will base a regulatory capital charge on their own internal operational risk measurement systems.

Internal measurement approach

3.10.68 For each line of business, the supervisor will define operational risk event types. Based on internal (and possibly external) loss data for operational failures, the Expected Loss (EL) is calculated for each line of business/event type as the product of the probability of an event that could cause losses (PE), the average losses given the event has occurred (LGE) and an exposure indicator (EI) that captures the scale of activities in the business line. The capital charge for each line of business will be taken as the expected loss (EL) multiplied by a gamma factor[30] (supplied by the supervisor) specific to the line of business. The overall capital required for operational risk will be the sum of the capital across all the lines of business.

Loss distribution approach

3.10.69 Another internal model that could be considered to calculate operational risk capital is based on a compound probability distribution, under which the bank would estimate the distribution of operational risk losses for each business line/ risk type combination, based on assumptions about the likely frequency and severity of operational loss events. By compounding these distributions, the Value-at-Risk (VaR) for each line is calculated and the overall capital would be the sum of the VaR across all the lines of business. This type of model is not widely used at present.

Usefulness of operational risk models

3.10.70 The advanced measurement approaches to calculating the capital required for operational risk aim to reduce the capital charge compared with other approaches proposed in the new Basel Accord. Banks that are able to undertake the cost of implementing these models will experience a greater benefit, not only due to the reduction of the capital charge, but also because the models and data used will be based on the bank's own experience and business mix.

3.10.71 Although regulators are encouraging banks to use and develop their own operational risk models, there remain some considerations that have to be taken into account. The main issue is the availability of operational loss data, which in many cases might not be reliable to estimate probabilities and may not reflect the bank's risk profile. In order to improve reliability and consistency of the data, care will be needed in defining what is a loss due to operational failure.

[30] This represents a factor currently proposed to be applied linearly. It corresponds to the 8% factor for credit risk. The gamma factor is determined by supervisors based on their best estimate, given their experience. Thus it represents the average expected rate of loss.

3.10.72 Under these approaches, correlations between lines of business are not taken into account and a simple summation of the charges is being considered. This may result in a higher number than otherwise, since capital reductions often arise when the correlation between lines of business is favourable.

3.11 Usefulness of banking models in insurance

3.11.1 The analysis of the types of models in use in the banking sector shows that there are some common underlying principles with insurance models, for example the VaR approaches have some similarity to ruin probability approaches and some credit risk models are applying the actuarial risk theory model of loss events and loss amounts. Stress test techniques and scenario approaches have a design that can be applied equally to either banking or insurance, and the ability to perform testing (and identify and analyse exceptions) is a key requirement for any model which is to be relied upon for use in the business. VaR models in the banking sector are suitable for testing in various ways, but validation can be a major issue for other types of model.

3.11.2 The actual models will nevertheless be quite different, due to the differences in the risks modelled and the significant differences in time horizons involved. Insurance companies tend to focus on long term implications, whereas banking models focus on short term implications particularly for trading risks. Further, where banks and insurers are exposed to similar risks, for example credit risk affects both institutions, the importance and the impact can be significantly different.

3.11.3 Risk modelling in the insurance sector shows a limited trend towards holistic modelling, which tries to capture the total risk profile of the undertaking (currently the reserve of only the most sophisticated insurers). Banks, however, tend to look at market, credit and operational risk categories separately and apart from VaR models for trading risks, little account if any is taken of correlations between different risks. The spread of risks is crucially important to both banks and insurance companies, but supervisory constraints on risk concentration for banks are generally applied mechanically through the large exposures regime, limiting credit exposures to the capital base, rather than by requesting additional capital (although this may be a weapon in the armoury of banking supervisors who are currently able to apply capital ratios differently between banks – see Pillar II below).

3.11.4 For insurers the impact of interest rate risk cannot be considered in isolation in relation to the effect on the investment portfolio without considering the impact on, say, lapses, valuation of liabilities and guarantees. Therefore it is critical for risk interaction to be properly reflected in the models. This is a significant difference, as banking models tend to focus separately on the key risk areas.

3.11.5 A key point of interest for insurance regulators is that the recognition of models by banking regulators has, on the whole, evolved to encompass changes in industry practices. There have been market incentives which have prompted banks to invest in more advanced techniques for quantifying, pricing and managing risk, but such incentives have been strengthened by an increasing focus of supervisory efforts on risk measurement and management, particularly those risks which give rise to a capital requirement. Supervisors have generally attempted to incorporate the risk analysis tools developed and used within the banking sector, and this has not been restricted to the use of statistical

models. Where models are not widely used or where they do exist but cannot be relied on, there may be alternative internal processes (such as the internal credit grading systems of banks) which could be harnessed in the assessment of capital requirements.

3.12 Current developments and proposed changes in banking regulation

The draft Basel Capital Accord

3.12.1 In January 2001, the Basel Committee on Banking Supervision issued a proposal which, once finalised, will replace the current 1988 Accord. It is unlikely to be implemented before 2005. The draft Basel Capital Accord sets out those options from which banks, with the authorisation of their supervisor, can choose depending on the complexity of their business, as well as the quality of their risk management. The Committee believes that this framework will motivate banks to improve continuously their risk management capabilities so as to make use of the more risk-sensitive options and thus produce more accurate capital requirements.

3.12.2 With respect to the overall level of capital, the Committee's primary goal is to deliver a more risk-sensitive methodology that on average neither raises nor lowers regulatory capital for the banking system, after including the new operational risk capital charge. Capital requirements may increase or decrease for an individual bank depending on its risk profile. The proposal is based on three mutually-reinforcing pillars that allow banks and supervisors to evaluate properly the various risks that banks face. The New Basel Capital Accord focuses on three pillars, namely:

- Pillar I - Minimum capital requirements
- Pillar II - Supervisory review
- Pillar III - Market discipline

3.12.3 The new framework is intended to align regulatory capital requirements more closely with underlying risks, and to provide banks and their supervisors with several options for the assessment of capital adequacy.

Pillar I – Minimum Capital requirements

3.12.4 Pillar I covers regulatory capital requirements for market, credit and operational risk. To improve risk sensitivity, the Committee is proposing a range of options for addressing both credit and operational risk.

3.12.5 The new framework maintains both the current definition of capital and the minimum requirement of 8% of capital to risk weighted assets. The revised accord will be extended on a consolidated basis to holding companies of banking groups.

3.12.6 For the measurement of credit risk there are two approaches:

- standardised approach – risk weightings are applied to assets based on external ratings;
- internal ratings based approach – subject to strict methodology and disclosure standards, banks can use their own internal estimates of creditworthiness. The

framework allows for both a foundation method (where banks estimate the probability of default and supervisors supply the other inputs) and a more advanced approach (where a bank with suitably developed capital allocation process may supply other inputs as well).

3.12.7 The framework also introduces more risk sensitive approaches to the treatment of credit risk mitigation and securitisation techniques through use of collateral, guarantees and credit derivatives.

3.12.8 There are three approaches to operational risk:

- basic indicator of operational risk for total activity;
- standardised approach uses the same indicator but different calibration for different business lines;
- advanced measurement approaches uses banks own internal loss data for capital estimation.

Pillar II – Supervisory review

3.12.9 The Committee's work has also affirmed the importance of the supervisory review process as a critical complement to the minimum capital requirements. The new Basel Capital Accord therefore proposes procedures through which supervisors ensure that each bank has sound internal processes in place to assess the adequacy of its capital and set targets for capital that are commensurate with the bank's specific risk profile and control environment. Banks whose self appraisal of capital requirements and control systems include the assessment of risks which are not directly covered under Pillar I will be required to hold additional capital.

Pillar III – Market discipline

3.12.10 The Committee believes that the disclosure requirements and recommendations set out in the package will allow market participants to assess critical information describing the risk profile and capital adequacy of banks. The Committee believes that the assessment by market participants who are the peers of institutions will provide a powerful influence on an individual bank's behaviour and capital planning. The proposals provide more detailed guidance on the disclosure of capital structure, risk exposures, and capital adequacy.

3.13 Implication of Basel for insurance supervision

3.13.1 The new Basel Capital Accord has clearly favoured a risk-based approach to measuring the capital requirements of banks. It is an approach which attempts to match more closely regulatory capital with a bank's own economic capital. It provides for varying degrees of sophistication in the areas of credit risk, market risk and operational risk, and attempts to reward banks with better measurement and control systems with progressively lower capital requirements. It is important to note that for the more advanced systems, it does not impose risk models, but requires their application to have certain key features. Although subject to supervisory review the use of a model for determining regulatory

capital requirements is not constrained to the use of a specific model, but always permits the development of improved modelling techniques.

3.13.2 Our comparison of the risks facing insurance companies and banks concluded that there are similarities in some of the risks which both industries face, but with different impacts in intensity and complexity. The possibility of banks being able to obtain recognition of their own risk models in assessing the capital requirements is a significant step forward in encouraging firms to enhance their risk management processes. In principle, it is quite possible that a similar, but differentiated approach, tailored specifically for insurance companies, would help in overcoming the drawbacks of the current European solvency margin system.

3.13.3 Flexibility is required in determining the capital requirements for insurance companies with the possibility of using a two-tier approach, whereby minimum capital requirements are set by a fixed-ratio system (which may be risk based) but is supplemented by assessments derived from the company's own risk models and methodologies.

3.14 Conclusions

3.14.1 Insurance is a risk business and risk management should be a core process in the business. Even in major insurance groups, integrated and comprehensive risk management systems are still evolving. A central part of risk management involves an internal assessment of financial resources and ensuring the undertaking has enough capital to avoid financial difficulties and insolvency. This assessment should cover at least the foreseeable future. This involves assessment of the full range of risks which could impact on the financial position of the undertaking.

3.14.2 Insurers define and categorise risks in a number of ways. In a future solvency system which takes more risk factors into account, a consistent categorisation of risks, at least at a broad level, would be desirable. At a high level it is possible to identify broad categories of risk. An acceptable working categorisation at a broad level is the US RBC system, which takes into account four main types of risk: asset risk, insurance risk, interest rate risk and business risk. The way that companies categorise risk is likely to drive the way they assess and manage risks, but some of the large companies pay less attention to categorisation and more to comprehensive identification, and quantification and modelling of those risks which can be quantified.

3.14.3 The key question for regulators and insurers alike is what are the key risks for solvency? Asset risk (market values, interest rates, inflation), and interaction between asset and liability risk factors, is often more significant in the risk profile than many insurers believe. Insurance risk is clearly key. Credit risk (mainly, but not exclusively, in relation to reinsurer security) is also important. Operational risk is often cited as a separate risk category that gives rise to a need for capital, but this is not always clearly defined, and is frequently seen as the residual risk category. Some insurers are trying to quantify operational risk and incorporate it more explicitly into advanced models. Operational risk is usually present in other risk areas, especially underwriting. Many failures in the insurance sector have been attributed to operational risk factors, often related to underwriting management.

3.14.4 Being able to assess capital requirements with a reasonable degree of accuracy depends on an insurer being able to understand its risk profile and the financial impact of that profile. In order to achieve this, an effective risk management framework is needed and part of this is the ability to model those risks which can be quantified. Modelling enables the financial position to be tested under different scenarios and for management to better understand the economic capital requirements of the business.

3.14.5 Only the larger insurers have developed sophisticated risk management and modelling methodologies. And there is little consistency in approach. A feature of advanced risk modelling is that by and large it tends to be developed in house, or tailored very specifically, so there are very few standard models.

3.14.6 Given the complexity and variety of risk profiles in insurance business, and the variety in the types of approaches in use, it is unlikely to be possible or desirable to impose a rigid approach. However, experience of some insurance regulators (particularly in the USA), and in the banking sector internationally, shows there are benefits in setting regulatory standards which encourage the industry to raise risk management standards. A broad requirement for all insurance undertakings to have adequate risk management systems may be possible at the European level.

3.14.7 Developments in banking regulation are helpful in providing an insight into the difficulties for regulators in placing reliance on internal methodologies in the capital adequacy process. They also help to indicate the type of conditions which must be met before regulators can rely on models and other methodologies. In order for insurers' internal models (and other methodologies) to be of significant use to regulators in assessing capital requirements, there are three fundamental conditions which would need to be met:

- models must be relied on by senior management in running the business. This has proved a sticking point in the banking sector, especially in risk areas where the reliability of models cannot easily be tested (and management do not rely on them);
- it must be possible to quantify the risks involved and provide a value as a result;
- it must be possible to validate the models – this means there has to be an appropriate form of internal but independent testing.

3.14.8 Analogies to the banking sector are however only useful up to a point. The discussion in this chapter of the risks faced by insurance undertakings and the comparison to risks faced by banks indicates that there is, by and a large, greater complexity and diversity of risks in insurance business. Accordingly, validation of risk models used by insurance undertakings is a difficult matter. It is possible to make assessments of a model's design, internal integrity, consistency and logic, but the more complex models involve considerable judgement in assumptions, and given the significant time periods involved an assessment of a model's soundness will also rely heavily on judgement.

3.14.9 Risk models could serve a useful purpose for insurance regulators but there are many difficulties involved. Increasing complexity of models is invariably accompanied by increasing data requirements, cost and communication issues, but with benefits in terms of predictive power.

3.14.10 It is important also to bear in mind that risk modelling is by no means a universal practice. The fact that sophisticated techniques are currently the preserve of the largest insurers suggests that any system in which prudential supervisors sought to harness the risk models used by insurers would need to be combined with less sophisticated approaches for smaller insurance undertakings.

3.14.11 Also of significance in this context is the fact that risk modelling, where it exists, normally forms one component of an insurance undertaking's approach to risk management. An effective risk management framework is unlikely to be based on risk models alone; there will be various other internal processes and structures which form part of the overall framework. The appropriateness and adequacy of risk management systems are important factors in making an assessment of the true overall financial position, and a key question in assessing risk management systems is: to what extent are risk management systems integrated across the business to provide management with a complete overall view of the risk profile? The extent to which risk management is an integrated process is highly variable throughout the insurance industry. In many insurance undertakings (including some of the larger groups) risk management is often not organised in an integrated way to provide a holistic view of risk across a group (or even, for that matter, across a single undertaking).

4 Technical liabilities

4.1 Terms of reference

4.1.1 *"Description of methods for determining non-life technical provisions, identification of best practice and new trends, as well as a reflection on the need or possibility for harmonisation at European / international level. Existing policies on discounting and the establishment of equalisation provisions must be studied as well as the practice for establishing IBNR ('incurred but not reported') provisions for property as well as liability risks."*

4.2 Introduction

4.2.1 The Müller report emphasised the importance of technical provisions in prudential supervision:

"The solvency margin as a rule fulfils its warning and safety function but it does not at all replace an effective company analysis and a prudent establishment and coverage of the technical provisions."[31]

4.2.2 Technical provisions represent the most significant liability item in a non-life insurance company's financial statements. The accurate assessment of the required level of non-life technical provisions is vital for purposes of calculating the company's solvency position for regulatory purposes and also because mis-statement of available capital could potentially lead to inappropriate management decisions being made. Also, inaccurate assessments of technical provisions result in inaccurate assessments of profitability. For example it may lead to inappropriate management decisions, such as failure to increase rates for loss making business, or ceasing to write profitable business where it is incorrectly assessed to be unprofitable.

4.2.3 In order to make a meaningful assessment of an insurance undertaking's true financial position, it is necessary for prudential supervisors to consider various qualitative factors, in addition to analysis of quantitative information. To this end, whichever method or methods are followed in establishing technical provisions, the importance of the supervisory review process, including inspection visits which enable supervisors to gain impressions inter alia of the quality of management and the rationale behind subjective judgements, cannot be overstated.

4.2.4 The calculation of the technical provisions, in particular the outstanding claims provision, is an extremely subjective area due to inherent uncertainty. Understatement of outstanding claims provisions is, almost by definition, one of the major factors in insolvencies of non-life insurance companies.

4.2.5 Below we consider the following:

- the key valuation principles and methodologies for determining non-life outstanding claims provisions within the EU and the extent to which these differ from those applied outside the EU;

[31] The Müller Group Report (1997).

- claims handling provisions;
- discounting;
- best practice and new trends in relation to the determination of outstanding claims;
- the need and possibility for harmonisation at a European and international level.

Other technical provisions are then considered briefly.

4.2.6 The terms of reference of the study do not specifically request discussion of life technical provisions however, for completeness, we have included a summary of the key differences internationally and between Member States.

4.2.7 Article 6 of the EU Insurance Accounts Directive (IAD) prescribes the format for disclosure of non-life technical provisions by EU Member States as follows:

- provision for unearned premiums;
- claims outstanding (including claims handling expenses);
- provision for bonuses and rebates (not significant for non-life);
- equalisation provision;
- other technical provisions (including provision for unexpired risks).

4.2.8 The description of the various captions may vary slightly in countries outside the EU, but the nature of the items is unlikely to vary significantly. Accounting regulations generally require non-life technical provisions and associated reinsurance recoveries to be disclosed separately in the balance sheet, either as a separate deduction from liabilities or as balance sheet assets.

4.2.9 In most countries in the EU there is a requirement that non-life technical provisions for regulatory purposes should follow generally accepted accounting principles applied to such provisions included in the financial statements. As discussed in the introduction to this study, the financial statement should be used as the primary basis for determining the company's net asset position for solvency purposes. Consistent with this principle, it is desirable that the non-life technical provisions included in the financial statements should be used as a starting point for the solvency margin test ideally with no adjustment or with minimal adjustment (for example to reflect the impact of adjusting post balance sheet events between the date of signing the financial statement and the regulatory return).

4.2.10 The Manghetti Report stressed the importance of specific and precise methodologies being applied to the calculation of technical provisions:

"the risk of uncertain technical provisions should therefore be forestalled both by companies adopting prudential (this term is to be interpreted in relation to the specific and precise methodologies for calculating technical provisions described in the report) calculation procedures and methodologies when setting up technical provisions, and by supervisory authorities".[32]

[32] The Manghetti Report; 'Technical Provisions in Non-Life Insurance' (2000)

4.2.11 Whilst recognised methodologies do exist in relation to the calculation of technical provisions, a high level of precision is difficult to achieve where the ultimate claims liability is uncertain and there is a wide range of outcomes. The Manghetti report also emphasised the importance of harmonisation of methodologies adopted in the various countries.

4.3 Analysis of the provision for outstanding claims

4.3.1 The provision for claims outstanding is defined in Article 28 of the IAD as:

"the total estimated ultimate cost to an insurance undertaking of settling all claims arising from events which have occurred up to the end of the financial year, whether reported or not, less amounts already paid in respect of such claims."

4.3.2 The provision for outstanding claims is analysed as follows.

The outstanding claims provision

Case provision for notified outstanding claims (agreed and not yet agreed)	=	Notified claims to date (agreed and not yet agreed) less paid claims to date
'IBNR' provision (Incurred but not reported)	=	Ultimate claims cost less notified claims to date
Total provision	=	**Case provision plus IBNR provision**

Source: KPMG

4.3.3 It should be noted that whilst the provision for outstanding claims can be analysed between reported claims outstanding (based on case estimates) and the IBNR provision, it is the total provision, and not the analysis between the two elements, which is important for financial statements and regulatory purposes. Many estimation techniques project total claims incurred for a particular class of business from which claims paid and reported outstanding claims are deducted to determine the IBNR provision. The total provision is based on the ultimate estimated claims cost. This means that any surplus or deficit amounts arising on specific provisions established for reported claims outstanding (sometimes known as incurred but not enough reported "IBNER") may be offset against the amount included within the provision with respect to IBNR when estimating the ultimate cost. In some countries the ultimate cost is determined by adding the case estimates to the IBNR provision which is often determined independently.

4.4 Valuation principles underlying the assessment of the provision for outstanding claims

4.4.1 The IAD[33] establishes a common framework of accounting principles which has been implemented in individual Member States. It lays down general principles for the determination of non-life technical provisions rather than the detailed methodologies which should be applied. (For example it does not prescribe a specific methodology to be applied in estimating the provision for claims incurred but not reported within outstanding claims).

4.4.2 An important requirement in the IAD relates to the establishment of outstanding claims provisions included in Article 56 which provides further explanation of what is meant by "adequate" in the First Non-Life Directive. Article 56 states that:

"the amount of technical provisions must at all times be such that an undertaking can meet any liabilities arising out of insurance contracts as far as can reasonably be foreseen".

4.4.3 In practice there are significant differences between how this requirement is interpreted between EU Member States. In some Member States provisions are set at such a level that no run-off adverse deviations are likely. In other Member States these are on a best estimate basis. These are also levels of provision at points in between. There is also currently no disclosure to the regulator of the expected range of outcomes and the expected probability of each outcome.[34]

4.4.4 The following table summarises how this requirement for "*provision to be made for liabilities as far as they can reasonably be foreseen"* is generally interpreted within the EU[35]:

Provisioning bases

Country	Are provisions set to attempt to ensure no adverse run-off or on a best estimate basis (50% confidence level)?	Do significant adverse run-off results occur in practice?
Denmark	Best estimate basis.	Yes for longer tail business such as disability, accident and worker's compensation.
France	Prudent level to ensure no adverse run-off.	No significant adverse run-off in last few years except on specific lines of business (eg construction and general liability).
Germany	Attempt to ensure no adverse run-off.	Yes in some classes of business but not overall.
Italy	Best estimate basis.	Yes these occur quite frequently in practice.
Netherlands	Companies strive for a positive run-off result.	Yes in motor because of whiplash and developing court rulings / legislation.
Portugal	Attempt to ensure no adverse run-off.	Yes, mainly in motor insurance for body

[33] Council Directives 91/674/EEC (Insurance Accounts Directive).
[34] Questionnaire sent to local KPMG offices.
[35] ibid

		injury claims with litigation.
Spain	Attempt to ensure no adverse run-off.	Yes but not frequently. Fluctuations can be significant in motor insurance.
Sweden	Best estimate basis.	Yes significant adverse run-off results do occur in practice. For example in motor insurance in the last five years.
UK	Attempt to ensure no adverse run-off.	Yes particularly for liability business.

Source: Questionnaire sent to local KPMG offices

4.4.5 It should be noted that there are different comments in column three of the above table even when the stated goals in column two are the same in many instances. There is no accepted convention as to how to quantify comments such as "Attempt to ensure no adverse run-off" or "Best estimate basis".

4.4.6 Prima facie, within most Member States, provisions will in general be higher than on a best estimate basis. However, it is not possible to be definitive on this view, as methodologies employed by some companies do not permit an evaluation of where in the range of outcomes technical provisions have been established.

4.4.7 US Generally Accepted Accounting Principles (GAAP) has a requirement for “best estimate” provisions (the most likely estimate for the ultimate settlement) which means that adverse run-off deviations are more likely in practice. Best estimate is generally interpreted to be the point that would provide a 50% chance that the provisions, based on the anticipated distribution curve of outcomes, will not be under- or overstated. Under US GAAP the margin for adverse deviation is taken into account in the capital requirements.

4.4.8 The forthcoming International Financial Reporting Standard (IFRS) for Insurance Contracts is likely to require provisions to be set up on a “best estimate” basis, using stochastic modelling to determine an expected value. In contrast to US GAAP the proposals include a further requirement to set up a separate provision for risk and uncertainty for the difference between a best estimate provision (50% confidence level) and the provision for risk and uncertainty based on market risk preferences (a higher confidence level which is yet to be determined). The forthcoming IFRS for Insurance Contracts also requires the provision for outstanding claims and the provision for risk and uncertainty to be discounted. In Australia, Prudential Standard GPS 210 (applicable from 1 July 2002) requires ‘best estimate’ provisions with an additional ‘risk margin’ provision.

4.4.9 If non-life outstanding claims provisions are included in the regulatory return on an IAS basis then it is vital that the regulator understands at what confidence levels both the non-life technical provisions and the related provision for risk and uncertainty have been set, in order to ensure that risks in excess of this confidence level can be taken into account in determining the solvency requirement.

4.5 Methodology to determine the provision for outstanding claims (including IBNR)

4.5.1 In determining the provision for outstanding claims it important to recognise that this is an extremely subjective calculation. Regardless of the complexity of the technique that is applied to the estimation process there are a large number of underlying uncertainties which mean that it is impossible, without the benefit of hindsight, to determine the correct amount to be provided.

4.5.2 The following are some of the factors that contribute to the complexity and uncertainty of the calculation:

- delays in the reporting or processing of claims (whether the business is short or long tail and delays relating to brokers and other intermediaries);
- determining whether the insurer is liable (ie whether the event is actually covered by the contract);
- changes in the approach to setting case reserves;
- difficulties in obtaining data (eg where historic claims development is unavailable);
- inflation;
- exchange fluctuations;
- legal, social and other developments affecting the ultimate cost of claims;
- latent claims such as asbestos related claims and pollution;
- large or unusual claims;
- catastrophe claims – particularly where the event occurs just prior to the accounting date;
- recognition of reinsurance recoveries;
- recognition of claims handling expenses;
- discounting (where applied).

4.5.3 There is a broad range of methods in use to estimate claims provisions and we have summarised the more common methods below. Given the range of methods in use we have highlighted the key factors that should be considered in selecting and applying the various methods.

Key factors to consider in the choice and application of methods

4.5.4 The reliability of the calculation of technical provisions depends crucially on the judgement made in selecting and applying the method. The following are some of the key factors:

- management and those persons responsible for setting the provisions need to have a clear understanding of the nature of the business being projected;
- management and those persons responsible for setting the provisions need to have a clear understanding of past and current issues affecting the business being projected

particularly where these impact upon any assumptions of consistency that are made within the method. For example, a one-off alteration to the level of court awards would affect past development factors. Use of the standard chain ladder techniques without adjustment may systematically over or understate provisions as a result;

- wherever possible a variety of methods should be used and the provision based on selection from the various results which are considered to be the most appropriate for that particular class. For example, both paid and incurred claims information should be analysed. For catastrophe claims, both a ground-up method based on claims reported to date and a top-down approach based on total expected costs and market share might be examined and the results compared;
- the person responsible for setting the provisions should be able to identify and communicate to management and in the financial statements and regulatory return the uncertainty inherent in the methods applied and the uncertainty inherent in the business being projected;
- where possible the methods selected for use should be capable of producing stable results over time and should not be overly sensitive to small changes in underlying data. In practice, it is not uncommon to allow for reinsurance recoveries by applying the ratio of recoveries expected on outstanding claims or those received on past settled claims to the gross outstanding claims provision. The recovery percentage derived in this manner can be volatile over time;
- the methods used to project gross claims and the reinsurance recoveries should be consistent. The projection of reinsurance recoveries bring additional complexity and this is discussed in more detail below;
- the extent of subjectivity in the methods used should be understood and any subjective adjustments identifiable.

Modelling of reinsurance recoveries

4.5.5 The modelling of reinsurance recoveries is usually a complex task. Reinsurance recoveries should be estimated based on an assessment of recoveries available under the company's reinsurance programme. The impact of various different types of reinsurance (for example quota share, facultative, excess of loss) will need to be modelled carefully. There is an inherent difficulty that past data cannot be reliably used for projections if the reinsurance programme has changed significantly.

4.5.6 It is important that provision is made for reinsurance recoveries both in respect of notified outstanding claims and also IBNR provisions. In addition to the factors noted above, the following are some of the key factors that should be considered in projecting reinsurance recoveries:

- the projection of claims gross and net of reinsurance should be consistent with the reinsurance programme in place;
- there needs to be a clear understanding of the nature of the reinsurance in place and any changes to the reinsurance programme. Reinsurance programmes are often subject to substantial change over time. This makes the application of basic chain ladder techniques to claims net of reinsurance more problematic;

- the extent of pure IBNR and IBNER within the gross IBNR provisions should be considered. An offset of a substantial negative IBNER and positive pure IBNR can make the projection of reinsurance recoveries difficult unless this observation has been identified in the projection of gross claims;
- the sub-division of data that is best for the projection of reinsurance recoveries may be very different from the sub-division that is best for the projection of gross claims. For example, the reinsurance programme may protect the claims result across a number of classes of business or across results from different periods;
- the impact of potential reinsurance exhaustion – either due to the potential size of IBNR claims (often referred to as vertical exhaustion) or the number of IBNR claims (often referred to as horizontal exhaustion);
- the potential for reinsurance bad debt;
- the impact of reinstatement premiums.

4.5.7 The key point is that it is crucial that the gross provisions and reinsurance recoveries are consistent and are set based on adequate reference to the actual reinsurance protections in place. If in the future, regulators require information on stress and scenario testing of outstanding claims provisions, then separate projection of the gross figures and the reinsurance recoveries will be essential. Current practice tends to be to model reinsurance recoveries on a net basis.

Use of case by case methods

4.5.8 A widely used methodology for the establishment of claims provisions is the use of case by case estimates. Broadly, this method is not actually a method for setting IBNR provisions, but involves the claims handling function setting case provisions for all open and notified claims.

4.5.9 The case by case method forms part of the rules for determining non-life technical provisions in the Insurance Accounts Directive. Article 60 of the directive includes the requirement that:

"a provision shall in principle be computed separately for each case on the basis of the costs still expected to arise. Statistical methods may be used if they result in an adequate provision having regard to the nature of the risks; Member States may, however, make the application of such methods subject to prior approval."

4.5.10 It also requires provision to be made for IBNR claims:

"…its amount shall be determined having regard to past experience as to the number and magnitude of claims reported after the balance sheet date".

4.5.11 The case by case method only provides part of the overall picture. It is important to assess the total requirement for claims provisions, from which known case estimates can be deducted to give the requirement for IBNER claims.

4.5.12 Case by case estimation is in practice an essential part of the process of establishing claims provisions. To be used as a basis for further estimation, it is of critical importance that trends over time in the case by case estimates are understood and that any

inconsistencies are identified, together with their causes (for example, change of claims handler, and changes in processing arrangements, as well as changes in the underlying claims experience). Over-reliance on the case by case method has disadvantages. In particular, inconsistencies in the case by case estimation process can lead to errors in assessing the total provision (hence the importance of preparing projections on the basis of paid claims, and not just incurred claims). Unusually large claims can also have a distorting impact.

Use of statistical methods

4.5.13 Insurance companies typically use statistical methods to assess IBNR and IBNER provisions. Article 60 of the IAD (see above) permits Member States to make the use of statistical methods subject to prior approval by the regulator.

4.5.14 A KPMG survey carried out in 1999 found that a minority of Member States made use of statistical methods subject to prior approval. In Spain for example, the use of statistical methods must be communicated to the regulatory authorities, who are empowered to deny their use. In any event, at least two different statistical methods must be computed, and during a period of five years the results must be compared with the individual valuation of claims (booking the higher of the two).

4.5.15 The use of statistical methods to determine outstanding claims provisions is widely accepted in the non-life insurance industry. Prior approval of the use of such methods therefore appears unnecessarily restrictive. From a supervisory point of view it is more important to require adequate disclosure to the regulator of the basis of determining of outstanding claims provisions included in the regulatory return by class of business, and the sensitivity of the estimates to changes in assumptions and adequate disclosure of the run-off results over time by class of business. This information should enable the regulator to form a view on the appropriateness of the statistical methods applied. There are, of course, costs involved for regulators; proper analysis of such information is not easy, and requires skilled people.

Quality of data

4.5.16 Statistical techniques are only as good as the quality of the underlying data and it is very important that the underlying data has been produced on a consistent basis and has been verified and audited. If the business category has not been written for a reasonably long period there will not be adequate data and even greater judgement will be required. The following issues should be considered:

- the way in which claims are subdivided for analysis. Claims should, where possible, be subdivided for analysis into groups so that it can be reasonably assumed that the claims will emerge and develop in a similar manner. Similarly the subdivision should be sufficient that any change in the mix of business written over time, eg from property type risks to longer tailed liability type risks, or make up of claims type, such as between bodily injury and property damage claims within a motor portfolio, does not materially distort the analysis. On the other hand too much sub-division is not desirable. If small volumes of data are used, random variation will play too great a role in the result;

- sub-division also needs to address large claims, unusual claims, latent claims and catastrophe claims;
- analysis should identify a clear best estimate even if it is then decided to include some explicit margin for prudence.

Review of results of statistical analysis

4.5.17 The determination of an appropriate level of provision will be influenced by the degree to which actuarial analysis is undertaken, the independence of the claims provisioning function from the underwriting, and the degree to which the management takes a prudent stance on provisioning issues. Past run-off results should be reviewed to see if there is a pattern of setting provisions which had a favourable run-off, or whether the converse applies. Significant variances may indicate shortcomings in the method or changes in the business which mean that historical claims development patterns are no longer applicable to new business being written. Also it should be possible to project future cash flows, and future loss emergence, and to monitor actual emergence against that anticipated.

4.5.18 The data provided, even if it has been prepared on a consistent basis, will always contain random variations and will often be affected by large claims, or even catastrophes or errors. If the calculations produce estimated ultimate loss ratios which are materially different from the market average or from the company's own historical experience these differences should be investigated.

4.5.19 Many companies do project on a number of different bases and compare the results; in certain Member States this is stipulated in current regulation or guidance. In Spain, for example, the regulator requires at least two statistical methods to be used and the higher valuation to be selected. In the UK, regulatory guidance states that management should not be limited to just one estimation method but should consider using one or more alternative approaches before selecting those which may be regarded as most appropriate to the nature of the business.

4.5.20 In the projection of all classes of business, especially those with significant uncertainty such as liability business, the application and interpretation of results of statistical techniques is a complex and judgemental area which requires the involvement of a qualified and experienced actuary or other professional. The Manghetti report identified significant disparity of views between different Member States as to whether it should be a requirement for the outstanding claims provisions to be the responsibility of an actuary (rather than another person with expertise in the subject matter) and also whether there should be a formal appointed actuary function as is the case in some countries for life insurance.

4.5.21 The actual provision should be set based on all the information available as a result of applying statistical techniques and the knowledge and experience of management. As discussed above it will also depend on the confidence level to be built into the provision.

4.6 Summary of the main statistical methods used to determine outstanding provisions in practice

4.6.1 Below we discuss the more common statistical methods applied by insurance companies together with an assessment of their strengths and weaknesses. New techniques are being developed all the time to cope with specific issues so it is not possible to give a categorical listing.

4.6.2 Some companies tend to use more straightforward methods such as "loss ratio" or average claims methods for short tail business with largely homogeneous claims costs such as short tail accident and sickness or property. More sophisticated triangulation techniques are used for longer tail business such as liability classes.

4.6.3 Examples of techniques which have been developed to deal with areas where there is significant uncertainty such as asbestos claims and claims arising from the World Trade Center disaster are dealt with below.

Triangulation techniques

4.6.4 Triangulation methods are the most common. However, there are many variations. Other methods discussed below, such as the Bornhuetter-Ferguson method and numbers and averages approach rely on triangulation techniques in some way.

4.6.5 Data is generally presented in an array known as a "triangulation" (so called as the data is presented in the form of a triangle). This format shows, for a group of policies, how the item under review (such as the number of reported claims, cumulative claims paid, cumulative claims incurred etc) develops from one accounting period to another through to its latest or ultimate value. Data is commonly grouped by accident year, the calendar year in which a loss occurs, or by underwriting year, the financial year in which the risks incept. The intention is to model the way in which cumulative claims develop over time. Having set out the basic claims data, the next step is to calculate the "development factor" (the rate at which the cumulative claims increase from year to year). This is the factor that relates one year to the next. The development factors to be applied to each year are then determined based on an averaging method (chain ladder, basic link ratio (simple average), weighted chain ladder, restricted diagonals etc). The strengths and weaknesses of using more complicated methods of determining the development factors such as weighted chain ladder, restricted diagonals and the inflation adjusted chain ladder method are considered in the table below. Having established typical development factors, historical claims data is projected forward to determine an estimated ultimate position.

4.6.6 Most typically the approach is applied to cumulative paid or incurred claims both of which generate an ultimate claim amount. The required outstanding claims provision (notified plus IBNR) is then determined by deducting claims paid to date from projected ultimate claims.

4.6.7 The basic assumption underlying triangulation methods is that the data develops in a consistent manner and therefore, development patterns derived from historical data can be used to project the ultimate outcome for cohorts which are not fully developed.

Bornhuetter-Ferguson method

4.6.8 The Bornhuetter-Ferguson (BF) method is a combination of the loss ratio and triangulation methods.

4.6.9 The starting point is the information from other sources which is used to construct an "initial expected ultimate loss ratio". This could be, for example, information obtained from the underwriter who supplies his planned loss ratio when he wrote the business or from market knowledge as to the expected out-turn of a particular year.

4.6.10 The claims pattern is the percentage of expected claims at a point in time, based on the link ratios and is calculated using a triangulation method. The claims pattern is used to calculate, based on the ultimate loss ratios, how much future development is expected for each year being projected. These future developments can be added to actual claims development to date in order to estimate the projected ultimate development for each year. Future claims are calculated by multiplying the expected loss ratio by the ultimate premium for a cohort and then applying the claims pattern to apportion the ultimate losses between future and current claims.

Loss ratio method

4.6.11 The loss ratio method uses the ultimate loss ratio (ULR) to estimate the ultimate cost of claims, usually for a class of business. The ultimate cost of claims is calculated as ULR multiplied by earned premiums. The IBNR is then calculated as the ultimate cost of claims less claims notified to date.

4.6.12 For short tail classes it may be appropriate to consider the actual loss ratio for one or more years immediately preceding the current year, since these will be almost fully developed. The loss ratios for these years should be adjusted for any unusually large claims so that the ULR reflects the actual expected out-turn of the business. Adjustments will also be required for the effects of inflation.

4.6.13 This method is extremely subjective and would generally be seen as a reasonableness check for the results of other methods rather than the key method being used.

Average claims method

4.6.14 The ultimate cost of claims can be estimated by multiplying the average cost of claims by the ultimate number of claims. The ultimate number of claims is usually estimated using a triangulation method. Once the numbers of claims for each accident or underwriting year have been estimated then the appropriate average values (preferably based on monthly rather than annual rates) can be applied.

4.6.15 The averages are calculated using the average cost of claims for underwriting and accident years which are almost fully developed. Allowances will need to be made for the effects of inflation (using an appropriate index) and other changes that will affect claims costs. For example, changes in policy conditions, superimposed claims inflation over and above the movement in the index and impact of nil claims need to be taken into account.

4.6.16 The projection of claims numbers usually shows a more consistent development pattern than claims costs since the variation that comes from the size of individual claims is excluded from the development. This can be very useful in examining the incidence of pure IBNR large claims. However, the selection of the average claims costs to apply can be very subjective.

4.6.17 Some variations of the "averages" method project the pure IBNR only and in these cases separate consideration on IBNER needs to be made.

Curve fitting

4.6.18 An alternative to triangulation methods is to use a mathematical curve to describe the development pattern. The idea is to estimate the shape of the curve from past claims data and then use this shape to project the progress of incompletely developed years.

4.6.19 Curve fitting can be used in several different ways:

- to fit a curve directly to the claim data;
- to fit the link ratio development factors in order to project future development – fitting the "tail" of the development;
- to fit a curve to the link ratio development factors already obtained to smooth them.

4.6.20 In order to fit a curve to any set of data (the raw claims data, the link ratios etc) it is necessary to:

- select a mathematical model of the right shape to represent the data;
- decide which points are to be fitted (which is not necessarily all the data);
- find the appropriate parameters for the curve which give "best fit" to the data.

4.6.21 Curve fitting is often used to extrapolate claims where a tail factor is needed. It is very subjective but is not uncommon.

Benchmarking

4.6.22 An important alternative often used where there is limited development history is to use a benchmark development pattern from another similar book of business. In this case assumptions are made that the nature of claims development will be consistent.

Exposure based analysis

4.6.23 Catastrophe events pose different difficulties of estimation. For example, there may be little actual claims development at the accounting date. A common method is to work from a top-down estimate of the total cost of an event. By making assumptions as to the total cost of an event, the extent of the cost that is insured and the company's market share, it is possible to derive a broad estimate of the company's exposure from which a provision can be estimated. The range of the resulting provision is likely to be extremely wide.

4.6.24 Another variation of exposure analysis, particularly for reinsurance companies, is to consider the impact of an event on a contract-by-contract basis. In the first instance those contracts not exposed (due for example to the period or geographic region of risk exposure) are excluded. For those contracts remaining it may be possible to identify the maximum cover provided and in this manner get an early indication of the upper range of the impact of the event (and hence provision required). Such methods are being used to assess the impact of the World Trade Center event which is discussed in more detail below.

4.6.25 The following table summaries the main statistical methods used by companies to determine their outstanding claims provisions (reported outstanding claims plus IBNR).

Strengths and weaknesses of different statistical methods

Method	**Key Assumptions**	**Strengths**	**Weaknesses**	**Data**
Triangulation techniques	Past claims experience can be used as a guide to future claims development. Basic assumption underlying triangulation methods is that the data being analysed is developed in a consistent manner, and that development patterns derived from historical data can be used to project the ultimate outcome of years not fully developed. Commonly the factors selected are adjusted in some manner. This allows greater flexibility in application but introduces subjectivity.	Projected ultimate cost is estimated using historical claims experience.	The assumption that claims will develop in the same way as in the past may not be valid and needs to be justified.	Historical claims data (eg claims incurred and / or claims paid) by accident or underwriting year. Data needs to be subdivided into a reasonable number of homogeneous classes of data and produced in a consistent basis.
(a) Chain ladder	Applies more importance to years with higher values by using values of the original data to weight the development factors. Gives more weight to those years with higher claims experience.	Development factors used in projection place less reliance on those derived from small volumes of data, and more on those from large volumes of data.	Large volumes of data may include unusual factors, which will distort averages.	For all statistical claims projection techniques, data needs to be reliable and prepared/ presented on a consistent basis.
(b) Basic link ratio (simple average)	The average value of the link ratios are used to project forward those cohorts which are not yet fully developed.	All years are given equal weight in determining the loss pattern.	Distortions in the underlying data particularly arising from cohorts with low values, may be magnified.	As for Chain ladder.

Method	Key Assumptions	Strengths	Weaknesses	Data
(c) Weighted chain ladder	Refines the basic link ratio model to attach more importance to recent years.	Gives more weight to the more recent link ratios.	Choice of weight is subjective.	As for Chain ladder.
(d) Restricted diagonals	Weights link ratios by only including the most recent diagonals.	Link ratios are calculated using the most recent claims experience only.	Choice of how many diagonals to use is subjective.	As for Chain ladder.
(e) Inflation adjusted	Future inflation rates are required.	The projection of the ultimate cost of claims allows for an estimate of future inflation which is specific and does not have to depend on past inflation.	Requires use of an inflation index, which may be generic, or out of date, and therefore may not give an accurate indication of future inflation.	Requires an inflation index which may or may not reflect the true inflation within the claims data.
Bornhuetter-Ferguson	Uses triangulation, but instead of calculating the future development as a multiple of the current position. BF and Cape Cod methods add the estimated future development to the current position in order to reach the ultimate position.	Attempts to overcome weakness of basic triangulations which can magnify distortions in the underlying data for later cohorts. Claims pattern is used to calculate, based on ultimate loss ratios, how much future development is expected for the year being projected.	Subjective, the answer is driven by selected loss ratios for years where very little has been reported to date.	Starting point is estimated initial ultimate loss ratio. Claims pattern is percentage of expected claims at a point in time based on link ratios and calculated using triangulation methods.

Method	Key Assumptions	Strengths	Weaknesses	Data
Loss Ratio	Ultimate loss ratio can be predicted from historical data or reliable estimates. Ultimate losses can be calculated as ULR multiplied by premiums. IBNR is calculated as ultimate losses less any claims notified to date.	Simple to use. Most suitable for short tail classes, where claims are generally notified and settled quickly.	Choice of loss ratio can be very subjective, and therefore needs to be carefully considered.	Underwriting year: losses arising on all policies incepting within the year. Accident year: all losses arising in a calendar year as a percentage of premiums earned in the year. Adjustments for large and unusual claims and also to update them to allow for the effects of inflation and rating changes.
Average claims or "formula claim"	Suitable for large number of similar claims which tend to be reported and settled quickly. Ultimate loss = average cost x ultimate number of claims.	Simple and efficient. Often a stable and at least visible base for the projection of large claims. Can be adjusted for inflation and other changes affecting claims costs such as changes in policy conditions.	Assumes that the population is homogeneous. Changes in policy conditions could change average cost and/or claims numbers. The requirements for explicit inflation and average assumptions adds subjectivity to the result.	Average value at which claims have been settled; average period to settle. Ultimate number of claims (often obtained using triangulation).

Method	Key Assumptions	Strengths	Weaknesses	Data
Curve fitting	Claims data can be fitted to a curve in order to project future development and link ratios in order to smooth them. Assumes that future claims development can be predicted from historical claims data, by fitting historical data to a curve.	Can be used to project link ratios.	Method requires a number of subjective decisions, such as which model is appropriate to use, which data points to fit to the curve, and which to exclude.	Mathematical model of the right shape to represent the data. Decide which data points are to be fitted. Find appropriate parameters for the curve which give "best fit" of the data.
Benchmarking	Assumes development of benchmark line of business is appropriate to apply to the business being projected.	Simple to use. Does not require a large history of loss development.	Very difficult to verify the key assumption that the benchmark development pattern is appropriate. Therefore highly subjective.	A suitable benchmark development pattern is needed. The current paid and/or incurred position is required from the business to be projected.
Exposure Based Methods	That it is possible to build a model that sufficiently accurately models the process that generates a loss for each given class of business.	Does not rely on loss information at all.	Difficult and expensive to perform. Numerous assumptions are required.	Actual data is required to calibrate models. The precise data depends on the model used.

Summary of the main statistical methods applied in selected countries

4.6.26 The table below summarises, based on a questionnaire sent to KPMG member firms, the main statistical methods which are applied within the EU. Triangulation methods appear to be the most popular method throughout the EU. As noted above companies should be applying a variety of methods and comparing the results of these.

Statistical methods applied in practice

Country	Methods most commonly used in practice
Denmark	Actuarial methods are used to determine IBNR and IBNER. Large companies apply a variety of techniques and compare results with expectations. In small companies less sophisticated techniques are used.
France	Except for motor, for which there is a requirement to use several statistical calculations (loss ratio and average claims cost), there is freedom to use statistical methods. In practice the most common methods used are triangulation techniques, including chain ladder on paid claims, loss ratios, and Bornhuetter-Ferguson.
Germany	Many companies use the loss ratio method recommended by the supervisory authority. There is also a trend towards chain ladder methods. Companies that draw up financial statements under US GAAP or IAS use a variety of techniques and compare the results.
Italy	Triangulation methods are used but other actuarial models are not typically used except where companies prepare US GAAP financial statements.
Netherlands	In general non-life actuarial techniques are not well developed / applied in the Netherlands and if adopted are only applied by large companies / groups. A lot of chain ladder techniques are used and some more advanced methods. Others apply average claims and experience.
Portugal	Triangulation methods based on paid claims, in particular chain ladder, basic link ratio and separation method.
Spain	Triangulation methods, in particular different weightings of the chain ladder method are the most commonly used. Some undertakings use a considerable variety of methods. It is a regulatory requirement to apply at least two different statistical methods over a five year period and take the higher figure.
Sweden	Triangulation based on paid claims is the most commonly used method with the method based on incurred claims also being used. Smaller companies with small and volatile business use loss ratio / average claims methods. The results of different techniques are often blended together or a simple average taken.
United Kingdom	Triangulation based on paid claims is the most commonly used method with the method based on incurred claims also being used. It is common to compare the results of different methods. Smaller companies with small and volatile business use loss ratio / average claims methods.

Source: KPMG

4.6.27 The companies we visited as part of this study emphasised both the importance and difficulty of obtaining reliable data, ensuring that data used for projections is homogenous, and the difficulties presented by latent claims. Larger companies tended to use a variety of methods and compare the results. Some companies actually determine "best estimate" provisions for management reporting purposes but then set up more prudent provisions for statutory reporting purposes.

4.6.28 Companies use a variety of methods to assess their provisions for outstanding claims and no single method is likely to be appropriate in isolation. Companies should use several methods and compare and explain the differences between the various methods before deciding on the most appropriate method to use. The methodology applied should be continuously reviewed and amounts provided compared with the actual experience. The tracking of the accuracy of past results is a key element of data that should be maintained to support this continuous review.

4.6.29 Disclosure to the prudential supervisor of the level of prudence which has been included in the provisions, the range of outcomes and their likely probability, the assumptions underlying the calculation and impact of changes in these assumptions is as important as the point estimate that is actually chosen. Disclosure to the supervisor should not necessarily lead to public disclosure. It is important that supervisors are informed of the degree of prudence, and the basis for judgemental decisions in setting provisions. Chapters 8 and 9 deal with recommendations on the benefits of enhanced disclosure in financial reporting.

4.6.30 In practice, assessing the probability of various outcomes is subjective. For personal lines classes there may be sufficient volumes of data to employ statistical techniques such as the Thomas Mack method. For less homogenous and/or classes where the volumes of data available are smaller then reprojection of the data using assumptions with greater or lesser degrees of conservatism is the only practical approach. Even though rigorous statistical analysis is not possible for many classes of business, there is great benefit to be gained by giving regulators a feel of how sensitive the provisions are to changes in key assumptions.

4.6.31 In Australia the supervisory authority has recently implemented a system of requiring discounted best estimate provisions to be held along with an explicit provision for adverse deterioration (PAD). The main criticism has been in the implementation of the system rather than the system itself. There can be an over reliance on statistical techniques to set ranges of outcomes and their associated probabilities. These are sometimes applied without sufficient understanding of the risks surrounding the underlying business. In most cases, producing a reasonably accurate estimation of the range of probable outcomes requires considerable investment in modelling techniques (as well as sufficient data). Chapter 10 includes further discussion of developments in Australia.

4.6.32 If a company is able to produce best estimate provisions, it should also be able to produce a range of outcomes using statistical techniques for personal lines business and reprojecting using more conservative assumptions for other lines of business.

4.6.33 Some organisations do not have sufficient data for parts of their book of business to set reliable best estimate provisions. These tend to rely on methods that generate very high levels of provision.

The role of senior management in establishing technical provisions.

4.6.34 The ultimate responsibility for determining the required level of provision should rest with the senior management and directors of the insurance company. They should ensure that calculations are based on appropriate techniques, applied consistently and on sound judgement in the selection of key assumptions. It is essential that the assessment of outstanding claims provisions is adequately considered by senior management and calculations and decisions appropriately documented. Senior management's considerations should include an understanding of the range of results generated from the methods applied and the level of uncertainty in the results. This documentation, particularly in any areas which rely on judgement, should enable an independent person (such as an auditor or regulator) to understand the broad principles employed by the company, (including the bases on which decisions have been taken or judgements exercised) and to form a view as to whether the provisions are reasonable. Regulators may require independent evidence that the directors' judgement is reasonable by having the right to request an independent actuarial report.

4.7 Provision for claims handling expenses within the provision for outstanding claims

4.7.1 In accordance with the IAD, provision should be made both for expenses that are directly attributable to claims (for example the costs of using external specialist loss adjusters to assess the value of direct claims) and indirect claims handling expenses (for example the salary and other administrative expenses of the claims handling function). Directly attributable claims handling costs are usually included in claims costs when projecting the IBNR provision.

4.7.2 The IAD does not provide any guidance on how indirect claims handling costs attributable to outstanding claims provisions should be calculated and there is significant disparity in the methods adopted between Member States. In Germany there is a detailed formula which must to be applied for the calculation of the provision for claims handling costs. It is not permitted to deviate from the formula and therefore no account can be taken of known changes to the claims handling function (for example outsourcing). In the UK indirect claims handling costs are determined on an estimated basis based on the proportion of total administrative expenses incurred in the current year estimated as attributable to claims handling and the level of outstanding claims. This calculation is judgemental and there is no standard formula.

4.7.3 The Manghetti report referred to supervisors' concerns in this area: "*as regards the estimate of future costs, it is common practice to use flat rate or statistical calculation methods mainly for indirect costs, while in general no rule has been established and the choice of methods to be used is left to the undertakings' discretion. However, many delegations have underlined the difficulties that the Supervisory Authority may have to face when controlling the provision for claims settlement costs due to the absence of statistics of reference to use for countering undertakings or when undertakings outsource*

claims settlement, or else when the methods vary considerably. Most of the delegations have highlighted the need to gather greater experience in this field and that companies will progressively abandon the flat rate practice and that they will adopt analytic accounting whose criteria should be systematically communicated to the supervisory authority."

4.7.4 A formulaic approach to the determination of the provision for indirect claims handling costs is not necessarily appropriate as such an approach can be affected by unusual fluctuations in costs in a particular year and does not take account of future changes in the claims handling function (for example future outsourcing arrangements). Such an approach could also needlessly penalise more efficient companies. A judgemental approach based on the particular circumstances of the insurance company together with adequate disclosure to the regulator of the amount of the provision by class of business and the assumptions underlying the calculation, as is the case in the UK, appears more appropriate. This should enable the regulator to monitor the historical development of the provision and to make comparisons between the levels of provision set by different companies for the same classes of business. As long as there is adequate disclosure it should not be difficult to make comparisons between companies and question the adequacy if there is a concern.

4.8 Discounting of outstanding claims provisions

4.8.1 The requirement of Paragraph 28 of the IAD[36] to show the ultimate claims cost is modified by Article 60 of the IAD, which whilst prohibiting implicit discounting (the failure properly to take account of future inflation will result in implicit discounting), allows Member States the option of permitting discounting, subject to certain specific conditions being met.

4.8.2 Discounting is not specifically defined in the IAD but it is reasonable to assume that the concept is widely understood in the insurance industry. In the UK for example discounting is defined as "the reduction to present value at a given date of a future cash transaction at an assumed date by the application of an appropriate discount factor reflecting the time value of money". Discounting does not alter the total charge in the profit and loss account over the life of the claims concerned but merely affects the timing of the charge, which is delayed by the amount of the discount applied. The discount on existing claims is recalculated each year and the difference from the previous year is a charge to the technical account (included within change in the provision for claims). The technical account benefits each year by the amount of discount set up on new claims arising in that year.

[36] Paragraph 28 of the IAD states that:
"the provision for claims outstanding shall be the total estimated ultimate cost to an insurance undertaking of settling all claims arising from events which have occurred up to the end of the financial year, whether reported or not, less amounts already paid in respect of such claims."

4.8.3 Arguments which are used in favour of discounting in the International Accounting Standards Board (IASB) Insurance Steering Committee's Insurance Issues Paper include:

- by using present value to measure claim liabilities, the entity matches increases in the claim liability over time, as a result of the unwinding of the discount, with interest revenue earned on the related investments;
- a well-managed insurer incorporates present value into pricing decisions and therefore it is appropriate to measure claims liabilities on a similar basis;
- whilst it is accepted that there is uncertainty inherent in many insurance liability measurements, present value provides more useful information than an undiscounted amount. Even if the measurement is undiscounted the insurer cannot avoid considering the timing of claim payments if the liability measurement includes assumptions about future inflation. The expected value techniques which are inherent in many actuarial estimates can be applied to uncertainties of both timing and amount. It could also be argued that due to various offsetting effects discounted values are likely to be more reliable and less likely to vary from one insurer to the next.

4.8.4 Arguments which are applied against discounting in the IASB Insurance Steering Committee's Insurance Issues Paper include:

- an undiscounted approach properly matches the cost of claims with related revenue. Discounting spreads some of the cost of claims beyond the end of the contract term and inappropriately accelerates recognition of investment income;
- using present value presents a precision in the measurement that is not present and may diminish comparability among insurers' financial statements;
- the carrying amount of insurers' claim liabilities can already contain implicit discounting.

Specific requirements in selected individual countries

Germany

4.8.5 In Germany companies are generally not permitted to discount or make deductions from any technical provisions for both statutory accounts and regulatory returns. The only exception to this rule is where non-life insurance companies have liabilities to pay annuities arising from liability claims which are required to be discounted in a similar way to annuity liabilities of life assurance companies. Discounting of outstanding claims provisions is however required for tax purposes.

UK

4.8.6 In the UK the use of implicit discounting is prohibited. Explicit discounting is permitted if certain conditions are met. These conditions follow the requirements of the IAD with the exception that there is no rule in the UK that the Financial Services Authority (FSA) must be given an advance notification of any change in method. The disclosure requirements in the statutory accounts are the same as the IAD requirements.

4.8.7 Additional disclosure requirements with respect to discounting are laid down for the purposes of the regulatory return. Companies which discount outstanding claims provisions are required to submit a form which analyses expected income and yield from admissible assets covering discounted provisions by major currency. This enables the regulator to monitor whether the discount rates used to discount outstanding claims provisions are supported by the rates of investment income expected to be earned on the actual investments held by the company.

4.8.8 A KPMG survey found that only two major UK insurance companies discount any part of their claims provisions, being those relating to longer tail business written in the US and some other overseas territories.[37] In addition Equitas, (the reinsurance company created in 1996 to run-off the 1992 and prior years' liabilities of Lloyd's syndicates) discounts its outstanding claims provisions.

Other EU Member States

4.8.9 Nine EU Member States prohibit the discounting of outstanding claims provisions. A commonly held view among some supervisory authorities is that discounting eliminates a buffer inherent in undiscounted provisions.

Requirements in selected non-EU countries

4.8.10 In the US discounting of outstanding claims provisions is only permitted where the amount and timing of payments is certain and of long duration for example in the case of workers' compensation scheme claims.

4.8.11 In Australia, Prudential Standard GPS 210 (applicable from 1 July 2002) requires discounting to be applied.

4.8.12 The Canadian federal regulator prohibits the use of discounting with the exception of certain accident benefit and similar periodic payment claims. However, it is proposed to introduce discounting from 2003.

4.9 New trends and emerging practice with respect to the assessment of outstanding claims provisions

4.9.1 The increasing sophistication of computer modelling techniques has meant that the use of a range of techniques and scenarios to determine the outstanding claims provision is becoming more commonplace, particularly in the UK and US and within other EU Member States where companies are moving onto a US GAAP basis for their published statutory accounts. As noted above there is no correct answer as to which technique to use for any particular class of business. Best practice is to use a variety of techniques (and different assumptions within those techniques) and see how the results compare with each other. Modelling claims is an iterative process requiring an in depth understanding of the book of business and is not a mechanistic calculation. Where results from various methods differ then further investigation should be carried out to understand what is causing the differences and to form a view as to which methods are the most appropriate

[37] KPMG study October 1999 "Principles & Presentation – Insurance, Survey of UK insurers´ 1998 financial statements."

to use. As projection methods become more sophisticated there is also the possibility of reflecting more accurately the company's reinsurance programme in stress and scenario testing.

Latent claims including asbestos claims

4.9.2 The use of standard statistical techniques for classes of business where there is significant uncertainty due to coverage issues and legal disputes is not appropriate. Latent claims such as asbestos are the best example of these. With these claims there is significant delay between the occurrence of the event and notification to the insurer. Settlement often involves protracted and costly litigation the outcome of which is extremely uncertain. Particular legal judgements often act a precedents affecting all underwriting years at the same calendar point in time. For instance a judgement handed down in 1999 may cause all underwriting year incurreds to double in calendar year 1999. Therefore, the 1970 underwriting year will double after 29 years but the 1960 underwriting year will double after 39 years. This undermines the main assumption behind most statistical techniques – namely that what happened in the past is indicative of what will happen in the future.

4.9.3 In such cases an exposure based approach is required. This involves going back to first principles and following the chain of insurance through the marketplace. Asbestos models have been developed mainly in the US. The approach is summarised as follows:

- start with a demographic analysis of when workers exposed to asbestos fibres will manifest symptoms;
- make assumptions as to when these victims will sue and who they will sue;
- look at the insurance coverage the employers had available and make assumption as to which insurance policies the employers will claim against;
- make assumptions as to the likelihood of successful claims being made;
- look at the reinsurance arrangements the primary insurers had available;
- look at the reinsurance available to the primary insurers reinsurers; etc.

4.9.4 There are a significant number of assumptions behind such models. The models are calibrated against what industry data is available but even so great uncertainty remains.

4.9.5 Similar models exist for pollution claims. Asbestos claims have continued to develop sharply upwards in recent years as legal developments in the US have encouraged more and more potential plaintiffs to attempt to take legal action.

World Trade Center claims

4.9.6 The size of the overall insured losses arising from the US terrorist attack of 11 September 2001 is the subject of speculation across the insurance market. This is causing companies significant problems in determining the required level of provisions. Forecasts have been made by insurance market experts which place the total market losses anywhere between US$30 billion and US$70 billion (and in some cases even higher, although these scenarios appear less likely as time progresses). The event will certainly be the largest insured loss to date. Litigation (or alternative forms of dispute resolution) will determine the final quantum of losses covered by insurers and the basis on which they will be paid.

There have already been a number of disputes arising over coverage terms (including whether the property loss should be regarded as one event or two), and it is clear that it will be some years before the final position will be known with any certainty. Litigation will also determine whether some of the claims costs currently with property insurers are subrogated back to liability insurers.

4.9.7 In order to assess exposure to the attack, emerging best practice is to produce a list of policies under each of the classes of business (property, aviation, personal accident, contingency, specie (including fine art), liability) that they believe to have a realistic chance of being exposed to the losses. For each of these policies the insurers consider their exposure, and in consultation between underwriters and management, attempt to assess for each contract what is a likely loss. Having listed the sources of potential exposure insurers have not assumed that every policy will produce a loss, but have put up provisional estimates against each such contract that they consider will be impacted.

4.9.8 As well as adopting this bottom-up approach, it is important to consider a top-down approach that looks at likely exposure to the wider insurance market and consider the company's likely share of this. Whereas a bottom-up approach may be more accurate for a direct insurance book and hence the exposure to the major individual losses described above, adopting this top-down approach will add considerable value for any reinsurance and retrocessional books. Where areas are identified which appear to have potential top-down exposure not accounted for in the bottom-up approach additional "non-specific IBNR" should be added to ensure that the gross estimates are not implausible.

4.9.9 Many companies have heavy reliance on reinsurance to cover such events. The ability of some reinsurers to pay claims is highlighted by such a large loss and appropriate bad debt provisions assume greater importance.

Other emerging best practice

4.9.10 In some countries, such as Denmark, there is a trend towards prudential supervisors using their own risk models to stress test an insurance company's provisions. (This applies to life companies and is discussed further under stress testing of assets in chapter 5). In France, also, the supervisory authority uses its own model to assist in its assessment of the strength of technical provisions of French insurance undertakings.

4.10 The need and possibility for harmonisation at a European and international level

4.10.1 The analysis above has highlighted the judgemental nature of outstanding claims provisions as a result of the significant uncertainty as to the eventual outcome. The interpretation of the general principles and application of the specific methodologies varies between Member States and between countries outside the European Union. There is scope for greater use of stress and scenario testing in determining outstanding claims provisions and for required disclosure of the likely range of outcomes and associated probabilities.

4.10.2 The following is a summary of areas where we have identified scope for European and international harmonisation. Harmonisation of accounting principles (in accordance with

IAS) is a pre-requisite in order to achieve consistency in the measurement of technical provisions.

Methodology

4.10.3 Companies use a variety of methods to assess their provisions for outstanding claims and no single method is likely to be appropriate in isolation. Companies should use several methods and compare and explain the differences between the various methods before deciding on the most appropriate methods to use. The methodology applied should be continuously reviewed and amounts provided compared with the actual.

Appropriate level of prudence

4.10.4 Different countries and even different companies within the same country interpret 'prudent' in different ways. This lack of consistency is somewhat opaque to the regulator as there is no quantitative measure of how much prudence is involved. A solution to this may be to set best estimate provisions and allow explicitly and separately for uncertainty elsewhere. However, it is important to bear in mind that prudential supervisors have significant powers of investigation at their disposal, particularly the ability to make detailed enquiries of senior management.

4.10.5 This may not always help, of course, in situations where an insurer's procedures and documentation are insufficiently rigorous or transparent to support judgements made. In the EU, in accordance with Article 56 of the IAD, outstanding claims provisions are generally set up on a prudent rather than a best estimate basis with a view to reducing the impact of any adverse run-off deviation.

4.10.6 The requirement in the EU for "prudent" provisions differs from the "best estimate" (discounted) provisions (together with an additional provision for risk and uncertainty) which is likely to be required under the forthcoming IFRS for Insurance Contracts. The best estimate is the point that would provide a 50% confidence level, based on the anticipated distribution curve of outcomes, that the provisions will not be under or overstated. Consistency between the level of prudence which is built into the provision for outstanding claims when setting the confidence level, and the extent to which this is taken into account in any provision for risk and uncertainty or in the capital requirement is vital in order to ensure that there is no double counting.

4.10.7 The Müller report suggests that uncertainty could be taken into account in the solvency margin requirements through the use of a third parameter, in addition to the premium and claims indices, which is calculated on the basis of the provisions for outstanding claims. It would come into force when settlement risks are identified based on the ratio of outstanding claims as a percentage of premiums. The actual measure would need to be subject to discussion and the issue of consistency between accounting liabilities and amounts reflected in the capital requirements referred to above is key. However, this approach may not, by itself, address the issue of insufficient prudence in technical provisions.

4.10.8 There is already a trend towards best estimate provisions as some European insurers also prepare US GAAP accounts. The EU will require listed companies to apply IFRS to their consolidated financial statements by 2005 (with some Member States extending the

requirement to individual financial statements and to non listed insurance companies as well). As the IFRS for Insurance Contracts is currently under development, companies which currently apply IAS use US GAAP for determining technical provisions. US GAAP requires a lower level of prudence to be applied to outstanding claims provisions than is generally the case in the EU with additional risks and the impact of discounting being taken into account in the capital requirements.

Disclosure

4.10.9 The disclosure to the regulator of single point estimates by class of business is less useful than disclosure of a range of outcomes under a range of disclosed assumptions. Disclosure of a range of outcomes and the impact of changes in assumptions is however not currently commonplace.[38] The only example we are aware of is the requirement in the UK to make maximum net probable loss disclosures. Also in the UK, Lloyd's requires its syndicates to make estimates of losses under certain prescribed "realistic disaster scenarios". Here however the concentration is on discrete extreme scenarios rather than a distribution of outcomes.

4.10.10 The following disclosures by class of business are likely to be appropriate:

- the methodologies applied to determine outstanding claims provisions;
- the likely range of outcomes and the expected probability of each outcome;
- the sensitivity of the calculations to changes in assumptions;
- the development of run-off results by accident / underwriting year.

Regulators typically currently only request information on the first and last points. Disclosure of all four points would be considerably more useful.

4.10.11 Some companies also provide external actuarial reports either as part of their statutory accounts or as private information to the regulator to support their assessment of the required level of provision for outstanding claims. The regulator should consider requesting such reports from perceived high risk companies where the subjectivity in determining the provisions is greater.

4.11 Other technical provisions

4.11.1 Below we consider briefly the other significant items included within non-life technical provisions.

Provision for unearned premiums

4.11.2 Article 25 of the IAD states that: *"The provision for unearned premiums shall comprise the amount representing that part of gross premiums written which is to be allocated to the following financial year or to subsequent financial years."* This method is consistent with the general accounting concept of accruals and matching generally applied throughout the world and is therefore uncontentious.

[38] Questionnaire sent to KPMG offices.

4.11.3 As regards valuation of the provision Article 57(1) of the IAD states that: *"the provision for unearned premiums shall in principle be computed separately for each insurance contract. Member States may, however, permit the use of statistical methods, and in particular proportional and flat rate methods where they may be expected to give approximately the same results as individual calculations."*

4.11.4 Article 57(2) of the IAD goes on to say that: "*in classes of insurance where the assumption of temporal correlation between risk experience and premium is not appropriate, calculation methods shall be applied that take account of the differing risk pattern over time*."

4.11.5 All EU Member States, with the exception of Greece, permit the use of statistical methods,[39] but the Manghetti Report notes that such methods are rarely used in practice. As most non-life companies are likely to have a computerised policy administration system it is relatively straightforward to perform the calculation on a policy by policy basis.

4.11.6 The Manghetti report states that the method most widely used in the EU is the analytical method based on the temporal correlation between risk experience and premium. Whilst we would not disagree with this comment, in practice most companies are likely to assume that time apportionment will be the most appropriate basis for earning of premiums with the risk profile only being taken into account where there is a marked unevenness in the incidence of risk. Examples include travel insurance, frost and hail, mortgage guarantee and extended warranty.

4.11.7 The treatment of unearned premiums should not be a major concern to the regulator as EU accounting regulations provide clear guidance in this area which is relatively straightforward to apply. Regulators should require disclosure, in the regulatory return, of the methods applied by class of business to ensure consistency from year to year and appropriate apportionment by period of risk for those classes where this is relevant.

Equalisation provision (reserve)

4.11.8 Article 30(I) of the IAD states *"The equalisation reserve shall comprise any amounts set aside in compliance with legal or administrative requirements to equalise fluctuations in loss ratios in future years or to provide for special risks. It shall be set up for volatile classes of business of insurance companies in addition to the provision for outstanding claims."* A distinction should be noted between equalisation reserves, which equalise loss ratios over time for volatile lines of business, and catastrophe reserves, which insurance undertakings sometimes incorporate within claims provisions to recognise the potential impact of future catastrophic claims events. The concepts and accounting considerations are similar, but it is the former which are the subject of the European directives, and the focus of this section.

Requirements of EU directives

4.11.9 EU Directives only require the equalisation reserve to be set up for "credit insurance" (EU Directive 73/239/EEC as amended by 87/343/EEC). Credit insurance is defined

[39] Options in European Insurance Accounting Rules (KPMG 1999).

(under Annex A No 14 of 73/239/EEC) as insolvency (general), export credit, instalment credit, mortgages and agricultural credit. Under Council Directive 87/343/EEC there is a choice of four methods for the calculation of the reserve for credit insurance. For all other classes of insurance each member state is free to define the rules it wants to or to make no requirements (Article 62 of IAD states that: *"pending further coordination, those Member States which require the constitution of equalisation provisions shall prescribe the valuation rules to be applied to them."*).

4.11.10 De minimis limits apply for credit insurance, where the premiums receivable in respect of credit insurance are less than 4% of the total premiums receivable by them and less than 2,500,000 Euros.

4.11.11 The equalisation reserve is treated as a liability for regulatory purposes but is disregarded for purposes of calculating the solvency margin requirement. Whether an equalisation provision is set up or not is also important if accounts serve as a basis for the determination of distributable profits.

Specific requirements in EU Member States

Finland

4.11.12 Equalisation provisions were introduced in Finland as early as 1953. The system has gone through some modifications since its early days, but the basic idea of equalising fluctuations in loss ratios over time has remained the same.

4.11.13 There is a requirement to set up an equalisation provision for all classes of non-life insurance, including credit insurance. The equalisation provision is treated as a liability in the accounts and it is tax exempt.

4.11.14 The transfer rule, according to which increases and decreases in equalisation provisions are calculated, resembles the third method in the EU directive for calculating equalisation reserves for credit insurance. A major difference is in the evaluation of a minimum and a maximum to the provision.

4.11.15 In Finland limits to the total amount of equalisation provisions are based on probabilistic rules that have been derived from an extensive simulation study. The limits depend heavily on the underwriting portfolio of the insurance company in question. Besides minimum and maximum, which are absolute limits, there is also a target zone. The target zone gives an optimal level for the total amount of equalisation provisions. Transfer rules take this into account such that equalisation provision tends to remain within the zone.

4.11.16 In the Finnish solvency calculation equalisation provisions are treated as part of the solvency margin.

Germany

4.11.17 In Germany there is a requirement to set up an equalisation reserve and other similar reserves. The equalisation reserve is treated as a liability for both statutory accounts and regulatory returns.

4.11.18 The other similar reserves relate to nuclear risks and pharmaceutical risks. These risks are excluded from equalisation reserves and calculated in a different way, but they are shown together with equalisation reserves in the same line in the balance sheet. For nuclear risks a reserve is set up in which 75% of all earned net premiums minus claims incurred are placed each year. If claims incurred are higher than 75% of the earned premiums the difference is taken out of the provision. The reserve for pharmaceutical risks is calculated in a similar way as the reserve for nuclear risks with the main difference that there is a maximum required amount.

4.11.19 The equalisation reserve is calculated for all classes of non-life insurance including credit business (excluding nuclear and pharmaceutical risks for which similar reserves are calculated as explained above). There is only one method of calculation, which is used for all classes of insurance. This method is close to the third method in the EU Directive for calculating equalisation reserves for credit insurance.

UK

4.11.20 The equalisation reserve is treated as a liability for both statutory accounts and regulatory returns. The Insurance Companies (Reserves) Regulations 1996 require equalisation provisions to be established for credit insurance and certain other types of insurance and reinsurance business. The categories of business for which equalisation provisions are required are specified and defined in the Reserves Regulations and are those types of business which the FSA considers to be most volatile based on an historical analysis of regulatory returns information.

4.11.21 The rules for calculating the equalisation reserves for credit insurance and the de minimis limits for calculating the reserve are the same as required under method one of the EU Directive.

Other EU Member States

4.11.22 All Member States must apply the requirements of the EU directive for credit business. There is flexibility as to which of the four methods has been implemented in a particular country. For non-credit business all Member States have prescribed requirements to set up an equalisation reserve with the exception of Greece, Luxembourg, the Netherlands and Sweden[40]. Although in Sweden no specific rules are prescribed, equalisation reserves can be set up subject to a maximum limit. In the case of Denmark, whilst there are prescribed rules there is no requirement to set up such reserves.

4.11.23 As regards credit business, as there is a choice of four methods and no prescribed method for non-credit insurance, there is unlikely to be any harmonisation with respect to the calculation of this reserve.

Requirements in selected non-EU countries

4.11.24 Insurance companies in the USA, Canada and Australia are not permitted to set up an equalisation reserve. Currently under International Accounting Standards (IAS), as there are no insurance specific rules, companies typically apply US GAAP to insurance specific

[40] Options in European Insurance Accounting Rules (KPMG 1999)

items in their financial statements. If this is the case then such reserves will not be permitted in IAS financial statements. Such reserves will also not be permitted under the forthcoming IFRS for Insurance Contracts.

Unexpired risks provision

4.11.25 Article 26 of the IAD states that the caption "*Other technical provisions*" should include the provision for unexpired risks. The provision for unexpired risks supplements the unearned premium provision on contracts that are reasonably foreseeable to be loss making.

4.11.26 Article 26 of the IAD defines the purpose of this provision as being: *"to provide for all claims and expenses in connection with insurance contracts in force in excess of the related unearned premiums and any premiums receivable on those contracts."*

4.11.27 Article 26 of the IAD also includes a member state option to combine the disclosure of the provision for unexpired risks with the provision for unearned premiums rather than disclosing as part of other technical provisions. This option does not however affect the magnitude of the liability recognised and therefore does not have an impact on solvency. The majority of the Member States choose to include the unexpired risk provision within the provision for unearned premiums, although half of these require it to be subject to prior approval[41].

4.11.28 Article 58 of the IAD deals with the valuation of the provision and states that *"the provision for unexpired risks… shall be computed on the basis of claims and administrative expenses likely to arise after the end of the financial year from contracts concluded before that date, in so far as their estimated value exceeds the provision for unearned premiums and any premiums receivable under those contracts"*.

4.11.29 The IAD therefore provides no guidance on issues such as whether losses on certain contracts can be offset against profits arising on those contracts which are expected to be profitable, whether investment income may, or may not, be taken into account in determining whether losses are foreseeable and whether deferred acquisition costs should be written off prior to establishing the need for an unexpired risk provision. The Manghetti report also highlighted that *"most supervisory authorities do not provide any indications of rules to be used for the valuation of such risks and therefore the estimate of future losses is left to companies"*.

[41] ibid

4.11.30 Most countries either require or permit investment income to be taken into account in determining the provision for unexpired risks, as shown in the table below[42].

Country	Is it required or permitted to take investment income into account in determining the provision for unexpired risks?
Denmark	It is permitted to take into account investment income relating to the unearned premium provision and unexpired risks provision for the period up to which future claims will be settled.
France	Not permitted.
Germany	There is no specific rule but it is generally considered appropriate that investment income may be taken into account.
Italy	It is not permitted to take future investment income into account.
Netherlands	It is permitted to take investment income into account. There are no specific rules except for health insurance.
Portugal	Investment income must be taken into account.
Spain	Investment income and expenses must be taken into account.
Sweden	There is no guidance on how to calculate this provision. Some companies take into account investment income with respect to long tail business.
United Kingdom	It is permitted to take into account investment income relating to the unearned premium provision and unexpired risks provision for the period up to which future claims will be settled.

Source: Questionnaire sent to local KPMG offices

4.11.31 Since, in practice, most companies are likely to take investment income into account in determining the unexpired risks provision, such provisions are only likely to be set up where exceptional losses are anticipated on a particular class of business. The extent to which such a provision is considered to be covered by future investment income is of significance to the regulator since the company may run into difficulties if such investment income does not materialise in practice. For the purposes of the UK regulatory return, where investment income has been taken into account in determining the provision the following disclosures are required:

- the provision before taking investment income into account;
- the interest rate used;
- the average interval to the date at which claims are expected to be settled in cash.

4.11.32 The Spanish regulator also requires an analysis of the calculation to be disclosed. However similar disclosures are not required by other jurisdictions.

[42] Questionnaire sent to KPMG local offices.

4.11.33 The Directive also provides no guidance on how claims events occurring after the balance sheet date should be taken into account when determining the need for a provision ie whether the provision should be projected on the basis of loss ratios experienced to the balance sheet date or whether significant known improvements or deteriorations in loss ratios should be taken into account. The treatment adopted with respect to post balance sheet events varies between Member States.

Country	**Are events occurring after the balance sheet date taken into account in determining the provision for unexpired risks?**
Denmark	Significant known improvements or deteriorations in loss ratios should be taken into account.
France	Generally no.
Germany	Claims events after the balance sheet date are not taken into account. The current opinion is that events that are probable at the balance sheet date such as premium adjustments and increasing costs may be taken into account. Claims events occurring after the balance sheet date are considered, as loss ratios used for this purpose take account of IBNRs.
Netherlands	In general claims occurring after the balance sheet date are ignored. In health insurance these are taken into account based on prescribed models from the supervisor.
Spain	N/A as the calculation is based on historical experience.
Sweden	In general claims occurring after the balance sheet date are ignored.
United Kingdom	Claims events occurring after the balance sheet date, if not capable of prediction at that time should be ignored. Material post balance sheet events not taken into account in the unexpired risks provision calculation should be disclosed in the notes to the financial statements together with an estimate of the financial effect.

Source: KPMG questionnaire to local KPMG offices

4.11.34 There are a number of areas with respect to the calculation of the provision for unexpired risks where harmonisation would be appropriate, particularly in areas of recognition of investment income and post balance sheet events. There is also significant disparity in the information disclosed to the regulator in relation to the calculation of the required provision.

Ageing reserves

4.11.35 Article 26 of the IAD states that other technical provisions should also include the "ageing reserves" for health insurance where Member States have not exercised the option under Article 3 of the IAD to operate health insurance underwritten by joint undertakings, according to the principles of life assurance.

4.11.36 *"The purpose of the ageing provision is to make up for the increased risk due to the advancing age of policyholders; it must be set up for annual or multi-annual health insurance contracts, when the insurer is obliged to renew the contract at its expiry date.*

This provision must therefore be calculated having regard to the foreseeable term of the contract, to the age of the policyholders and to the actuarial technical bases generally used by the undertaking."[43]

4.11.37 The findings of the Manghetti report were:

"in most European countries their provisions are envisaged and regulated, and the calculation method adopted is similar to the technical principles of life assurance (current value of the insurer's commitments less the policyholders' commitments), although in one case the use of a flat-rate method is permitted. Six delegations do not envisage this kind of provision. In some cases the supervisory authority exerts strict controls over this kind of insurance given that the technical bases used here are generally less well-established than in life assurance."[44]

4.11.38 The key issue here is that where Member States have exercised the option in Article 3 of the IAD for composites to treat long term health insurance business as non-life business, that ageing provisions are set up on an actuarial basis, calculated consistently with the requirements for life insurance business. It is important to ensure that adequate provision is made in circumstances where the company has made a commitment not to increase premiums. This does not appear to be a significant issue for non-life business as the majority of Member States have not exercised the option in Article 3 of the IAD. There may also be scope for harmonising the treatment of short term and long term health insurance business within the EU.

4.12 Life technical provisions

4.12.1 The terms of reference of the study do not specifically request discussion of life technical provisions. This has been included for completeness and summarises the key differences internationally and between Member States together with consideration of the impact of these differences on capital requirements.

[43] The Manghetti Report; 'Technical Provisions in Non-Life Insurance' (2000)
[44] Ibid.

4.12.2 The following table summarises the main differences internationally in the treatments of life assets and liabilities for regulatory purposes and in the solvency margin requirement.

	AUSTRALIA	CANADA	EU	SA	US
Asset Valuation	Market value	Equities and real estate marked to market at 15% per annum; others at book value	Cost or market value	Market value	Cost or market value
Degree of Guidance for Liabilities	Standards of practice	Standards of practice	Level of guidance varies	Standards of practice	Standards of practice
Degree of Judgement for Liabilities	Some prescriptive and judgement	Judgement and some prescriptive	Largely prescriptive	Some prescriptive and judgement	Prescriptive
Degree of Prudence for Liabilities	Only via deferred profits. Prudence is quantifiable	Quantifiable	Not quantifiable	Via PADS[45] Quantifiable	Not quantifiable
Solvency Margin	Formulae driven (RBC). Largely prescriptive for solvency, scope for judgement for capital adequacy	Formula driven (MCCSR)[46]	Formula driven	Explicit CAR[47] using judgement	Formula driven (RBC)

Source: KPMG

[45] PADS = Provisions for adverse deviation

[46] MCCSR = Minimum continuing capital and surplus requirements.

[47] CAR = Capital Adequacy Requirement.

Supplemental provision testing	None we are aware of	Dynamic capital adequacy testing	None we are aware of	None	Cashflow testing

Australia

4.12.3 In Australia, accounts and prudential regulation are integrated with the same basis for assets and liabilities. Assets are held on a market value basis. The provisioning uses a gross premium method with best estimates plus a liability for the present value of future profits which are then recognised and spread over the term of the policies (this is known as the Margin on Services methodology (MOS)). Assumptions are reviewed annually, and as long as the business is expected to remain profitable, the effect of the changes is recognised over the remaining life of the policies. If the business is loss-making, the method recognises the loss at inception and there is no margin in future years. Prudential requirements are based on a risk based capital framework and comprise a two tier structure. The solvency requirement is largely prescriptive and is intended to demonstrate the ability to meet liabilities in a run-off scenario. The capital adequacy requirement allows more scope for judgement and is intended to demonstrate the viability as a going concern.

4.12.4 The Appointed Actuary position in Australia also encompasses a legally specified whistle-blower role. Standards of Practice are determined by the Life Insurance Actuarial Standards Board (LIASB).

Canada

4.12.5 In Canada, there is a single federal regulatory body for banks and insurance, the Office of the Superintendent of Financial Institutions (OSFI) and regulation is at the federal level, except for a few provincial companies based in the province of Quebec. Assets are held on a book value basis, except for equities and real estate, which are adjusted towards market value at 15% per annum, and with realised gains also deferred and taken into income at 15% per annum. The same accounting basis is used for regulatory and company account purposes. The provisioning method is the Canadian Asset Liability Method (CALM) which is a gross premium method where best estimate experience plus provision for adverse deviation is used for all but investment assumptions. Under CALM the discount assumption for the liabilities is developed by stress testing the resilience of the assets supporting the liability cash flows under plausible future economic conditions.

4.12.6 The Appointed Actuary position is a legal requirement and reports directly to the board on provisioning as well as dynamic capital adequacy testing (DCAT), which is a deterministic testing of various adverse possible scenarios on the insurer's projected future financial condition. OSFI also has a program for assessment of regulatory compliance (PARC) which requires the board to assess its non-quantifiable operational risks. Standards of Practice are determined by the Canadian Institute of Actuaries, which also publishes general guidance notes.

European Union

4.12.7 In the EU, assets are held at cost or market value and for the most part, the same accounting system is used for regulatory and company accounts. The majority of the business is 'with-profits' with only a limited but growing amount of unit linked business. In general a net premium approach is adopted. In most countries, provisioning is done using the same mortality and interest rate used in premium pricing so an identical product can have several different assumption sets. A Zillmer adjustment for acquisition costs is very common, lapses are ignored unless the provision would increase. The products often guarantee relatively high (in current conditions) rates of interest, typically 3-4%, or similar to that of the US.

4.12.8 If the above approach gets out of date e.g. annuitant mortality, additional provisions may be added (Netherlands has a so called adequacy test). But in the interests of protecting policyholder bonuses, implementation of these additional provisions are often spread over a number of years rather than implemented immediately as done in other jurisdictions.

4.12.9 The approach used in the UK and Ireland is somewhat different to the remainder of the EU. Assets are held at market value and to match this dynamic approach, assumptions used in provisioning must be regularly reviewed and adjusted when necessary. Minor adjustments to this statutory system are made for inclusion in the company accounts. Whilst a net premium valuation is common, a gross premium approach may be used for non-linked non-profit business. Compared to non-linked business, regulation of linked business is less specified but there are standard methodologies in use which regulators expect will be followed. Regulations also require that tests are performed to establish whether additional provisions are needed should investment conditions change from those which currently apply.

4.12.10 Some EU countries have an appointed actuary system. That person is responsible for setting actuarial provisions for life insurers, which must comply with both specified minimum levels of prudence and the guidance provided by the local actuarial professional bodies.

South Africa

4.12.11 South Africa has a Financial Soundness Valuation (FSV) approach, which is used for both accounting and prudential supervision. Assets are valued at market value. Liabilities are based on a realistic gross premium valuation with minimum defined margins. Higher than minimum margins can be used, but this has to be disclosed. Liabilities on this basis are used for both company accounts and prudential supervision. For the latter, a capital adequacy requirement (CAR) has to be determined taking into account various adverse scenarios, and assets have to exceed liabilities by at least this amount. There is no requirement for any dynamic solvency testing into the future.

4.12.12 The Appointed Actuary is responsible for determining the FSV liabilities and the determination of the CAR.

United States

4.12.13 In the US, regulation of insurance is on a state by state basis, with states differing as to whether the requirement is for the entire company if business is written in the state (extra-territorial), only for business written in the state, or only for companies domiciled in the state. Prudential statutory accounts are provided to the state regulators, on the basis discussed below. The company accounts are on a different basis under US GAAP and are standard nationwide. Assets are held at book value.

4.12.14 The National Association of Insurance Commissioners (NAIC) publishes model laws which are then promulgated under the individual states, and are often modified along the way. However, in general, the states require a net premium reserve method which only deals with guaranteed elements. The interest rates are prescribed by the commissioner by year of issue of the policies and locked in thereafter. Mortality tables are also prescribed, but change less frequently. However, in addition to the provisions held above, the valuation actuary must certify the adequacy of the provisions and provide cash flow testing to the state reflecting asset adequacy. This standard while still deterministic, was recently strengthened to incorporate 200 stochastically generated scenarios. These additional scenarios are then tested by all companies.

4.12.15 The Valuation Actuary is a legally required position, appointed by the board. Standards of Practice are determined by the American Academy of Actuaries, which unlike in Canada, is a separate organisation from the Society of Actuaries, the actuarial professional body.

4.13 Conclusions

4.13.1 There is an overriding need for financial statements and regulatory returns within the EU to be on a consistent basis with sufficient disclosure to enable prudential supervisors to understand how the technical provisions have been determined. We do not believe that there is currently sufficient consistency or disclosure for the supervisors to feel comfortable that they can form an independent opinion as to the adequacy of a company's provisions. Some supervisors take a closer interest than others in assessing adequacy of outstanding claims provisions. However, achieving consistency in establishing technical provisions on a 'best estimate' basis is a significant challenge.

4.13.2 Best practice involves the following:

- the use of best estimates and an agreed methodology for establishing either provisions for risk and uncertainty or prudent margins for adverse deviations.
- gross and net provisions should be reviewed separately and the difference reconciled to the outwards reinsurance held by the company;
- a number of different methodologies should be applied and the results compared using knowledge of the business/additional analysis to explain the differences and to select which methods to use.

4.13.3 Analysis should be at a sufficiently detailed level using recognised methods and approaches applied in conjunction with a thorough understanding of the book of business being provided for.

4.13.4 There are a number of inconsistencies in the valuation of technical provisions. There is no quantitative assessment or disclosure of the degree of prudence adopted. The lack of consistency in the amount of prudence is not apparent to prudential supervisors. This leads to solvency margin requirements which are not comparable.

4.13.5 The process of establishing provisions requires management judgement. The rationale for judgemental decisions made and key assumptions should be documented. Best practice would suggest that, certainly for areas where more judgement is required, more than one method should be used and the results compared, as part of the decision making process.

4.13.6 Senior management's considerations should include an understanding of the range of results generated from the methods applied and the level of uncertainty in the results. The documentation, particularly in any areas which rely on judgement, should enable an independent person (such as an auditor or regulator) to understand the broad principles employed by the company, and to form a view as to whether the provisions are reasonable.

4.13.7 If prudential supervisors are to assess the adequacy of systems and controls, then data will need to be relevant, reliable and consistent. Disclosure to the prudential supervisor of the level of prudence which has been included in the provisions, the range of outcomes and their likely probability, the assumptions underlying the calculation and impact of changes in these assumptions is arguably more important than the point estimate that is actually chosen.

Discounting

4.13.8 Discussion of discounting often gives rise to concerns in the insurance industry. The view is sometimes expressed that discounting is not prudent, as it accelerates the recognition of future income. When a company commences a policy of discounting its claims provisions, this is frequently taken to be a sign of weakness. However, whilst such arguments are undoubtedly founded, in some cases, on practical examples of insolvencies, it is important to note that where a policy of discounting is properly applied, a better measure of the true economic value of liabilities will result, reflecting settlement patterns and the time value of money. Transparency can be improved by making explicit an undertaking's assumptions regarding risk and uncertainty, and discounting that amount. It will also ensure that implicit discounting does not occur. Discounting necessitates that an undertaking obtains a more detailed understanding of the claim settlement pattern. It should also be noted that in some jurisdictions discounting is required for taxation purposes.

4.13.9 The adoption of discounting provides a conceptually sound framework to measure technical provisions on a consistent basis to enable recognition of the significant differences which exist in the claims profile of companies. The transparency of information available to the regulator would be greatly improved if, rather than prudence being reflected in undiscounted outstanding claims provisions, this is reflected in the capital requirements. Discounting is consistent with the asset liability model (best estimate basis plus a provision for risk and uncertainty and after discounting) put forward in the International Accounting Standards Board, (IASB) Draft Statement of Principles (DSOP) for the forthcoming IFRS on Insurance Contracts.

4.13.10 The requirement in the IAD is that the discount rate should not exceed the return on past investment performance. The appropriate discount rate to be used is currently the subject of discussion by the IASB which favours the use of the risk-free rate on the basis, inter alia, that, *"the discount rate for a liability should reflect the characteristics of that liability, not the characteristics of some other instrument with different features"* and *"the use of observed market yields reflects the time preferences of market participants in general, which may differ from an insurer's own time preference."*[48] This view achieves consistency between statutory accounts and regulatory return net assets with additional prudence being reflected in the capital requirements.

4.13.11 It should be noted that the EU Solvency I review requires the impact of discounting to be added back when determining the net asset position for solvency purposes. In view of the conclusions above, this issue should be considered further as part of the Solvency II project.

4.13.12 It is recognised that undertakings may find it difficult to construct a reliable model of claims settlement patterns particularly for long tail business where the ultimate liability and the settlement date are extremely uncertain. This should not be a barrier to discounting as long as estimates are continuously reviewed and revised. The use of expected value techniques proposed by the DSOP will require companies to model future cash flows. This will enable cash flows to be estimated and in the longer term provide better management information on the claims and maturity profile.

4.13.13 If discounting is required for financial statements, it will be important to assess at what confidence level technical provisions and the provision for risk and uncertainty have been set, in order to ensure that capital requirements have been set consistently. There are, however, currently few EU Member States which permit discounting to be applied to non-life technical provisions and in those states which do permit discounting it is not applied very frequently in practice. If discounting were to be a requirement, various issues would need to be resolved including the interest rate to be chosen for discounting.

Equalisation reserves

4.13.14 There are inconsistencies between Member States in the implementation of requirements for insurance undertakings to establish and maintain equalisation reserves. It is important to recognise the impact of future catastrophes and adverse claims experience in the solvency system and the need to maintain adequate capital. However, there are inconsistencies between Member States in the methods used within the solvency margin methodology.

4.13.15 Regardless of whether equalisation reserves are included as a liability for regulatory purposes or taken into account in the capital requirements, a method of calculation should be prescribed for credit insurance business and consistent requirements should be laid down for non-credit business for all EU Member States.

4.13.16 If equalisation reserves are included as a liability for regulatory purposes then adequate disclosure would be required in the statutory accounts and/or regulatory return by class of business to ensure that the regulator and other stakeholders fully appreciate the financial

[48] IASB Draft Statement of Principles.

impact. The disclosure should distinguish, as is currently the case in Germany, between equalisation provisions required to equalise claims ratios over time and catastrophe reserves designed to smooth low frequency, high severity losses over time.

5 Asset valuation

5.1 Terms of reference

5.1.1 *"Description of methods for valuing insurance assets, identification of best practice and new trends, as well as a reflection on the need or possibility for harmonisation at European / international level. The investment risk inherent in such calculations should be analysed as well as the use of stress and resilience test methods to capture the amount of volatility in insurance assets."*

5.2 Introduction

5.2.1 The most significant categories of assets for an insurance company are as follows:

- investments, including assets held to cover linked liabilities and land and buildings;
- reinsurers' share of technical provisions;
- investment in subsidiaries and participating interests;
- debtors arising from insurance operations, including premium debtors, amounts due from brokers and intermediaries and reinsurance recoveries;
- deferred acquisition costs;
- other assets, including tangible assets, cash and debtors not directly arising from the insurance operations;
- other items arising from accounting treatment, such as prepayments and accrued income.

5.2.2 For most insurers, the first two categories are likely to be the most significant asset categories. Reinsurers' share of technical provisions should be valued in a consistent manner to the underlying gross technical provisions. Reinsurance is discussed in chapter 6 of this study, and so this is not considered in detail within this chapter. The remaining categories are normally relatively insignificant in comparison with the size of the investment portfolio, although investments in subsidiaries and participating interests may be significant in vertical groups. This chapter concentrates on the area of investments.

5.2.3 The Third Life and Non-Life Directives[49] (the Third Directives) set out guidance on the valuation of assets covering technical provisions for solvency purposes with which each Member State must comply. Member States may set additional requirements over and above these, and this has resulted in the variation in approach that currently exists. This makes comparison of the financial strength of insurance companies across Europe difficult to achieve.

[49] Council Directives 92/49/EEC and 92/96/EEC.

5.2.4 Within this chapter, we outline the range of valuation bases currently applied by different Member States. In considering the advantages and disadvantages of harmonizing the EU requirements further, it is important that any recommendations comply with the guidelines set out by the International Association of Insurance Supervisors (IAIS) in their core principles. The broad principles are summarised later in this chapter.

5.2.5 We consider not only developments in the insurance industry worldwide but also developments in other industries. We discuss the risk based capital approach adopted by the banking industry and consider whether these could be adapted for use in the insurance industry. Discussion of the Valuation at Risk model and the new draft Basel Capital Accord is included in chapter 3. Similarly, accounting developments are included in chapter 8. Accordingly, only the principal features of these developments are included within this chapter, and reference should be made to those chapters for more detail.

5.2.6 Finally, we set out both the current resilience requirements and consider the greater use that could be made of stress and scenario testing as a means of measuring investment risk.

5.3 Existing methodologies

Assets permitted to cover technical provisions

5.3.1 Article 21 of the Third Directives contains rules governing the categories of assets allowed to be used to cover technical provisions and their valuation in the regulatory returns. These valuation rules may differ from those contained in the Insurance Accounts Directive. The full list from the Third Life and Non-Life Directives are included as Appendix 5.1.

5.3.2 Some Member States have implemented further restrictions on the type of assets that can be used to cover technical provisions. Examples of categories of asset prohibited from being used to cover technical provisions in individual countries are included in Appendix 5.2. The application of such additional requirements has led to the regimes applied in some countries being superequivalent. Any form of super-equivalence makes comparison of the relative solvency of individual insurance companies throughout the EU very difficult to achieve.

5.3.3 It should be noted that the Third Directives do not set requirements on the valuation of assets that are surplus to the coverage of technical provisions.

Valuation bases

5.3.4 Article 21 of the Third Directives sets out the general requirement that all assets held to cover technical provisions should be valued at a prudent amount, having regard to their likely realisable value. The requirements of Article 21 of the Third Non-Life Directive are set out in Appendix 5.3.

5.3.5 Article 21 of the Third Non-Life Directive allows transferable securities that are not dealt on a regulated market to be accepted as cover for technical provisions in the solvency calculation as long as they can be 'realised in the short term'. However, no guidance is provided on what this phrase means, nor is there any guidance on how they should be valued. There is, therefore, likely to be variation in interpretation between Member States.

5.3.6 Although the general requirement for a prudent valuation is given, no detail is provided of the precise valuation basis to apply to any asset category, and this has led to a variance in the approach adopted by individual Member States. The bases adopted have arisen in part due to individual supervisors harmonising the valuation bases adopted in the financial statements and the regulatory returns in their country. Many of the differences may therefore be explained by differences in local generally accepted accounting principles (GAAP). Some supervisors have also applied more restrictive requirements in order to build an implicit capital margin into the valuation of assets for solvency purposes. A summary of the methods currently adopted in the regulatory returns is given below.

Valuation bases adopted in regulatory returns

Country	Fixed interest securities	Equities	Land and buildings
Austria	Lower of cost and market value	Lower of cost and market value	Lower of cost and market value
Denmark	Market value[50]	Market value	Market value
France	Amortised cost	Cost[51]	Cost[51]
Germany	Lower of cost and market value[52]	Lower of cost and market value[52]	Lower of cost and market value[52]
Italy	Amortised cost[53] Lower of cost and market value[54]	Cost[53] Lower of cost and market value[54]	Cost[53] Lower of cost and market value[54]
Netherlands	Amortised cost	Market value	Market value
Portugal	Amortised cost or market value	Market value	Market value
Spain	Cost	Cost	Cost
Sweden	Market value	Market value	Market value
United Kingdom	Market value	Market value	Market value

Source: KPMG

[50] Amortised cost until 31 December 2001. With effect from 1 January 2002 market value.
[51] Cost less any provision for permanent elimination.
[52] In some circumstances a valuation below cost can arise due to tax rules.
[53] This basis for durable assets ie. those held to maturity.
[54] This basis for non durable assets ie. those available for sale.

5.3.7 As can be seen there are broadly three alternative bases – cost (or amortised cost for fixed interest securities), lower of cost and market value, and market value. Cost and market value are discussed below. It should be noted that the Insurance Accounts Directive requires that historical cost values as well as current values are included in the financial statements (the basis not used in the accounts should be given in the notes to the accounts).

Cost

5.3.8 Assets are valued at the amount for which they were originally purchased throughout the period they are held. This is generally a prudent valuation basis, with only the 'lower of cost and market value' resulting in more prudent valuations. As can be seen from the table above, a large proportion of the countries require this basis for all the three main investment categories.

5.3.9 Outside the EU, Canada applies a cost valuation basis to equities and properties for non-life insurers. These are written down to market value where there has been a permanent diminution in value.

5.3.10 France and the Netherlands require fixed interest securities to be valued at amortised cost. Amortised cost differs from the cost valuation basis in that the difference between the purchase price and the maturity value is amortised over the period to maturity. This may therefore result in higher valuations than cost in certain circumstances. This basis has also been adopted by the United States and Canada for the valuation of redeemable fixed interest securities.

5.3.11 We understand that in Germany assets can actually be valued at less than cost as a result of various deductions that may be made for tax purposes[55]. The German system appears to be different from other countries that have similar tax treatments, in that the tax treatment drives the valuation in the statutory accounts and this is followed in the regulatory returns.

Market value

5.3.12 Assets are recorded at their current market value. Few countries in the EU require market value to be used as the only valuation basis. Outside the EU, the United States requires market value as a basis for valuing equities. Australia requires market value for all investments. In Canada, the equities and property investments of life insurers are adjusted towards market value by 15% annually, and realised gains on these assets are deferred and amortised into income at 15% annually; periodic market appraisals are required for property assets.

[55] There are several options that enable companies in Germany to decrease their taxable profits as a result of the lower valuation of assets. The condition for these options to apply is that the assets are valued in the same way for accounting purposes as they are in the tax assessment. An example of one of the options is to rollover the gain on the sale of certain assets (such as a building). The gain on the sale of a building can be used to reduce the valuation of a new building in the balance sheet, which would then be carried at cost less the rollover reserve.

5.4 Comparison of cost and market value

5.4.1 Proponents of the cost basis argue that this basis involves no subjectivity in the measurement basis. In addition, there is no volatility in the balance sheet, as the valuation will not reflect the prevailing economic climate. This allows some certainty in the numbers. The use of amortised cost for redeemable fixed interest securities which are held to maturity is a more relevant measurement basis, as short term fluctuations in market values are irrelevant in considering the financial position of the company. Some supervisors also prefer this basis as it allows some implicit capital requirements to be included, thereby increasing the overall capital that an insurance company needs to hold. This will make insurance companies adopting a cost valuation basis appear less solvent than may actually be the case. The amount of implicit capital will generally increase over time, as investments tend to increase in value over the longer term, if the gains are not realised.

5.4.2 Opponents of the cost basis argue that the valuation does not reflect the current realisable value of the investments, and so adoption of this basis does not permit the true financial strength of the company to be seen. This therefore hinders comparisons between the financial strength of different insurance companies. Amortised cost has a slight advantage over cost in that the amortisation charge reduces the volatility in the balance sheet and allows the asset to be written up to its recoverable amount at maturity. However, valuation at any point before maturity will not reflect the actual recoverable amount, were the asset to be sold, as the market price is likely to fluctuate in line with changes in interest rates.

5.4.3 Market value basis removes these implicit capital requirements, as the assets are valued at the best estimate of their current realisable value. Where a market value is readily available, market forces drive the valuation, and this enables valuations to be reliably made. The use of market values therefore means that the information included in the financial statements and regulatory returns is up to date. This enables a comparison of the financial strength of insurance companies that adopt the market value basis to be more easily made.

5.4.4 However, for certain assets a market valuation may not be easily obtained. This means that varying amounts of subjectivity can become involved in the valuation of these assets. For most assets a reliable valuation can be obtained. Techniques do exist to value unlisted securities (see Best Practice and New Trends below).

5.4.5 The main disadvantage of the use of market values is that volatility arises in the asset valuations. This does not necessarily flow through to the reported profits, as companies may be permitted to take such changes to equity rather than to the profit and loss account. Further, market values tend to fluctuate which is likely to make the information at the balance date out of date by the time the accounts are published or thereafter.

5.4.6 The following is an example to illustrate the impact of the asset valuation basis on the assessment of financial strength.

Example of impact of asset valuation basis on assessment of financial strength

	Company A	Company B
Same asset portfolio		
- Market value basis	200	
- Cost basis		100
Same liabilities and solvency margin requirement	75	75
Solvency position	125	25

Source: KPMG

5.4.7 Whilst the true financial strength is the same for both companies, company A shows a much stronger position because of the market value basis for assets in contrast to the cost valuation basis for assets adopted by company B. Whilst the reporting of company B may be regarded as prudent it may be a competitive disadvantage for company B.

5.4.8 As discussed in chapter 8, the change to preparing financial statements in accordance with international accounting standards (IAS) will result in more assets being included at fair (or market) value. This is likely to flow through into the regulatory return reporting system, unless supervisors decide that they wish to impose different rules for solvency monitoring purposes. Adoption of different bases may make it difficult to reconcile the financial statements and the regulatory returns, and effectively require two sets of records to be kept. This is already the case in several Member States.

5.4.9 Whilst there are a number of advantages to using historic cost, there are a number of significant disadvantages. Fair values represent appropriate and relevant bases in measuring the financial strength of a company at any point in time. Recent turbulence in stock markets has led to significant fluctuations in share prices of insurance companies and concerns over solvency. This illustrates that market mechanisms respond to such events and it would be inappropriate to measure solvency in a way which does not respond to these events.

5.4.10 Accordingly, a transition to full adoption of fair values in the valuation of investments for solvency purposes should be in place at the same time as the transition to IAS in the financial statements. This would also remove the discrepancy caused by some companies applying for hidden reserves relating to the difference between market value and cost of investments to be treated as an asset for solvency purposes.

5.5 Asset restrictions

5.5.1 Within the classification of allowable assets, assets are further categorised as restricted or unrestricted. The use of such restrictions prevents insurance companies from having complete investment freedom over the assets they select to cover technical liabilities. They effectively substitute the supervisor's view of 'appropriate' for management's view. As the names suggest, this basically means that an insurer may hold unlimited quantities of certain lower risk assets (the unrestricted categories), but that limits are imposed on other categories of asset (the restricted categories).

5.5.2 It should be noted that these requirements do not apply to assets held to cover linked liabilities. The requirements for these assets are set out below.

Unrestricted assets

5.5.3 There is no definitive list of assets that may be classified as unrestricted, and this is a matter for individual Member States to decide. This could be read in conjunction with Article 22 of the Third Directives, which requires that certain assets should be limited in comparison with other assets. This could be taken as meaning that these other assets are unrestricted. An alternative method of interpreting which assets are fully admissible would be to use the allowable assets stated in Article 21 and compare this to the restrictions mentioned in Articles 21 and 22 (see below). Any which are not discussed within the restrictions could be implied as being able to be held without restriction.

5.5.4 Examples of the categorisation of assets as unrestricted for some Member States is included as Appendix 5.4.

Restricted assets

5.5.5 Certain asset categories are restricted in the Third Directives because they carry greater investment risk. By limiting the amount that may be included in the coverage of technical provisions, the regulations discourage (but do not prohibit) companies from holding positions that exceed the limits. Any amount held in excess of the restriction limit cannot count towards solvency.

5.5.6 The portfolio limits set out in Article 22 of the Third Directives are calculated as a percentage of gross technical provisions. These limits are as follows:

Portfolio limits required by the Third Directives

	%
Any one piece of land or building	10
Total shares and negotiable instruments of one company	5
Any single unsecured loan[56]	1
Aggregate unsecured loans	5
Cash in hand	3
Total unlisted equities and debt securities	10

Source: Article 22 Council Directives 92/49/EEC and 92/96/EEC

5.5.7 There are additional restrictions for non-life insurers relating to unlisted equity shares. These are only allowable if the value is realisable in the short term. This is because it is important that an insurer holds most of its investment portfolio in liquid assets to meet liabilities as they fall due. Unlisted shares may be difficult to sell, particularly at short notice.

5.5.8 Article 22 of the Third Life Directive sets out the principles that Member States should apply in setting more additional restrictions for other assets. These are summarised in Appendix 5.5. Several countries have adopted additional restrictions on the amount of individual or aggregate categories of asset that can be valued for solvency purposes (see Appendix 5.6 for examples).

Exposure to counterparties

5.5.9 The Third Directives impose limits on an insurer's exposure to any counterparty. Any amount in excess of the limit is disallowed for solvency purposes. The restriction on exposure to any counterparty is set out as follows. In general, only 5% of the total gross technical provisions can be invested in the aggregate of:

- shares and other negotiable securities (treated as shares, bonds, debt securities);
- other money or capital market instruments from the same undertaking;
- loans granted to the same borrower. The loans exclude those granted to a State, regional or local authority or natural person or to an international organisation of which one or more Member States are members.

5.5.10 This limit may be raised to 10% if an undertaking does not invest more than 40% of its gross technical provisions in the loans or securities of issuing bodies and borrowers in each of which it invests more than 5% of its assets.

Assets held to cover linked liabilities

5.5.11 The Third Life Directive recognises that there are insurance contracts where the benefits provided are directly linked to the value of units in undertakings for collective

[56] Under the Non-Life Directive, the admissibility limit for unsecured loans is 5% of gross technical provisions, including 1% for any single unsecured loan. For life insurers, the supervisory authority in each Member State may raise these limits to 8% and 2% respectively.

investments in transferable securities (UCITS) or to the value of assets contained in an internal fund (usually divided into units). For this type of contract the Directive requires that the technical provisions in respect of these benefits must be represented as closely as possible by those units or assets. Within this chapter, this type of contract and the corresponding assets will be referred to as property linked.

5.5.12 The same Directive requires that for contracts where the benefits provided are directly linked to a share index, or some other reference value, the technical provisions are represented as closely as possible by units deemed to represent the reference value or by assets that correspond as closely as possible with those on which the particular reference value is based. It also requires that these assets are of appropriate security and marketability. This type of contract and the corresponding assets will be referred to in this chapter as index-linked.

5.5.13 Assets held to match property linked or index-linked benefits are exempt from Articles 20 and 22 of the Third Life Directive. Exemption from Article 20 means that the insurer does not need to consider the safety, yield and marketability of these assets or ensure they are diversified and adequately spread. Exemption from Article 22 means that the assets are not subject to the asset restriction or valuation rules. There is no exemption from Article 21, which lists the allowable assets that may be used to cover technical provisions. The only exception to these exemptions is where the contracts include a guarantee of investment performance or some other guaranteed benefit. In this case the technical provisions relating to the guarantee will be subject to the full requirements of Articles 20, 21 and 22.

5.5.14 The safety, yield and marketability or the spread of investments in matching property linked contracts are not particular issues for the insurance company as all investment risk is borne by the policyholder so any adverse movement would not effect solvency. However, safety and marketability can affect the insurer's solvency in the case of index-linked contracts, as the assets held are unlikely ever to match exactly the index to which the policyholder return is linked. For index-linked contracts, credit risk is therefore borne by the insurer.

Other asset categories

Derivatives

5.5.15 The Third Directives allow derivatives to be brought into account as long as they contribute to a reduction in investment risks or facilitate efficient portfolio management. The valuation of the derivative should be straightforward as there will be a market value or a close out value. However, differences arise between different Member States in the definition of an allowable derivative contract. For example, in the Netherlands, Germany and Italy the conditions on the use of derivatives are those contained in the Third Directives, while Denmark and the UK place additional rules on derivatives that may be counted towards solvency. The situation could, therefore, arise where the same derivative contract would be valued at nil in one Member State but be assigned a value in another Member State.

5.5.16 Derivatives as a means of controlling risk are discussed in chapter 7.

Investment in subsidiaries and participating interests

5.5.17 The Third Directives require the underlying assets held by a subsidiary undertaking to be taken into account when valuing a subsidiary which manages all or part of an insurer's investments (the look through basis). This means the assets held by the subsidiary will be valued in the same way as if they had been held directly by the insurance company.

5.5.18 There is an option in the Directives to value all subsidiaries and participating interests in this manner. Where this is not implemented, subjectivity will exist in determining the value to apply to such holdings. If the company were valued at net asset value as reported in the financial statements (under the Insurance Accounts Directive rules), then this may take into account assets that would be excluded under the asset valuation rules (in the Third Directives). Most Member States require subsidiaries to be valued on the look through basis although there are some differences. Spain only requires the look through valuation for subsidiaries managing investments for the insurer.

5.5.19 Italy places further restrictions on holdings in subsidiaries and participating interests (see Appendix 5.6). The UK permits non-insurance subsidiaries to be held at market value or the look through basis.

Debtors arising from insurance operations, including premium debtors, amounts due from brokers and intermediaries and reinsurance recoveries

5.5.20 As stated in Appendix 5.3, debts due from policyholders and intermediaries arising from insurance and reinsurance operations may only be recognized insofar as they have been outstanding for not more than three months. Due to the short time scale involved, such debts are recorded at the amount due without discounting.

Other assets, including tangible assets (other than land and buildings), cash and debtors not directly arising from the insurance operations

5.5.21 There are no specific rules, and the general principle of calculation on a prudent basis, with due allowance for the risk of any amount not being realisable, will apply. Some countries do not allow certain categories of such assets to cover technical provisions (see Appendix 5.2). Given the relatively low significance of such assets for most insurers, we have not investigated the detailed valuation bases applied.

Other items arising from accounting treatment, such as prepayments and accrued income and deferred acquisition costs

5.5.22 Several countries limit the use of these items to cover technical provisions (see Appendix 5.2 for examples). Given the relatively low significance of such assets for most insurers, we have not investigated the detailed valuation bases applied.

Implicit items

5.5.23 Article 18 of the First Life Directive[57] allows additional assets to be brought into account in the solvency calculation in respect of future profits, Zillmer adjustments and hidden

[57] Council Directives 79/267/EEC.

reserves, provided regulatory approval has been obtained to do so. Zillmer adjustments depend on the basis applied in the valuation of technical provisions and these are not considered in this chapter. Hidden reserves reflect reserves resulting from the under estimation of assets or the over estimation of liabilities (other than mathematical reserves). The move to fair value accounting for investments removes the need for such an asset. Future profit items are allowed to mitigate the impact of over prudent technical provisions. Moving to best estimate of technical provisions will negate the need for these items.

5.5.24 The question arises whether future profit items should be allowable for solvency purposes. If it is considered that the amount of prudence contained within the technical provisions is too great, then the issue could be tackled at its source by amending the approach to calculating the provisions. It is arguable that to calculate the provisions on too prudent a basis and then correct the position by introducing an artificial asset is a source of confusion and unnecessary complexity to those who seek to review the financial position of insurers.

5.5.25 A further reason for not allowing future profits is the element of choice which it introduces. There is the choice as to whether a Member State allows a future profits facility or not. If a Member State does allow such a facility, there is then the choice made by individual companies as to whether the facility is actually used. This can only make comparisons of companies' financial positions (both between and within Member States) more complicated. Where a future profits item is used by a company, it could also give rise to an unfair competitive advantage in relation to a company where no future profits item is used. On implementation of Directive 2002/12/EC (Solvency I) the use of future profits implicit items will be restricted until 31 December 2009, after which time the use of such items will cease to be allowed.

5.5.26 Similar arguments to those set out above in respect of future profits can be applied to hidden reserves. As for Zillmer adjustments, there is no reason why any such adjustments cannot be included in the basic mathematical reserves, and so there is no need for an implicit item facility in this respect

5.6 Investment risk

5.6.1 For an insurance company investment risk primarily relates to the risk of poor investment performance resulting from an inappropriate mix of investments, overvaluation of assets or an excessive concentration of any class of asset. Investment risk can also arise from market value fluctuations or movements in interest rates. Investment risk could result in the amount and timing of future cash flows from investments differing from that estimated, or a loss of value if the investment becomes worth less than expected. A particular and important example of investment risk is where liabilities which cannot be reduced (for example the sums assured and declared reversionary bonus liabilities on with-profits business) are backed by assets such as equities where the market value can fall.

5.6.2 The EU requirements discussed in the section on existing methodologies above are designed to address investment risk. The combination of the list of allowable assets and the restrictions on the amounts of certain types of assets permitted to cover technical provisions help ensure that an insurance company's investments are well diversified and

are of appropriate marketability and liquidity. This reduces investment risk from excessive concentration of one type of asset. More details of investment risk can be found in chapter 3 of this study.

5.6.3 Member States have adopted various interpretations of these principles, and this has led to implicit capital requirements being built into the valuation of investments. We have therefore considered other mechanisms that could be employed to counter investment risk and assess the amount of volatility in insurance assets. Some other methodologies available are discussed in chapter 10.

5.6.4 The valuation of investments at market value will increase transparency of the inherent investment risk. Where assets are recorded at cost, falls in investment values will reduce the implicit capital and this effect is not visible.

5.6.5 Investment risk exists in any investment purchased, whether market, credit or interest risk. Even government bonds have risks. Existing mechanisms in use in certain parts of the EU, and elsewhere, to deal with investment risk include stress testing and resilience testing, and various forms of risk based capital requirements. More sophisticated stochastic modelling techniques can also be used, and some of the existing risk based capital approaches are based on such modelling.

5.6.6 It should be noted that currently approaches differ as to how the effect of stress testing is allowed for in published results/returns. In the UK for example, mathematical reserves have to be increased to allow for any "mismatching" of assets and liabilities, with the stress tests being used to quantify the extent of the mismatching. In other territories (eg South Africa), the liabilities are not affected, but the capital requirements are increased to allow for the mismatching. In order to increase the transparency, any allowance for investment risk should be included within the solvency requirements rather than as an addition to liabilities.

Stress testing on investments held at market value

5.6.7 Assets recorded at market value are likely to be the most volatile of a company's investments. This can be problematical for supervisors wishing to assess an insurance company's financial strength, and as a result, some supervisors have determined that investments should be recorded at cost (see earlier discussion). Those Member States where market value is a permitted option, or is required, have developed alternative means of dealing with the threat to solvency that would arise if investment values were to fall suddenly. Such methods may be known as stress tests or resilience tests. In other territories, the amount by which the market value of the assets must exceed the liabilities (ie the risk based capital or the capital requirement) takes account of the volatility of the assets.

5.6.8 An important aspect of stress testing is the interaction between assets and liabilities. For example, it may well be that a fall in the market value of the assets would automatically imply somewhat lower liabilities – either because benefits would be reduced, or because the underlying interest rate would then be higher, leading to lower liabilities. It is important that any system allows for this interaction.

5.6.9 Denmark, France, Ireland and the UK require stress testing. The UK and Irish systems for stress testing are similar, although the parameters for the tests may not be the same. The UK rules are summarised below.

UK procedures for stress testing assets held at market value

Resilience reserves are currently applied only to life business, although there are proposals to extend resilience testing to non-life insurers where there is a risk of significant movements in asset values.

Guidance issued by the UK regulator requires the appointed actuary of a life company to perform (and as appropriate reserve for) resilience testing which meets certain minimum criteria. The criteria are amended from time to time, but are currently as follows:

(i) a fall in the value of equities of between 25% and 10%, depending on the level of interest rates in relation to equity price/earnings ratios, and combined with a subsequent worsening of 10% in earnings yields;

(ii) changes in the value of other assets, and changes in yields on long term fixed interest and index-linked securities to be determined by the appointed actuary using professional judgement, but bearing in mind the general concept of prudence.

In carrying out the tests, any unrequired margins in the valuation basis can be released. Depending on the size of such margins, the resilience testing may or may not reveal the need for an explicit additional reserve. If there is such a need, then the additional resilience reserve would have to be added to the basic mathematical reserves.

Either way, the ultimate technical provisions therefore include a provision for investment risk based on the scenarios tested.

Source: KPMG

5.6.10 The aim of the UK stress test is to determine whether an additional provision is required to avoid insolvency following a sudden change in market conditions. Rather than just adding a margin to the liabilities, the test has the advantage that it takes account of the way both assets and liabilities change as a result of a change in market values. The test therefore reflects what would happen in practice. However, the test only considers the effects of an immediate, one-off change in asset values and interest rates. It does not consider what may happen to the value of assets in the future. Moreover, the test is rather formulaic and this may lead to onerous reserving requirements. For example, if stock markets actually fall by 25% then a stress test that requires you to assume a further fall in equity values of 25% may be regarded as over stringent. The current test seeks to address this by limiting the fall in equity values according to the relationship between interest rates and equity price/earnings ratio.

5.6.11 The Danish supervisor carries out its own stress tests and scenario tests to assess the strength of the technical provisions of life assurance companies as well as requiring each company to carry out stress tests. The aim of the stress tests is an evaluation of the soundness of the company under certain assumptions regarding interest rate risks and credit risks on assets and liabilities, risks in the price of shares, risks in the rate of exchange and risks in investments in property.

5.6.12 The French supervisor has recently introduced requirements for stress testing of asset portfolio and asset liability management.

5.6.13 In addition, the Dutch insurance supervisor (PVK) has proposed a number of scenarios to be part of their Financial Assessment Framework, including: mismatch between

investments and liabilities, in terms of both market risk and credit risk; and structural deviation from the anticipated cost-induced inflation.

Risks associated with debt securities

5.6.14 Debt securities with fixed maturity are generally held to match specific liabilities, matching payments under policies which are either made on a regular basis for annuity business or estimated payment patterns for other classes of business. A holding of interest bearing securities therefore provides a good match for these policies and can be used to hedge away some of the exposure to interest rate changes. Debt securities may be traded or may be held to maturity. For investments held to maturity the amortised cost basis of valuation is a more relevant measurement attribute.

5.6.15 The main risk to insurance companies from debt securities is therefore credit risk if they are of fixed term and held to maturity. This is the risk of default against the terms and conditions of the particular debt security (the payment of interest and the repayment of capital). The present system used in the EU does not in general take explicit account of the credit risk other than through the general application of counterparty exposure limits. However, there is a requirement to use a valuation rate of interest which is less than or equal to a maximum rate[58]. The method for determining the maximum rate differs according to whether the asset is valued at cost or market value and the maximum rate is assumed to be sufficient to cover the credit risk. In the UK, however, for liabilities backed by debt securities, there is a requirement to further reduce the maximum valuation rate of interest by an amount reflecting the default risk on the debt security. This is commonly done by reference to the corresponding yield on government securities (with an adjustment to allow for differing liquidities). This requirement is therefore a more explicit allowance for credit risk than that generally used elsewhere within the EU.

5.6.16 An alternative approach would be to apply different risk weightings to the issuers of debt, depending on their overall credit rating; the greater the risk of default, the higher the level of capital requirement imposed to cover the risk of default. In order to prevent companies from having to form their own credit assessment, this may require the accreditation of rating agencies to provide such credit assessments (see chapter 9). This would have the advantage of preventing the system from being overly complex. Banking supervisors are already considering such a system in relation to the banking book and this is of particular relevance to insurance companies in relation to debt securities held for investment. This is discussed below.

Linked assets

5.6.17 The main investment risks are largely borne by the policyholder, particularly for property linked contracts, as the return on investments accrues to the policyholders. If the value of the assets in the internal funds falls, then the benefits payable fall proportionally. Where benefits are linked to an index, apart from any guaranteed minimum benefit, the benefit will move proportionally with the index. The insurer is exposed to investment risk in respect of any mismatch between the portfolio of investments held and the index that determines the payment. The main such investment risks will be market risk (the risk of potential loss due to unfavourable changes in market prices) and credit risk (the risk of

[58] Article 17(1)(B)(a) of Directive 78/267/EEC.

default of a counterparty). The same considerations discussed above therefore also apply to index-linked assets.

5.6.18 There is however a further, secondary, issue in relation to linked assets. Commonly, an insurance company will levy a charge against the value of the linked benefits under the policy. This is commonly referred to as a fund management charge. If the value of the linked assets and liabilities falls (as envisaged in the paragraph above), then there will be a reduction in the amount of future fund management charges. As these fund management charges may have been taken into account in determining the mathematical reserves, a stress or resilience test needs to be undertaken to assess (and if need be provide for) the affect of lower future charges. There could also be other secondary effects in relation to changes in the value of linked assets/liabilities.

Investment risk in the Finnish solvency system

5.6.19 In Finland every insurance company has to calculate a solvency requirement arising from investment risk. This requirement forms part of the Finnish solvency test, which is supplementary to the solvency requirement under the European directives. The solvency requirement arising from investment risk takes market risk, interest rate risk and concentration risk into account.

5.6.20 The assets under consideration are those that are sufficient to cover technical provisions, excluding equalisation provisions and the solvency requirement due to insurance risk. Assets beyond these are not taken into account. In the calculations, assets are classified into six categories: loans, short term money market instruments, bonds, equities, real estate and other, with some further sub-categories.

5.6.21 For each category parameters representing mean, standard deviation and mutual correlations (between categories) of the return on assets are provided by regulations. In addition, every company has to calculate its own maximum requirements for overall return on assets.

5.6.22 Using this information, the solvency requirement for investment risk takes into account the insurer's own risk profile. The more volatile the assets are, the higher the solvency requirement will be.

5.6.23 The Finnish system is described more fully in chapter 10.

5.7 Best practice and new trends

International Association of Insurance Supervisors (IAIS) core principles

5.7.1 The IAIS core principles set out guidance on the standards that insurance supervisors should expect to address in their financial supervision of insurance companies. These core principles help to ensure that all insurance companies are supervised in a broadly similar manner regarding their investment policies and that consideration is given to the relative risk involved in the underlying assets.

5.7.2 In relation to assets, the IAIS recommends that, at least in relation to an amount of assets equal to the technical provisions, the supervisory rules should address:

- diversification by type of asset;
- any limits, or restrictions, on the amount that may be held in financial instruments, property and receivables;
- the basis for valuing assets which are included in the financial reports;
- the safekeeping of assets;
- appropriate matching of assets and liabilities;
- liquidity.

5.7.3 As can be seen from the earlier discussion of the current EU requirements, these are largely addressed within the current system. Any proposed change in the prudential supervision system will need to comply with these requirements.

Unlisted securities

5.7.4 The British Venture Capital Association has developed guidelines[59] for the valuation of unlisted securities which are currently under review. Initially the valuation is based on impaired cost and subsequently based on an earnings multiple. In the UK, the supervisors' guidance on the valuation of unlisted securities refers to these guidelines. Under this method a price/earnings multiple for a comparable listed company, discounted to reflect the lower marketability of the unlisted security, is applied to the earnings of the unlisted security.

Banking supervisors use of credit ratings

5.7.5 Banking supervisors currently restrict the reliance on credit rating agencies to identification of investment grade corporate bonds[60] in the trading book. Investment grade corporate bonds (known as qualifying bonds) carry a substantially lower specific risk charge compared with other bonds. The criteria for determining which rating agencies are recognised by supervisors for this purpose is largely left to individual supervisors. In the UK, the Bank of England (and subsequently the Financial Services Authority) published a list of which rating agencies they deemed to have the competence to determine which type of bonds they were capable of rating for this purpose.

5.7.6 The draft Basel Capital Accord[61] proposes to amend the requirements for the banking book, so that rating agencies may be used to determine risk weighting of lending to sovereigns, banks and corporate entities in what is called the "Standardised Approach" under pillar 1 of the proposed three pillar approach. The proposal is that the current risk weightings of 0%, 20%, 50%, 100% (and a new category of 150%) should be used in conjunction with rating agency credit quality categories to determine the capital requirements associated with lending in these areas.

[59] Guidelines for the Valuation and Disclosure of Venture Capital Portfolios, British Venture Capital Association.
[60] Market Risk Amendment to the Basel Accord of 1996 and the European Capital Adequacy Directive (96/3/EC).
[61] See discussion of the draft Basel Capital Accord in chapter 3.

5.7.7 The paper sets out two alternative systems and as yet it is unclear which will be preferred or whether both will be available for use at the discretion of the national supervisor. The following table sets out suggested risk weightings under both proposals, based on Standard & Poor's rating system.

Risk weightings for banks

Credit Assessment	**AAA to AA-**	**A+ to A-**	**BBB+ to BBB -**	**BB+ to B-**	**Below B-**	**Unrated**
	%	%	%	%	%	%
Sovereigns	0	20	50	100	150	100
Option 1 Banks (based on sovereign's rating)	20	50	100	100	150	100
Option 2 Banks (based on ECAI's)	20	50	50	100	150	50
Short-term bank deposits	20	20	20	50	150	20

Credit Assessment	**AAA to AA-**	**A+ to A-**	**BBB+ to BB -**	**Below BB-**	**Unrated**
Corporate	20	50	100	150	100

Source: Draft Basel Capital Accord

5.7.8 Of the many alternatives that have been considered by the Basel Committee, the use of external credit ratings to assess credit risk is the simplest and most practical in the absence of using internal models.

5.7.9 There are some concerns arising from the application of such a system, not least of which is that rating agencies are not regulated and there is no external 'quality check' of the rating agencies. Different agencies may also provide different ratings for the same issue.

5.7.10 However, we believe these weaknesses can be overcome and the benefits of including credit assessment within the solvency system outweigh these. The draft Basel Capital Accord proposals include eligibility criteria for rating agencies, leaving banking supervisors to determine whether a rating agency meets those criteria. Insurance supervisors could adopt a similar approach, for example by having a pre-approved list of rating agencies whose ratings can be used for this purpose. Where rating agencies give different ratings for the same issue, the lowest grading could be applied on the grounds of prudence. We believe that use of ratings would improve the current system by aligning the overall capital requirement with the risks to which the company is exposed.

5.8 Risk based capital charges as they operate within the banking industry

Outline of the banking approach to risk based capital

5.8.1 To ensure a prudent solvency position is maintained at all times, banks calculate a daily capital requirement. This calculation addresses the following key areas of asset risk to which banks are exposed:

- banking book (credit) risk (see above);
- trading book;
- equity risk;
- interest rate risk;
- foreign exchange rate risk;
- commodity risk;
- large exposures risk.

5.8.2 Equity risk is the risk that the price of an equity investment may go up or down (the risk being dependent on the direction of the price fluctuation and the position held, i.e. short or long). For the purposes of calculating the capital requirement, equity risk is divided into general risk (which relates to the overall movement in the relevant index) and specific risk (which is the risk associated with an individual item). The calculated capital requirement for equity is then:

- 8% of the market value of the equity in respect of general risk;
- a specific risk charge depending upon the nature of the stock, which is charged at:
  - 4% in respect of indexed stocks. A reduction to 2% is available if indexed equities are part of a well-diversified portfolio (minimum 20 stocks with no one stock representing greater than 5% of the portfolio's market value);
  - 8% in respect of non-indexed stocks.

5.8.3 Interest rate risk relates to traded debt securities and derivatives such as swaps. Individual bonds are classified as qualifying or non-qualifying, depending on the credit rating of the bond. An investment grade rating means the bond is qualifying[62]; a junk bond grading means it is non-qualifying. General and specific charges are then levied on both categories of investment, the difference being that the specific charge will reflect the grading of the bond. The general market risk is the risk-free rate, i.e. based on rates obtained on government bonds or the London inter bank offer rate (LIBOR). No deductions are available for well-diversified portfolios, although penalties may apply if the portfolio is not particularly well diversified. Where bonds have been issued by governments, and as such are relatively risk free, a reduced capital charge is applied. There is an alternative method 'Modified Duration' which takes account of the timing of

[62] The credit rating agencies and investment grade ratings used in the UK are included in Appendix 5.7.

cashflows. This is a more complex calculation but results in lower capital charges and is more relevant to insurers where matching is of potentially greater significance than diversification per se.

5.8.4 In relation to traded investments the risk capital charges reflect the matching or otherwise of positions held.

5.8.5 Similar charges are applied to foreign exchange and commodity risk. For large exposure risks, for example a large loan from a bank, an additional capital charge is required for exposures above a capital based limit. A flat rate capital charge of 8% is applied to properties which are part of the banking book. Capital charges on unit trust investments are applied on the basis of the underlying assets, but with the entire trust being treated on the basis applicable for the lowest grade equity within that trust.

5.8.6 Currently banking regulators' views are that liquidity should not be managed as part of capital but rather by requirements to maintain appropriate liquid investments and active liquidity management.

Possible application to the insurance industry

5.8.7 The banking approach focuses on asset risk. It is only the application of the banking approach to asset risk of insurers that is considered here.

5.8.8 The system outlined above means that banks are required to hold sufficient capital to cover the risks inherent in their investment portfolio. It also takes account of the risk of default of the banking book through applying different risk charges to debt securities depending on their credit rating (see above).

5.8.9 However, the application of fixed capital charges means that no account is taken of price volatility. Consequently, banks will hold too much capital at some times and not enough at other times. For interest rate risk, a separate calculation is performed for each currency, which takes no account of the interactions between different currencies. Similarly, it ignores the inverse correlation between equity prices and bond prices that has been seen recently (the latter being affected by interest movements)[63].

5.8.10 However, we believe that the advantages of considering investment risk outweigh the disadvantages, and we believe that such a model could be adapted for use by the insurance industry in relation to asset risk. Adjustments would need to be made to reflect the fact that whilst many of the risks faced by companies within the two industries are the same, there are a number of important differences. This would require the model to be amended as follows:

- for investment-linked insurance products, the investment risk is often borne by the policyholder (see earlier discussion). As the insurer is not exposed to the investment

[63] There is an alternative model (Value At Risk model) which looks at the portfolio as a whole, taking into account how interest rates move in line and the correlation between equity and bond prices. This looks at how much capital is required based on historical volatility to cover the risk within a 10 day holding period and a 99% confidence level, then applies a multiple of 3 to this. Currently this method is optional for banks, although conditions have to be satisfied for it to be used.

risk on matching assets, it would seem more appropriate not to apply a capital charge, so that any charge levied reflects the actual risk borne by the insurance company;

- for assets matching other technical provisions the situation is less clear. It could be argued that as the assets are matching technical provisions no capital charge should be required. However, the expectations of policyholders need to be considered and this may mean that some capital charges may still be required. Where companies are not adequately matched a mismatching capital charge should be levied;
- where some form of guarantee is included within the insurance policy, the company is exposed to the investment risks discussed. As discussed in the accounting chapter, we believe that option-pricing models should be used to value these. An appropriate capital charge will need to be determined.

5.8.11 Like banks, insurance companies are exposed to mismatching risk. The banking model only considers matching of trading positions. Insurance companies need to ensure that liabilities are suitably matched with corresponding assets in terms of duration and yield. The risk charges should for all assets reflect the extent of mismatch that exists, with higher charges levied in cases of significant mismatch.

5.8.12 Liquidity risk is the risk that assets will not be realisable in the short-term. Insurers need to ensure that they can pay claims as they fall due. A similar approach to banks could be adopted (see above) or alternatively this could be linked in with the consideration of mismatch of duration of assets and liabilities referred to above.

5.8.13 As lower risk investments will have a lower capital charge this may act as an incentive for companies to hold low risk investments. Further consideration may need to be given to participating contracts and whether it is appropriate to impose capital charges in these assets where investment risk may be wholly or partly shared with shareholders.

5.8.14 The current Third Directives deal only with assets covering technical provisions, and the UK is the only Member State that applies the same rules to all the insurer's assets in determining its solvency. We believe that some explicit capital charges should be required in respect of the surplus assets (i.e. those not matching technical provisions) and those covering the solvency margin requirement as the risks inherent in these assets can affect solvency and therefore the risk needs to be reflected within the capital charge.

5.8.15 There are, of course, significant differences in the time periods over which banks and insurers hold assets. This is particularly true in the case of a bank's trading book, where the risk profile changes on a daily basis. Asset portfolios tend to be held over longer periods of time by insurers, and this would have implications for the application of banking approaches to insurance. In particular, the larger volume of transactions over short time periods means that banks can generate more data to analyse the impact of risk events on the portfolio.

International accounting developments

5.8.16 Chapter 8 discusses the current IAS 39 (Financial Instruments: Recognition and Measurement), recent proposed amendments to this and the recommendations of the Joint Working Group on financial instruments. However, it is worth noting in this chapter that if regulatory returns are prepared in accordance with international accounting standards at

some future date, this will mean that more of the investment portfolio will be included at fair value. This will introduce volatility into the valuation of assets and into the margin of solvency determined in accordance with the current solvency regime. However, insurance undertakings with investment portfolios mainly invested in bonds may continue to value bonds at amortised cost provided that they satisfy the stringent 'held to maturity' condition in IAS 39.

5.9 Conclusions

5.9.1 The lack of definitive rules in the Third Directives on the detailed bases to be applied to dealing with assets has meant that various approaches have been adopted in individual Member States. This has lead to some countries' requirements being superequivalent, and implicit capital charges have been built into the solvency system through prudent valuation of assets. This also makes it very difficult to compare the true financial strength of insurance companies throughout the EU, even though they are all preparing regulatory returns in accordance with the Third Directives.

5.9.2 Since the Third Directives were enacted, there have been a number of developments in both supervision in other industries and valuation methodologies. Companies now have far more sophisticated tools available to them, and these developments should enable improvement of the solvency system.

5.9.3 Harmonisation of the approach adopted across Member States would be helped by the harmonisation of accounting requirements. Insurance companies' compliance with international accounting standards, would be a necessary first step towards the harmonisation of the solvency regime.

5.9.4 In most cases, a market or fair valuation of assets would improve transparency and enable the financial strength of companies to be more readily determined.

5.9.5 The valuation of some assets, notably unlisted securities and subsidiaries and participating interests at fair value may be difficult. However, there are a number of alternative valuation bases available and the relative benefits of these should be considered and guidelines developed for valuing such assets[64]. It should be borne in mind that moving to fair value may create tax issues in some Member States.

5.9.6 Many Member States have widened the scope of non-allowable assets. This has either been through the non-recognition of additional categories of asset, application of more restrictive admissibility limits or application of the admissibility rules to other assets. There are two alternatives if harmonisation is to be achieved – either to have a common non-allowable list, removing the ability of supervisors to widen this, or to replace the solvency system with something that takes account of the risks arising from the assets as well as the insurance risk.

5.9.7 A form of risk based capital charges on assets would have a number of advantages over the existing solvency system. Ideally, such a system should be limited to consideration of the key investment risk areas only – equity risk, credit risk, mismatch risk and liquidity

[64] The guidelines issued by the British Venture Capital Association could form the basis of these.

risk. Whichever approach is used, risk based or fixed ratio, other prudential risks and the supervisory review system will still be required to support the capital system.

5.9.8 Capital charges can achieve the same objective as placing restrictions on holdings of assets whilst allowing much greater investment freedom. It may be beneficial to either retain the restrictions on exposure to individual counterparties (covering all assets where the risk of counterparty default is borne by the insurance company) or include some capital concentration charges in the model. It is likely that the introduction of capital charges could lead to increased capital requirements for some insurers compared to a system of asset or admissibility restrictions.

5.9.9 The use of explicit capital requirements should enable management and supervisors to more fully understand the risks to the insurer arising from its holding of certain assets, and may reduce the need for additional stress or resilience tests.

6 Reinsurance

6.1 Terms of reference

6.1.1 *"The role of reinsurance in the future and its integration in a future harmonised solvency system. Evaluation of the current reduction in the solvency margin requirement for ceded reinsurance and its relevance for proportional and non-proportional business. Supervisory techniques to assess a cedant's reinsurance arrangements (quality of programme, quality of reinsurers, coverage of technical provisions, as well as the existence of collateral or deposits) should be specifically addressed."*

6.2 Introduction

6.2.1 Reinsurance is "insurance for insurers". The use of reinsurance gives an insurance company the flexibility to select and control the risks it wishes to retain and minimise significant exposures. As a result, the cedant is left with only a part of the original risk. In law, however, the cedant remains liable to the policyholder for the full amount of the claim, and if the reinsurer defaults or becomes insolvent the cedant is obliged to meet the full amount of any claims.

6.2.2 The International Association of Insurance Supervisors (IAIS) in its "Draft Standard on the Evaluation of the Reinsurance Cover of Primary Insurers and the Security of their Reinsurers" (22 December 2000) emphasises the role of reinsurance to improve capital efficiency and in an insurer's risk management process:

"Through the use of reinsurance and some Alternative Risk Transfer (ART) products, an insurer can reduce risk, use available capital more efficiently and expand underwriting capacity. The purpose of reinsurance is to the reduce the insurance risk of primary insurers and stabilise their solvency. Reinsurance is an instrument allowing insurers to obtain a desired, prudent risk profile."

6.2.3 Reinsurance contracts can take a number of different forms. Contracts can be divided between facultative (bespoke contracts for particular risks) and treaty (where the reinsurer agrees to cover all business written which falls under the specific terms of the contract). Contracts can be further sub-divided between proportional (where the reinsurer covers a proportionate share of the risks ceded) and non-proportional (which allows the insurer to retain risks between a predetermined upper and lower limit). Appendix 6.1 provides a more detailed description of the common forms of reinsurance contracts.

6.2.4 This chapter considers in detail the two key areas which the regulator should focus on when supervising a company's reinsurance programme:

- the level of credit to be given for reinsurance in the capital requirements. We discuss the effectiveness of the current EU solvency margin requirement, together with its relevance for proportional and non-proportional reinsurance and areas where the current system could be improved.
- assessment of the quality of the company's reinsurance arrangements in providing protection for current and future claims. We outline the supervisory techniques

typically used by prudential supervisors to assess the quality of the reinsurance arrangements.

6.2.5 Conclusions on the integration of reinsurance into a future harmonised solvency system based on our analyses must also be seen in the light of the likely future role of reinsurance in the insurance industry. We consider this, particularly in the light of the World Trade Center attack on 11 September 2001 and the implications for the supervision of ceded reinsurance. We consider in our conclusion how supervision of ceded reinsurance could be integrated into EU developments in prudential supervision.

6.3 Current reduction in the solvency margin requirement for ceded reinsurance

6.3.1 The solvency margin requirement (including the deduction for reinsurance) is laid down in the EU First Life and Non-Life Directives. Member States have implemented the requirements of these directives.

6.3.2 The capital / solvency margin requirements for insurance companies are typically reduced to take account the effect of reinsurance. The extent to which credit for reinsurance is permitted is restricted to a fixed maximum percentage. The use of reinsurance to support the business is generally considered to be more risky than the use of equity capital due to the potential credit risk.

6.3.3 Restrictions with respect to reinsurance are dealt with entirely in the solvency margin requirement. EU directives do not impose any further restrictions in the regulatory return with respect to reinsurance. Reinsurance recoveries are admissible in full in the balance sheet in the regulatory return.

6.3.4 In order for reinsurance to provide protection to the insurer's capital position there needs to be adequate risk transfer from the insurer to the reinsurer. Insurance companies may, however, enter into contracts which in substance are more akin to financing arrangements. If such arrangements are treated as reinsurance (rather than financing) then a reduction in the solvency margin requirement will be obtained even though there is no reduction in risk as a result of the arrangement. The identification of contracts with limited risk transfer (for example, financial reinsurance) and their exclusion from any credit given in the capital requirements is therefore a key issue for regulators. The actual assessment of risk transfer is considered in more detail in chapter 7 of this report (together with other ART products). As noted below, prudential supervisors tend to rely on accounting standards to ensure that contracts with limited risk transfer are not treated as reinsurance and do not usually request information on the treatment of such contracts.

6.3.5 An overview of the current reductions permitted for reinsurance is given below.

Non-life

6.3.6 The First Non-Life Directive sets out the credit to be given for reinsurance, for both the premiums basis and the claims basis of solvency calculations. It states that the deduction for reinsurance should be determined based on actual historical reinsurance recoveries on actual historical claims incurred, but limited to a maximum deduction of 50%.

The main advantages of the current method are:

- by basing the calculation on actual claims incurred rather than premiums paid, the calculation takes account of the actual effectiveness of the company's reinsurance programme to protect its business (if premiums were used instead then credit would be given immediately for just taking out a particular contract);
- the use of one year's reinsurance recoveries reduces the risk of taking account of aspects of the reinsurance programme which are no longer applicable;
- the restriction of the maximum permitted deduction for the effect of reinsurance to 50% reflects the fact that reinsurance is considered to be a more risky form of capital than shareholders' equity as there is a risk of reinsurer default. This therefore penalises companies who place significant reliance on reinsurance protection (ie in excess of 50% recoveries) compared with companies who make more use of risk free share capital.

6.3.7 The main disadvantages of the current method are:

- the restriction of the maximum deduction to 50% is somewhat arbitrary and does not take account of potential credit risk at lower levels of reinsurance protection;
- the method unnecessarily penalises companies who only place significant reinsurance with highly rated reinsurers and does not encourage companies to select highly rated reinsurers;
- the financial year on which reinsurance recoveries are based may be atypical and will not take account of future changes in the reinsurance programme;
- there is inadequate consideration of the actual characteristics of the reinsurance programme; unless the reinsurance programme changes, proportional reinsurance recoveries are likely to be roughly a constant percentage of gross claims incurred (for those classes of business covered by such reinsurance) whereas non-proportional recoveries will vary significantly from year to year;
- there is no consideration of the effect on reinsurance recoveries of an accumulation of exposures to a single catastrophic event.

Life insurance

6.3.8 The First Life Directive sets out the margin of solvency as the aggregate of two calculations.

- 4% (0% to 1% for certain business) of the mathematical provisions gross of reinsurance, reduced to allow for reinsurance recoveries (subject to 15% maximum reduction);
- 0.3% of the gross capital at risk (generally sums assured less the mathematical provisions) reduced to allow for reinsurance recoveries (subject to a maximum reduction of 50%).

6.3.9 By contrast to the non-life calculation above, the required margin of solvency for life business is based not on premiums and benefits paid, but on the 'mathematical provisions' (life business liabilities) and on 'capital at risk' which is the amount payable on death less the mathematical provisions.

6.3.10 The main advantage of the current method is:

- the calculation for life business is based on balance sheet liabilities rather than the ratio of net to gross claims incurred. It is therefore less likely to be distorted by fluctuations in current underwriting results.

6.3.11 The main disadvantage of the current method is:

- as for non-life, the calculation does not take account of future changes in reinsurance arrangements;
- the rationale for the EU requirement for a 15% maximum reinsurance reduction for the mathematical reserves element of the calculation and a 50% reduction for the capital at risk element is somewhat arbitrary. A justification for the differing percentages could be that whilst mathematical reserves include an investment element as well as a risk element and the investment element is not typically reinsured, the sum assured is purely the risk element (the amount payable on death of the policyholder) on which it is more usual to have reinsurance protection.

Alternative methods applied in non-EU Member States

6.3.12 The US risk based capital model (for both non-life and life) takes account of both insurance risk (based on exposures net of reinsurance) and credit risk with respect to reinsurance recoveries. A factor is applied to balance sheet assets relating to reinsurance recoveries to determine the capital requirement in relation to credit risk. An asset concentration factor is added to this asset risk total that is designed to reflect the risk of high concentration of assets with one reinsurer. There is no consideration of the effect on reinsurance recoveries of an accumulation of exposures to a single catastrophic event.

6.3.13 For Canadian life business the capital requirement in relation to asset default risk is calculated by applying a factor of fixed percentages to balance sheet assets relating to reinsurance recoveries according to the ratings assigned by rating agencies. The Canadian method does not take account of concentration of exposures to one reinsurer.

6.3.14 In Australia, Prudential Standard GPS 110, which was finalised in November 2001 and comes into force from 1 July 2002, lays down a choice of methods for determining the minimum capital requirement:

- the company's internal model[65] (which must be approved by the regulator);
- the prescribed method;
- a combination of the above appropriate to the mix of business.

6.3.15 The prescribed method determines the minimum capital requirement as the sum of the capital charge for insurance risk, investment risk and concentration risk. Insurance risk is divided into premium liability capital charge (the risk that net premiums are insufficient to cover future claims) and claims capital charge (the value of net outstanding claims by class multiplied by a factor for the class) both of which take into account the impact of reinsurance. The investment risk charge is determined by multiplying the balance sheet value of each reinsurance asset by the appropriate percentage for its counterparty rating.

[65] As set out in Guidance Note GGN 110.2.

The concentration risk capital charge reflects the risk associated with a single catastrophic event and also takes account of the impact of reinsurance. The concentration risk capital charge is set equal to the insurer's "maximum event retention" (or maximum probable loss net of reinsurance).

6.4 Supervisory techniques to assess a cedant's reinsurance arrangements

6.4.1 An insurer's reinsurance arrangements need to provide protection both for claims which have already been incurred and for future claims. Supervisory techniques should focus on the following areas:

- appropriateness of the reinsurance programme;
- allowance for reinsurance in technical provisions;
- reinsurer security (including impact of collateral deposits).

6.4.2 The following table summarises the approach to reinsurance supervision adopted by prudential supervisors in certain jurisdictions. This demonstrates that there is currently no consistent approach to the assessment of a cedant's reinsurance arrangements. The information set out below has been compiled based on questionnaires completed by supervisors or meetings with supervisors.

Country	**Approach to reinsurance supervision**
Finland	The following information must be reported on reinsurance ceded in the annual regulatory return: ■ names of reinsurers and their participation (analysis of risk concentration by premiums, provisions, claims, unearned premium provision, claims outstanding, deposits and debts over 3 months old); ■ reinsurance arrangements (type, description, validity period, retentions, maximum retentions, number of reinsurers and share of ceded premiums) by class of business or grouped in an appropriate way; The quality and appropriateness of the reinsurer is verified through the use of ratings (mainly through Standard & Poor's rating database).
France	■ the supervisor performs both desk top and on-site audits; ■ during on-site audits, the reinsurance programme could be analysed in detail; ■ the regulator requires annual confirmation that renewal of specific treaties has been achieved.

Netherlands	The insurer's reinsurance policy is described in the annual regulatory return. Disclosure includes the relevant issues in relation to the reinsurance arrangements in force, such as type of coverage, levels of retention, reinsurer used: ■ ratings of reinsurers are examined; ■ developments in the reinsurance policy of the insurer are analysed over time in relation to the characteristics of the insurer's risk profile.
Italy	Considerable information is obtained on the reinsurance programme. Companies are required to submit annually: ■ balance sheet items; ■ items included in the economic result of the treaty; ■ name of and shares accepted by reinsurers representing 80% of each treaty; ■ details of the whole reinsurance ceded programs; ■ specific details of the five principal treaties including: - economic and financial profile of other treaties; - names and exposures to principal reinsurers.
Spain	The focus of the supervisory function is on the following: ■ reinsurance plans and therefore retention limits are prudently defined in relation to the company's economic-financial capacity; ■ analysis of the reinsurance result; ■ reinsurance recoveries; ■ market factors which may affect reinsurer solvency.
UK	■ The main information on a company's reinsurance programme is obtained from the regulatory return; ■ Reliance is placed on auditors with respect to reinsurance recoverability. Market and rating information is also considered; ■ Some questions on the reinsurance programme are raised at supervisory visits; ■ Maximum probable loss (MPL) disclosures are considered useful (currently these are only disclosed on a net basis, gross MPL's would also be useful).
Source: Supervisory Authorities	

6.4.3 In most jurisdictions the information provided in the annual regulatory return is the most widely used source of information on the company's reinsurance arrangements. Information is also obtained from meetings with companies during company visits.

6.4.4 Other sources of information available to the supervisor include:

- application for authorisation (typically details of the proposed reinsurance arrangements are required to be provided);
- details of changes in reinsurance arrangements required to be notified to the supervisor (for example where a newly authorised insurance company is required to notify changes in reinsurance arrangements);
- prior approval by the supervisor of reinsurance contracts (if required);
- expert reports requested by the supervisor.

Appropriateness of the reinsurance programme

6.4.5 Assessment of the appropriateness of the reinsurance programme is vital to ensure that it affords sufficient protection for both current and future exposures and claims. The key areas which the supervisor should focus on are:

- risk management procedures in relation to reinsurance;
- analysis of the reinsurance programme;
- stress and scenario testing of the reinsurance programme;
- risk transfer issues.

Risk management procedures in relation to reinsurance

6.4.6 Information on the company's risk management procedures in relation to reinsurance would provide vital information to the supervisor on how the company perceives and manages its risks in this area. Companies usually conduct an annual review of their gross exposures and from this update their reinsurance policy which is likely to include the type and level of reinsurance protection which they will purchase in the market and the approved reinsurers with whom reinsurance should be placed. The setting of reinsurance guidelines is the responsibility of the board who should introduce appropriate procedures to monitor compliance with this policy and to track aggregate exposures.

6.4.7 Paragraph 10 of the IAIS "Standard on the Evaluation of the Reinsurance Cover of Primary Insurers and the Security of their Reinsurers" – December 2000 states that:

"In order to ensure that the insurer has a prudent risk profile, the supervisor should verify that its Board of Directors has established an overall policy framework – addressing inter alia underwriting and reinsurance policy. Reinsurance policy must provide guidelines where reinsurance cover should be purchased and how the security of reinsurers should be assessed. The Board must ensure that the company's reporting and internal control systems properly check that underwriting respects company policy and that all legal and regulatory requirements are met. At least once annually, or where there has been a major change, the Board should reassess the adequacy of the existing reinsurance policy."

This information does not currently appear to be requested by supervisors in any jurisdiction as part of their annual regulatory return or otherwise.[66] This may however be obtained during company visits.

Analysis of the reinsurance programme

6.4.8 As illustrated in the table above on supervisors' approach to reinsurance regulation there is significant disparity in the type of detailed information requested in different jurisdictions in the annual regulatory return.

6.4.9 In order to analyse the reinsurance programme, information should be provided on the actual reinsurance programme including the split between treaty and facultative cover and between proportional and non-proportional business together with the gross exposures. There does not appear to be a requirement in any country to provide diagramatic presentation. Such presentation may be useful to the supervisor in identifying potential gaps in cover.

6.4.10 Supervisory methods applied need to take account of the different effects of proportional and non-proportional contracts on an insurance company's results and financial position. Proportional arrangements protect a proportion of every loss whereas non-proportional arrangements protect against specific catastrophic events.

6.4.11 The disclosure by class of business of the effect of reinsurance on the company's current financial position is of importance to the regulator in assessing both the current and potential future impact of reinsurance. This information is collected by the regulator in the regulatory return in most jurisdictions[67].

Stress and scenario testing

6.4.12 Stress and scenario testing in relation to reinsurance cover is not usually requested as part of the regulatory return[67]. Such information, for example the impact on reinsurance recoveries of various claims scenarios, would be of great value to the regulator. With the increase in the use of internal risk models by companies this is something which the supervisor should consider requesting.

6.4.13 Currently few companies adequately stress and scenario test their reinsurance programmes. Historically this has been because computer systems were unable to cope with the complexity of many companies' reinsurance programmes. Another reason is that in Europe many reinsurance programmes have been largely proportional in nature. Proportional programmes do not have the same risks of exhaustion and any variation in gross results flows through to the net position in a fixed proportion. In more recent years there has been a trend towards greater use of non-proportional reinsurance. This increases exposure to reinsurance exhaustion.

6.4.14 The minimum requirements of a system should include scenario testing of gross and net results where material use is made of non-proportional reinsurance or proportional

[66] KPMG questionnaire to regulators and review of regulatory returns in selected countries.
[67] ibid

reinsurance with significant profit sharing clauses. The aim of such a system would be to alert regulators to instances where a small percentage change in gross reserves might lead to a large change in net reserves possibly impairing solvency.

6.4.15 The UK and Australia do however request disclosure of maximum probable losses figures which give some indication of maximum exposures to any one event. In the UK the disclosure is only required to be made net of reinsurance (disclosure of the gross figure would be helpful as well). The details requested are the company's maximum probable loss (net of reinsurance) from:

- any one contract;
- all contracts taken together.

6.4.16 The disclosure is given separately for each risk group or business category or part thereof regardless of whether or not the company has purchased any reinsurance cover for that business category, risk group, or part thereof.

6.4.17 The maximum probable net loss (MPL) is defined as:

"the maximum loss (net of reinsurance) arising from any one incident, or any series of incidents from the same originating cause, which:

a) the directors, at the time they decided upon the reinsurance cover to be obtained in respect of the financial year in question, (regardless of whether or not the directors determined to take out reinsurance protection) reasonably contemplated to be of a type which might take place during that financial year; or

b) has actually occurred during the financial year in question".

6.4.18 This disclosure however has certain limitations unless it is seen in the context of the company's underwriting guidelines and controls (about which no information is required to be disclosed).

6.4.19 Lloyd's requires disclosure of 'Realistic Disaster Scenario Analysis' showing gross and net losses for certain prescribed scenarios.

6.4.20 The Spanish supervisor is considering standardising the use of stress and scenario testing which is currently requested on an ad hoc basis, as part of a modernisation plan.

Risk transfer issues

6.4.21 Some contracts which take the legal form of reinsurance contracts may in practice in substance be more akin to financing arrangements in that there is limited risk transfer between the insurer and the reinsurer. If such arrangements are treated as reinsurance rather than a financing arrangement, credit may also be taken in the solvency margin requirement. The supervision of such arrangements presents significant challenges to the regulator. Contracts which do not transfer significant risk are dealt with in more detail in chapter 7 of this Study.

6.4.22 There are currently no specific disclosure requirements in the regulatory return with respect to such arrangements.

Allowance given for reinsurance in determining the valuation of technical provisions

6.4.23 The determination of reinsurance recoveries on claims paid and outstanding, including incurred but not reported, (IBNR) is considered in chapter 4 of this study. The key disclosures likely to be useful to the supervisor in the regulatory return are:

- disclosure of amounts included in the balance sheet for reinsurance recoveries;
- impact of changes in assumptions on amounts on reinsurance recoveries.

6.4.24 Most jurisdictions require disclosure of amounts included in the balance sheet (but not necessarily split by class of business). Regulators do not usually require disclosure of the accounting policies with respect to reinsurance and therefore presumably rely on the information disclosed in the statutory accounts. The impact of changes in the underlying assumptions on amounts shown is an important disclosure which is not currently requested by supervisors. As noted in chapter 4 on technical provisions the assessment of gross outstanding claims provisions and the associated reinsurance recoveries is subject to significant inherent uncertainty and the statistical estimation methods applied to assess them are not entirely reliable. Disclosure of a range of outcomes for the amount of reinsurance recoveries related to changes in the gross liabilities, and their associated probabilities, would provide more useful information to the regulator than a simple point estimate.

Quality of reinsurers (including collateral arrangements)

6.4.25 In assessing the quality of reinsurers, the supervisor needs to consider the security of reinsurance balances recognised as assets (or netted off against technical provisions) in the balance sheet and the impact of collateral arrangements where such arrangements exist. The supervisors should also take account of the fact that it is likely to be prudent for insurers to use a number of different reinsurers, rather than placing excessive reliance on any one particular reinsurer, as long as the reinsurers selected are of an appropriate credit standing.

6.4.26 The supervisor needs to form a view on the adequacy of provisions made for reinsurance debtors and the reinsurer's share of technical provisions for which no provision has been made. Market factors, particularly in relation to World Trade Center issues, are currently contributing to low profitability of reinsurers and there has been significant erosion of the reinsurers' capital. Reinsurers are only regulated in a small number of jurisdictions which presents important issues for the regulator in assessing the security of the reinsurers with whom the primary insurer has placed its insurance.

Supervisory techniques to assess reinsurer security

6.4.27 Supervisors request a significant amount of information on exposure to reinsurers. The majority of regulators request details of the reinsurers with whom reinsurance has been placed, with the US and Canada requiring additional information on whether the reinsurer is "authorised" or "non-authorised" by the supervisor. The supervisor is likely to review this information in the light of some or all of the following:

- industry knowledge and experience including knowledge of reinsurers who are insolvent or facing financial difficulty;
- knowledge of the quality or lack of regulation of reinsurers in a particular jurisdiction;

- ratings given to the reinsurer by rating agencies;
- reinsurer's financial statements and regulatory returns (where available);
- press comment;
- information received from other prudential supervisors;
- evidence obtained from on-site inspections on the operation of risk management procedures applied by the insurer with respect to reinsurers with whom it cedes business.

6.4.28 The supervisor is unlikely to have sufficient time and resources to apply all the methods noted above when considering the security of all the reinsurers with which an insurance company has placed its business. It is likely however that in most cases only a small proportion of the reinsurers with whom business has been placed are likely to cause concern to the supervisor and therefore require follow up.

6.4.29 The Danish supervisor has implemented a rating model, REMOS, (reinsurance monitoring system) to determine the risk profile of the reinsurance cover of the insurance companies. The reinsurance programs of all large direct insurers are registered in REMOS including treaties, cover and security. This system rates companies by reference to a number of financial ratios, but also takes into account the level of exposure that companies assume when rating the security of a buyer's entire reinsurance program.

Use of information supplied by rating agencies

6.4.30 The extent to which the supervisor can rely on rating agency assessments in assessing reinsurer security is a contentious area. The potential use that can be made of rating agencies to assist in assessing the financial strength of insurer and reinsurer is considered in detail in chapter 9 of this study. Rating agencies often have access to information which is not publicly available but are not subject to regulation themselves.

6.4.31 In certain countries such as Germany, the auditors are required to comment (as a separate ad-hoc report) on the creditworthiness of the reinsurers. In other countries such as Spain, the regulator may refer to the solvency assessment made by a rating agency only where the reinsurance debtor is located outside the Organisation for Economic Co-operation and Development (OECD).

6.4.32 The UK supervisor does not rely on ratings to assess reinsurer security, however this is considered to be a useful source of additional information. The French supervisor does not place any reliance on ratings and, as explained below, requires all reinsurance recoveries to be supported by collateral pledged by the reinsurer.

Use of collateral as security for reinsurance recoverables

6.4.33 The French supervisor deals with the issue of recoverability of reinsurance assets by requiring insurers to ensure that reinsurance debtors are fully collateralised[68]. The US

[68] The topic of collateralisation of reinsurance assets, with particular reference to the French example, is dealt with more fully in the study by KPMG, published by the European Commission (2002): "Study into the methodologies for prudential supervision of reinsurance with a view to the possible establishment of an EU framework".

supervisor requires non US insurers / reinsurers to place funds in US trust funds to cover claims by US policyholders.

6.4.34 This use of collateral represents a potential opportunity cost to the reinsurer and therefore has a significant impact on the competitive position compared with other jurisdictions which do not impose such rules It can in certain situations create liquidity difficulties in the market. For example the use of US Trust Funds has created certain liquidity issues for insurers and reinsurers in the light of the World Trade Center disaster.

6.4.35 Most jurisdictions require information on the collateral or deposits placed with the cedant to be submitted to the supervisor. We understand that the French supervisor will need to provide its approval where collateral deposits are guaranteed by a bank. The US supervisor requires information on collateral or deposits placed where the reinsurer's share of technical provisions exceeds 10%. This disclosure is required in Spain if the reinsurer's share exceeds 5% of technical provisions.

6.5 Role of reinsurance in the future

6.5.1 The attack on the World Trade Center on 11 September 2001 will certainly result in the largest insured loss to date. For the insurance industry this has resulted, inter alia, in increased concern over reinsurer security, a reduction in the level of reinsurance cover available (including the use of terrorist exclusion clauses) and considerable price increases where cover is available.

6.5.2 Companies' reliance on reinsurance will be tested, and it is likely that some weaker reinsurers may fail as the extent of their exposure becomes clearer. For those companies that do successfully recover on their reinsurance policies, the issue arises of whether they will be able to reinstate them to pay any further losses during the policy period, particularly as there were several other major losses during 2001.

6.5.3 In many lines of commercial insurance business reinsurance premium rates have doubled or even more, terrorist exclusion clauses have been imposed, and insurers are often writing smaller lines to balance better their risk portfolio due to concerns over the likely cost and availability of reinsurance from January 2002.

6.5.4 On the positive side, those reinsurers who have controlled their underwriting exposures are likely to be in a position to take advantage of the much higher premium rates. Many reinsurers have been forced to re-evaluate their risk management procedures as the scale of the World Trade Center losses was previously at the limit or outside the scope of their stress and scenario modelling. It is likely that catastrophe modelling will play a much bigger role in reinsurers' risk management procedures in the future.

6.5.5 Traditional reinsurance products are likely to continue to have a significant role to play in the future. Nevertheless, the increase in reinsurance rates will mean, at least in the short term, that companies will either retain more risk, or seek an alternative form of reinsurance which is more cost effective. This is likely to include a greater use of ART and financial reinsurance solutions. These products are discussed further in chapter 7 of this study.

6.6 Integration of reinsurance in a future harmonised solvency system

6.6.1 There are no current EU directives for the supervision of reinsurance. The European Commission is considering whether reinsurers should be supervised and supervision of reinsurance will need to be integrated into the EU solvency margin review (Solvency II). If in the future there is a harmonised solvency system in the Member States for insurers and reinsurers, supervisors of insurance companies may be able to place more reliance on the quality of security offered. This may lead to the supervisor being able to reduce procedures in relation to the review of reinsurer security. However as the World Trade Centre disaster has illustrated, the financial position of reinsurers can change very rapidly.

6.6.2 Supervision of reinsurers would not however result in any reduction in the supervisory procedures which the supervisor would need to apply to the actual reinsurance programme as this is specific to the individual cedant.

6.6.3 A number of other potential benefits could arise from a harmonised solvency system:

- supervisors of insurance companies will have access to better information on the reinsurers to assess the credit risk. For example comparisons of solvency margin calculations of reinsurers would be available in addition to any other information submitted to supervisory authorities;
- supervision of reinsurers would enable some of the Member States to withdraw their requirements for collateral deposits. However it should be noted that there may be reinsurers domiciled outside the EU who may either not be regulated or not subject to equivalent standards of solvency.

6.7 Conclusions

6.7.1 The company's own risk management procedures in relation to ceded reinsurance are key. Management's analysis of their gross exposures and the use of stress tests is likely to provide evidence of the adequacy of their reinsurance programme to react to adverse scenarios. Management should assess the effectiveness of the arrangements put in place to control both current and future risk and the security of amounts due to the insurance company under reinsurance contracts. In order to understand the risks facing the company the supervisor should review this assessment.

6.7.2 Fixed ratio methods (such as those used in the EU) do not sufficiently take account of the specific characteristics of an insurance company's reinsurance programme. In particular they do not adequately model the impact of non-proportional reinsurance, where the recoveries will not have a direct relationship with gross claims and which are likely to vary more from year to year. The methods are backward rather than forward looking and therefore do not take account of future changes in the reinsurance programme.

6.7.3 A formulaic approach could be used to set the minimum standard if internal risk models are not used. A risk based capital approach which takes account of both insurance risk (based on exposures net of reinsurance) and credit risk (for example based on reinsurer ratings) with respect to reinsurance recoveries represents a significant improvement over the fixed ratio methods. Credit for reinsurance within internal models should be exposure

driven and this is best captured within prospective risk models. Both scenario based and probabilistic approaches provide the ability to recognise the effect of reinsurance, as these tend to capture the actual exposures rather than crude averages. It is possible to recognise the impact of both proportional and non-proportional reinsurance, under this approach.

6.7.4 The events of 11 September 2001 have emphasised the fact that, due to the inherent uncertainty underlying the insurance market, the security of reinsurers cannot be guaranteed. The reduced capacity of the reinsurance market is likely to leave insurers more exposed and therefore increased regulatory focus on companies' risk management procedures in relation to reinsurance will be key.

7 Alternative risk transfer arrangements and advanced risk reduction techniques

7.1 Terms of reference

7.1.1 *"The use of asset liability management (ALM) techniques, financial reinsurance, alternative risk transfer (ART), portfolio diversification techniques, derivative products etc to control or transfer risk. The analysis should cover the impact of these instruments in the present system, as well as their potential in a possible future system. Supervisory techniques to monitor the use of these instruments should be specifically addressed."*

7.2 Introduction

7.2.1 This chapter deals with a range of diverse products and techniques. The common thread is that they are all methods of reducing (or controlling) risk. Some of the methods considered have evolved only in recent years, in response to market events, market pressures, and occasionally regulatory factors have played a part. Asset liability management and portfolio diversification have always been an important element of insurance business but the techniques have become more sophisticated in recent years, particularly with advances in computer modelling. Similar to risk modelling techniques discussed in chapter 3, the more advanced ALM techniques tend to be used mainly by the more sophisticated insurers.

7.2.2 ART arrangements represent a set of products which can have a significant impact on an assessment of the financial position of an undertaking. Financial reinsurance, where little or no insurance risk transfer takes place, has existed for many years, but market developments (and accounting and regulatory factors) have led to a range of products emerging in recent years, characterised by features which make them different to conventional insurance arrangements. The central feature of such arrangements is usually related to the extent to which they transfer insurance risk.

7.2.3 Many of the products and techniques discussed in this chapter give rise to issues for insurance supervisors, in terms of understanding the transactions and techniques, identifying their impact, and deciding on an appropriate supervisory approach. The chapter summarises the main types of products and methods in use and discusses their impact upon the financial position of an insurance undertaking.

7.2.4 There are no standard definitions of ART and financial reinsurance. In this study we have used the term ART to embrace two types of arrangement: capital market innovations and financial reinsurance.[69]

7.2.5 *Capital market innovations* are arrangements which transfer insurance risk but which do not take the form of a conventional insurance contract.

[69] ART is also used in relation to self-insurance and captive insurance arrangements entered into by undertakings which are not themselves insurance companies. These are not addressed on the grounds that they are of less concern to insurance supervisors than arrangements entered into by insurance companies themselves.

7.2.6 *Financial reinsurance* arrangements are those which do take the form of reinsurance contracts, but which do not result in any material transfer of insurance risk.

7.2.7 The two types of arrangement are therefore quite distinct and give rise to very different issues for prudential supervisors. In general, capital market innovations do not give rise to additional risk in the insurance sector itself. On the contrary, the arrangements spread risk outside the insurance sector and normally do so without material credit risk to insurers. A greater issue for insurance supervisors is to ensure that insurance regulations do not unduly inhibit the development of arrangements which are of clear benefit to the insurance sector. On the other hand, the main concern that supervisors have with financial reinsurance arrangements is that they give rise to liabilities which do not appear on an insurer's balance sheet or that they mask the true level of liabilities or potential liabilities.

7.3 Capital market innovations

7.3.1 In this chapter we consider three broad types of capital market innovation:

- securitisations/bond structures;
- insurance derivatives;
- contingent capital arrangements.

7.3.2 Within these broad categories, there are many varieties and the objectives of the arrangements vary. The common theme is that amounts payable or receivable under the arrangements are contingent on the occurrence of an adverse loss event and that they therefore have the effect of reducing the insurer's overall exposure to loss. To some extent they can be considered as an alternative to conventional reinsurance arrangements.

Securitisation

7.3.3 An alternative way for an enterprise to obtain protection against adverse events is for it to issue a bond, but to link the interest payable on the bond and/or its redemption value to the non-occurrence of specified adverse events. Thus, for example, a fruit producer might issue $100 million of five year bonds offering an interest rate of 10%, but in any year in which the crop yield fell below a specified level, the interest would be waived. If the rate it pays on conventional five year bonds was 8%, and assuming that the initial subscribers pay par value for the $100 million, then the transaction would be similar to paying an insurance premium of $2 million a year in return for $10 million of cover for each of the five years.

7.3.4 There are three fundamental features which distinguish such an arrangement from a conventional insurance transaction:

- first, there is no risk to the insured that the cover will not perform. If the loss event occurs, the bond issuer simply deducts the amount of the loss from payments to the bondholders;
- second, the cover is readily transferable around the market. A bondholder wishing to reduce its exposure to insurance losses can do so by selling the bonds. This degree of

transferability is not possible with conventional insurance contracts as the insured party needs to be satisfied as to the creditworthiness of the provider of the insurance;

- third, the contract does not have to observe the indemnity principle which is an intrinsic element of a conventional insurance contract. The indemnity principle means that, under a conventional insurance contract, an insured party can only be reimbursed for losses it has actually incurred. The absence of this principle from securitisations means that the cover can be linked to an index of losses (as are published by a number of brokers) or to external measures, such as the amount of rainfall in a particular area.

Typical catastrophe bond structure

7.3.5 In practice the bonds that have been issued have involved a more complex structure than that outlined above and have been arranged by insurance companies. Although, in principle, enterprises could issue such bonds on their own account, to date almost all bond issues have involved an insurance company as sponsor. (A material exception is the operators of Tokyo Disneyland which issued a $100m bond in 1999 maturing in 2004, depending on the non-occurrence of an earthquake within 75km of Tokyo Disneyland).

7.3.6 The structure that has been most commonly adopted is for the insurance (or reinsurance) entity to establish a special purpose vehicle (SPV), typically an independent charitably owned trust that is authorised to write reinsurance in an offshore location such as the Cayman Islands or Bermuda.[70] The SPV simultaneously issues the bonds and enters into a reinsurance contract with the insurance entity. Any losses that the SPV incurs on the reinsurance contract will automatically be matched by a corresponding reduction in the amount it has to pay to holders of the catastrophe bonds it has issued.

7.3.7 Most bonds issued to date have been for a term of one or three years, although there have been five of five years duration and one of ten years duration.[71]

The catastrophe bond market: cover, participants and volumes

7.3.8 Since the first issue in 1994, there have been some 34 widely publicised issues of catastrophe bonds, each issue raising between $10 million and $500 million, the average being around $100 million[72]. The sponsors have, for the most part, been large reinsurance companies – Swiss Re, Munich Re, American Re, Gerling, SCOR, Winterthur Re. USAA has issued a $200 million bond each year since 1997.

7.3.9 The covers have related to earthquakes, hurricanes and windstorms. The trigger for the cover has in most cases been related to losses actually incurred by the insurer although some of the most recent issues include a trigger related to an index or an external measure[73].

[70] Gail Belonsky et al, "Insurance Linked Securities", Swiss Re New Markets, 1999.
[71] Fitch, op cit, page 10.
[72] Sigma 3/2001 page 35 and Fitch, op cit, page 10 both contain detailed lists of transactions.
[73] The lists in Sigma 3/2001 and Fitch contain details of the triggers.

7.3.10 The volume of issues since 1996 has been $12.6 billion[74] and Swiss Re foresees the volumes rising to $10 billion per annum by 2010[75].

Derivatives

7.3.11 Derivatives are securities whose value is derived from that of another security. There are three basic types:

- a future or forward contract (a contract which obliges one party to buy, and the other to sell, an underlying asset at a specific price and date in the future);
- a swap (an agreement for an exchange of payments between two counterparties at some point or points in the future and according to a specified formula);
- an option (a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset by (or on) a specific date for a specific price; for this right the buyer pays a premium).

7.3.12 Conventional derivatives have their values derived from investment values, exchange rates, interest rates and commodity prices. In the mid 1990s, attempts have been made to develop insurance derivatives which have their values related to loss events

Exchange traded derivatives[76]

In December 1992, the Chicago Board of Trade launched futures and options contracts based on an index of catastrophe losses, but there was little activity in the market and trading was halted. A re-launch of these securities in 1995 met with more success and in 1996 to 1997 the total capacity created by catastrophe options was $89 million. However, trading has since slowed to a virtual halt. In 1997 the Bermuda Commodities Exchange was established to trade catastrophe options, but the market enjoyed little activity and was suspended in 1999.

Catastrophe swaps

7.3.13 In a swap transaction, the company seeking cover agrees to pay a series of fixed payments (typically each quarter) in return for a series of floating payments which may vary according to the occurrence of a specified event or the standing of an index.

7.3.14 The transaction is closer to a conventional insurance arrangement than a catastrophe bond issue in that the series of fixed payments are more akin to an insurance premium and the insured party incurs a risk that the provider of the cover will not perform. However, the transaction still differs from a conventional insurance arrangement in that the swap is, in principle, transferable, and the payments are not limited by the indemnity principle.

7.3.15 There have to date been 11 widely published swap arrangements, but of these seven were made in 1998 and none has been concluded since 1999[77].

[74] Sigma 3/2001, page 3.
[75] ibid, page 34.
[76] ibid, pages 21-23.
[77] ibid, page 36.

Contingent capital

7.3.16 Contingent capital instruments provide the buyer with the right to issue and sell securities (whether equity, debt or a hybrid) at a fixed price for a fixed period of time if a predefined event occurs[78].

7.3.17 There have been 15 widely publicised deals since 1995. Unlike catastrophe bonds, these transactions have not generally involved an insurance entity. The most recent deals have involved Royal Bank of Canada, a US consulting firm, Michelin and Pacific Electric[79].

Life sector capital market innovation

7.3.18 Life insurance transactions differ from typical non-life transactions in that they involve the receipt of premiums over many years although the purchaser of the contract has a unilateral right to terminate the contract at any time. In a regular premium contract, the life company will expect to receive a stream of premium payments in the future but these do not represent a debt. Moreover, in a single premium contract, the life company will make charges under the terms of the contract for as long as it remains in force.

7.3.19 A number of companies have raised funds by securitising these anticipated earnings streams. Examples of companies which have done this include NPI, Hannover Re, Skandia Life (USA) and Alleanza/Generali.

Summary

7.3.20 The capital market innovations described here are still in the early stages of development. To date there have been no more than 100 deals of any significance. The annual insurance volume has been around $1 billion in recent years and Swiss Re forecasts that this could grow to $10 billion by 2010[80]. Given a yield spread on catastrophe bonds of around 2% over corporate bonds, the insurance premium element of current transactions is some $20 million, compared with global reinsurance premiums of around $100 billion. Thus these types of transaction account for 0.02% of the reinsurance market.

7.3.21 Moreover, to date there do not appear to have been any instances of material losses being incurred on catastrophe bonds.

The risk profile of capital market innovations

Catastrophe bonds

7.3.22 From the point of view of the issuer of the bonds, the transaction is essentially risk free. In the event of loss, the issuer deducts the amount due from the payment to the bondholder. In effect, the only risk of non-performance would occur if the bondholders disputed whether the trigger had occurred.

[78] ibid page 16.
[79] ibid page 37.
[80] ibid page 34.

7.3.23 From the point of view of the purchasers of the bond, the principal risk is that they pay too much for the bond or suffer a loss through reduction in value or interest payments. Although there is a credit risk, in practice the special purpose vehicle holds collateral so that the risk of default by the bond issuer is largely eliminated. At all times, the parties providing the cover are exposed to a maximum loss of the amount they have paid for the bond, or loss of interest depending on the structure of the bond.

Insurance swap arrangements

7.3.24 The entity obtaining cover is exposed to a degree of credit risk, though to a lesser degree than conventional insurance. Collaterisation arrangements can reduce the risk. Moreover, if the counterparty under the swap defaults, the entity obtaining the cover can cease making future payments.

7.3.25 The nature of the risks facing the provider of the cover are similar to those facing purchasers of catastrophe bonds. However, unlike catastrophe bonds, the transaction does not tie up a large amount of capital.

Contingent capital

7.3.26 The entity which obtains the cover by granting the right to issue capital at the pre-negotiated level faces the risk that the buyer of the right will not perform its obligations under the transactions. In practice, the risk can be largely eliminated through the use of collateral arrangements.

7.3.27 The main risk for the granter of the right is that the value of the cover is uncertain. In some circumstances it might be the case that the pre-negotiated price for the securities is no different from the price that the issuer could have obtained in any case; thus the transaction would not have brought the granter of the right any benefit.

7.3.28 From the point of view of the purchaser of the right to subscribe for securities the risk is two-fold. As well as the underwriting risk, which is similar to that facing a conventional insurer, there is the additional market risk associated with the securities themselves.

Derivatives

7.3.29 The use of derivatives by insurance companies has increased significantly in recent years. Derivatives are used commonly and have various uses, for example:

- matching foreign currency and interest rate exposures;
- supporting guaranteed or investment linked products which require derivatives to track an index;
- reducing investment risk of the portfolio, for example to minimise the downside risk to market movements in equities.

Summary

7.3.30 A common feature of all these types of transactions is that the purchaser of the cover incurs little performance risk, in contrast to conventional insurance where there is almost always a risk of non-performance.

7.3.31 On the other hand, the risk accepted by the purchasers of the instruments is in some respects higher than that of a conventional insurance arrangement in that they assume market risk as well as underwriting risk. Against this is the fact that the total potential loss is readily quantifiable.

Impact of capital market innovations on supervisory systems

7.3.32 Capital market transactions have to date been few in number and those deals which have been struck have generally been made in offshore locations. In these circumstances, supervisory authorities have generally not produced specific guidance on how such transactions should be dealt with for regulatory purposes.

Catastrophe bonds

7.3.33 Catastrophe bonds can reduce an insurer's loss exposure if a reinsurance arrangement is entered into with a special purpose vehicle which issues a bond. Credit for solvency purposes is recognised in accordance with the normal rules. Some bonds, unlike a conventional reinsurance transaction, will not lead to reduction in exposure immediately in calculating the solvency position, either in the calculation of the minimum required margin, or in reducing the unearned premium provision. Moreover, even when an actual loss is incurred, the insurer will probably not immediately be able to take full credit for the compensatory reductions in interest payable in determining its solvency position. This is because basic accounting principles would require the reduction in interest payments to be spread over the period to redemption. The position might be different if the compensation was obtained in the form of a reduction in the redemption value, but in most jurisdictions we believe the required treatment would be for the reduction in redemption value to be treated as a discount on the bond which would be amortised over the remaining life of the bond.

7.3.34 At present, therefore, supervisory systems do not explicitly enable insurers to take proper credit for some types of catastrophe bonds in determining their statutory solvency position.

7.3.35 The position of the purchaser of catastrophe bonds will impact on the insurance supervisory system if the purchaser is itself an insurance undertaking. As far as we are aware, no jurisdiction has explicit rules for dealing with this situation and the bond would be treated like any other debt investment. In principle, there could be an aggregation of the insurance risk attaching to the bond and other insurance risks, and this is unlikely to be picked up by existing techniques for monitoring aggregate exposures. However, to date, it is unlikely that this issue will have ever been material.

Swaps arrangements and other insurance derivatives

7.3.36 EU directives[81] require Member States to lay down rules which provide that *"derivative instruments such as options, futures and swaps in connection with assets covering technical provisions may be used insofar as they contribute to a reduction of investment risks or facilitate efficient portfolio management".* This requirement relates to derivatives *"used in connection with assets covering technical provisions"* and therefore

[81] 92/49/EEC Article 21, 92/96/EEC Article 21.

does not strictly apply to insurance derivatives which are used in connection with liabilities. However, in implementing the directive, some Member States have introduced rules which have the effect of restricting the use of insurance derivatives. Further discussion is included in chapter 5.

Contingent capital

7.3.37 The primary benefit of contingent capital arrangements is that they enable insurers to continue writing volumes of new business even where losses erode the existing capital.

7.3.38 Supervisory regimes typically focus on ensuring that an insurer has sufficient capital to support the risks it has already assumed. In general, they only address whether insurers have sufficient capital to support anticipated levels of future business at the point of authorisation. In many cases, therefore, contingent capital arrangements will not have a material impact on existing supervisory systems.

Supervisory techniques relating to capital market innovations

7.3.39 The main issue facing insurance supervisors in relation to capital market innovations is the extent to which insurance entities using these arrangements should be able to take credit for them in determining their solvency requirements. The sheer variety of arrangements and the fact that they are in a continual state of development means that it is not practical to make explicit allowance for them in formulae for calculating minimum solvency levels. Moreover, unlike conventional reinsurance contracts, the compensation obtained will not necessarily exactly match losses incurred and the insurer obtaining protection is therefore subject to basis risk. On the other hand, individual companies will be able to take innovatory capital market arrangements into account when performing their own scenario and stress tests. If supervisory authorities increasingly take account of companies' own models in supervising individual companies, they will in consequence be able to give credit for effective capital market innovations. Supervisors will probably not need to develop specific techniques for monitoring the use of these instruments; rather they will have to acquire a sufficient understanding of individual arrangements to assess whether companies have dealt with them appropriately in carrying out their scenario and stress tests.

7.4 Financial reinsurance

7.4.1 We consider four broad types of financial reinsurance arrangement which are:

- discounting covers;
- deposit arrangements;
- off-balance sheet funding contracts;
- life funding arrangements.

Discounting covers

7.4.2 The essential feature of a discounting cover is that the reinsured is certain to make a recovery under the contract in excess of the premium paid. These arrangements are often referred to as retrospective covers or time and distance policies. An example might be a company with long tail liabilities for which it has reserved, say, $20 million on an undiscounted basis. The company could pay a $1 million premium and obtain $2 million xs $5 million of cover. The chances of the ultimate payments not exceeding $7 million are virtually zero so that the company knows it will ultimately recover $2 million. There could be uncertainty regarding when the $2 million will actually be recovered (in which case there is 'timing risk'), but in fact such contracts often specify the dates when the recoveries will be paid. The transaction enables the reinsured to reduce its net reserves by $2 million in return for the payment of a $1 million premium so that its net asset position increases by $1 million. The contract has, in effect, enabled the reinsured to discount its reserves.

Deposit arrangements

7.4.3 Whereas discounting covers are retrospective, deposit arrangements are prospective. Deposit arrangements are similar to discounting covers in that they involve the payment of a reinsurance premium up front and the subsequent receipt of guaranteed recoveries in excess of the premium. The difference is that the arrangement is structured so that the reinsured does not recognise the full amount of the recovery, so that there is either no change in the reinsured's reported net asset position or there may even be a reduction. Features of these arrangement include experience accounts, profit commissions, and additional and return premiums based on the experience account. They are usually characterised by the reinsurer being unlikely to suffer a significant loss over the period of the contract. Such transactions may be attractive for several reasons:

- tax reasons, where the reinsurer is in an offshore location and the investment return on the reinsurance premium paid can roll up at a lower rate of tax;
- it allows the reinsured greater scope to smooth its net results as a result of the timing of the reinsurance recoveries;
- lack of availability of traditional reinsurance cover at economic rates.

Off balance sheet funding contracts

7.4.4 Off balance sheet funding contracts are another form of prospective cover. The basic feature of off balance sheet funding contracts is that the reinsured is obliged to continue paying renewal premiums until these exceed claims recoveries (together with the associated investment return that could have been earned on these funds). The contracts are structured so that the reinsured can justify not recognising the obligation to continue paying renewal premiums as a liability in its balance sheet. These contracts can be used both to enhance the reported net assets position and to smooth results.

7.4.5 To some extent, these contracts can be regarded as a formalisation of the long-term relationship which commonly exits between reinsurer and reinsured whereby the reinsurer naturally seeks to recoup underwriting losses out of subsequent premiums. However, there is a fundamental difference in that, in a conventional reinsurance arrangement, the reinsured can elect not to renew.

Life funding arrangements

7.4.6 Under a life funding arrangement, the reinsured receives an initial sum from the reinsurer, characterised as either reinsurance commission receivable or as the receipt on account of claims recoveries. The initial sum is then repaid in the form of subsequent reinsurance premiums payable. Because the repayment of the initial sum is wholly contingent on the emergence of future margins from the reinsured policies, the reinsured may not have to recognise the future payments as a liability in its balance sheet. As well as providing the cedant with cash, the arrangement can therefore improve the cedant's reported net asset position.

7.4.7 A variation on these arrangements is the "cashless" funding arrangement. Under these treaties, the cedant does not receive an advance, but instead obtains cover which enables it to reduce the net provision in its accounts. The premium payments for this cover are made in subsequent periods and again are contingent on the receipt of future premiums which have not been taken into account in setting the original provision.

Summary

7.4.8 The common feature of all these types of arrangement is that the rationale for structuring the contract as one of insurance arises from situations in which conventional accounting treatments may not reflect the economic substance of the transactions. However, this does not mean that all types of arrangement necessarily involve "window dressing". Indeed, there is in practice a spectrum of types of contract, at one end of which are conventional insurance transactions where there is complete uncertainty as to what the future cash flows under the contract will be, while at the other, there are arrangements where all future cash flows are known with reasonable certainty at the outset of the contract. In between there are contracts which do involve risk transfer to varying degrees, and a difficult issue for insurance supervisors is the impact of contracts which do not involve significant transfer of risk upon the solvency position of both reinsureds and reinsurers. Accounting rules can be of assistance in this regard, where they exist, together with increased disclosure. However, within Europe not all Member States have such accounting rules or conventions in place, and even where they do exist, the complexity of some contracts means that it can be difficult to assess their true economic substance. Sometimes it is possible to split a contract, between elements that involve risk transfer and those that are purely of a financing nature, but this is not without difficulties, especially where a contract does not have separable components.

7.4.9 Financial reinsurance arrangements are, in economic substance, akin to banking transactions. Discounting covers and deposit arrangements have the characteristics of bank deposits or bond investments. Off-balance sheet funding arrangements have the characteristics of an overdraft facility with pre-defined payback terms. Life funding arrangements are in the nature of a rolling credit facility.

7.4.10 The risk inherent in these transactions is therefore relatively low and, in the case of the borrowing transactions, negligible. Discounting covers and deposit arrangements usually give rise to credit risk, but these can be largely eliminated through deposit back arrangements with the cedant.

Impact of financial reinsurance arrangements on supervisory systems

7.4.11 Financial reinsurance represents a significant challenge to supervisors since, by its very nature, it increases the risk that supervisors will not form an accurate assessment of an insurance company's financial strength. Financial reinsurance contracts frequently result in the reduction or non-recognition of liabilities or over valuation of assets. They can also lead to higher credit being taken for reinsurance when it may not be appropriate to do so. This may result in an inappropriate conclusion being drawn on the financial strength of an insurer.

7.4.12 The key issue for supervisors is to ensure that transactions which do not transfer insurance risk are properly accounted for. If the accounting treatment is inappropriate, it is possible that the supervisor may need to ensure that the regulatory returns are prepared on the basis of the substance of the transactions rather than legal form. The need to ensure these transactions are properly accounted is essential to ensure that the solvency position is not compromised as a result of the non-recognition of liabilities or the release of implicit margins. Chapter 8 sets out the proposed treatment of contracts which only transfer investment or financial risk. The essence is that such contracts should not be treated as insurance contracts; this may assist in ensuring consistent treatment for contracts which do not transfer significant insurance risks.

7.4.13 Discounting covers were developed because conventional accounting restrictions on discounting prevented companies from valuing liabilities in a way which reflected the true economic position. This is also the case with life funding arrangements where conventional accounting restricts the extent to which life companies can recognise future premiums or premium margins on existing contracts as an asset. In these cases, the reinsurance transaction removes a distortion arising from artificial stipulations in the accounting rules. However, such transactions sometimes remove the implicit and prudential margins which may be required to cover future contingent losses.

7.4.14 By contrast, deposit arrangements and off-balance sheet funding contracts are designed to enable insurers to take advantage of shortcomings in the rules and to manipulate the financial position disclosed in the regulatory returns. Such arrangements are commonly entered into for catastrophe protection when conventional reinsurance cover is not available.

Non-life insurance

7.4.15 Regulations with respect to non-life reinsurance contracts have been developed in certain jurisdictions to counteract the distorting effect of financial reinsurance arrangements for accounting purposes. In the US (FAS 113) and the UK (FRS 5 and ABI SORP[82]), accounting standards lay down detailed rules with respect to the assessment of risk

[82] Association of British Insurers Statement of Recommended Practice on accounting for insurance business.

transfer and the accounting treatment to be adopted. The treatment adopted under these standards is also required to be followed in the regulatory return. Where an arrangement fails the risk transfer test, it has to be re-characterised and accounted for as though it were a deposit or loan transaction.

7.4.16 There are two key tests which are applied in determining whether a significant transfer of risk has taken place between the insurer and reinsurer in non-life insurance business. There has to be a reasonable possibility:

- that the insurer may realise a significant loss under the contract;
- of a significant range of outcomes under the contract.

7.4.17 We are not aware of any jurisdiction which quantifies what is meant by "significant" in this context. Whilst an absolute threshold cannot be determined for establishing significance, an insurance policy resulting in a reasonable possibility of a loss to the insurer greater than, say, 10%[83] of the present value of amounts paid to the insurer may be considered to transfer significant risk, and we understand that this is the general view taken in the US in applying FAS 113.

7.4.18 A key difference between the US and UK requirements is that the UK requirements consider timing risk to be an element of insurance risk whilst in the US a contract which only transfers timing risk is considered to be a financing arrangement rather than an insurance contract. The UK view is that timing risk can represent a genuine risk to the insurer; if payment is required to be made earlier in the period of the contract then a higher loss will be made than later in the contract when the insurer will have had the opportunity to earn investment income on the premium received.

7.4.19 Where a contract involves clearly distinct and separable elements, only certain of which result in significant insurance risk being transferred, it may be appropriate when accounting for the contract to divide it into its risk and financing elements.

7.4.20 The principles of FAS 113 are also applied in Canada and the Netherlands. The Australian regulator has issued a circular G3/94 which suggests that the regulator may seek to disallow arrangements as reinsurance where there is uncertainty as to risk transfer regardless of the treatment adopted in the financial statements.

7.4.21 There are no regulations in Germany with respect to accounting for financial reinsurance. The German tax authorities regularly disallow arrangements with limited risk transfer from being treated as reinsurance, however, the findings of tax investigators have no influence on financial statements and regulatory returns prepared in accordance with German Generally Accepted Accounting Principles (GAAP). There are also no regulations in France or Spain. In some countries, such as Italy and Spain, the use of financial reinsurance contracts by insurance companies is closely monitored by the regulator. There are, however, no specific rules to identify such contracts. The regulator can require a different accounting treatment for contracts which do not transfer risk. The UK treatment in the regulatory returns follows the treatment in the financial statements and reinsurance credit is not available for contracts which do not transfer significant insurance risk.

[83] This is an arbitrary approximation.

Life insurance

7.4.22 The rules applied to life insurance with respect to risk transfer are typically not as strict as those applied to non-life business. For example, in the UK, a contract will be regarded as an insurance contract if it transfers any mortality, morbidity, investment, persistency or expense risk, however small. It should be noted that the UK Accounting Standards Board is currently challenging this approach.

7.4.23 In the UK under a life funding arrangement, the insurer continues to recognise acquisition costs in the profit and loss account but additionally recognises an additional asset in the balance sheet representing the future profits expected to emerge to finance the loan.

7.4.24 The implications of the use of financial reassurance were a report published by the UK's Financial Services Authority[84]. An extract of the recommendation is set out below:

"The current solvency regulations define provisions that contain prudent margins. These margins provide an opportunity to arbitrage against economic reality particularly through the use of some forms of financial reinsurance. This arbitrage undermines the margins of prudence in the current framework and could pose a threat to the financial system.

We recommend that a review be undertaken of the extent to which the financial strength of the industry is eroded by the amount of such financial reinsurance in place.

We also recommend that full disclosure of these arrangements, including the material contingencies to which they are subject, should be made in the regulatory returns."

7.4.25 In certain other jurisdictions the existence of such arrangements enables acquisition costs to be fully deferred. For example, in Germany the large majority of business is reinsured through contracts which have the objective of financing the direct insurer's acquisition costs. This can, for instance, be achieved by higher reinsurance commission payments in the first year and lower or negative commission payments in following years in proportional business. The German Insurance Supervisor does not interpret these contracts as being financial reinsurance.

7.4.26 There are a number of contrasting responses that can be made to this challenge:

- tightening accounting rules so that financial reinsurance does not affect the reported financial position;
- removing elements of accounting rules which result in the accounts failing to reflect the economic substance of transactions;
- concentrating on obtaining sufficient details and understanding of all material reinsurance arrangements so that an accurate assessment of financial strength can be made.

7.4.27 The US and UK regulators and accounting bodies have already devoted significant efforts to the first of these approaches. In practice though, it has proved difficult to devise watertight rules.

[84] Report of the Financial Services Authority on the Review of the Regulation of the Equitable Life Assurance Society – 16 October 2001.

7.4.28 The advantage of the second approach is that it addresses the fundamental source of financial reinsurance arrangements. However, it involves a fundamental shift in the approach to setting provisions, especially in relation to life business. Historically, supervisors have actively encouraged regimes where prudential margins are built into provisions. Such margins in effect represent an implicit solvency margin. If supervisors move to removing implicit solvency margins and replacing them with explicit margins, there would be much less scope for insurers to use financial reinsurance to obscure their true financial position.

7.4.29 The third approach could be adopted either in addition to the other two or as an alternative. In principle it would be relatively straightforward to require insurance companies to submit details of all material reinsurance arrangements to the supervisory authorities. The practical difficulties with this approach will be that the supervisors may not have sufficient resources or expertise to be able to evaluate arrangements properly.

7.5 Portfolio diversification and ALM techniques

7.5.1 Diversification is a core principle of insurance business. The concept is not restricted to insurance risks, but applies to all risks. Portfolio diversification and ALM techniques aim at risk reduction by pooling risks in a balanced way (portfolio diversification) or by neutralising risks through off-setting asset and liability positions (Asset Liability Management techniques).

Portfolio diversification

The diversification principle

7.5.2 Portfolio diversification is the structuring of assets or liabilities in order to reduce the overall variability of net wealth. Diversification techniques can be applied to portfolios of assets or portfolios of liabilities. The key principle of diversification is the pooling of independent risks, and this is a fundamental concept in insurance underwriting. Provided the risks are independent, simultaneous adverse development from multiple risks will not happen systematically, but only by chance.

7.5.3 Portfolio balance is further improved if the individual risks in a portfolio are homogeneous, that is, if the risk characteristics (such as likelihood of loss and potential maximum impact) are not too diverse (for example, a balanced portfolio of motor risks would consist of numerous similar policies of similar monetary limits).

7.5.4 The main obstacles to portfolio diversification are risk peaks and dependence. Risk peaks are individual acceptances or portfolio segments with an exceptionally large potential loss size compared to the rest of the portfolio. For example, the inclusion of motor fleet policies in a portfolio of motor business, or concentration of property risks in a geographical area give rise to peaks. Adverse development of just a small number of risks can cause significant variations in the portfolio results.

7.5.5 Dependence across policies can be due to accumulations of losses arising from single events such as natural perils. For example, widespread flooding or windstorms can have a major impact on a portfolio of risks, even though the component risks are largely independent of one another. In the presence of such dependence and accumulation risk,

an increased number of policies (size-effect) does not necessarily provide improved portfolio diversification[85].

7.5.6 Dependence can also arise through economic, social and technological trends. This kind of dependence arises from systematic and systemic risks, and cannot be off-set by portfolio diversification. A rise in unemployment, for example, can result in an impact across an entire portfolio. Reinsurance is a key tool in reducing the risks caused by such dependence.

7.5.7 The examples given here are related to insurance underwriting risks but apply equally in respect of other risks, and to assets as well as liabilities.

Active portfolio diversification

7.5.8 Active portfolio diversification requires that the co-variation of risks is distinguished and at least qualitatively known or ideally quantified. Active diversification decisions concentrate on the areas of investments and liabilities.

7.5.9 Investment diversification is achieved by investment in different asset classes and by spreading within individual classes (based on patterns of price movements between equities and bonds, and across different equity sectors, for example).

7.5.10 Often, the diversification of the portfolio of insurance risks is not actively managed, but the underlying diversification effect is assumed to take place, within underwriting policies and guidelines. Active diversification of liabilities is usually achieved in the following ways:

- by number: in line with the principle of diversification the insurer seeks to increase the number of policies (size effect) in order to spread the total risk over many independent sources. In this way it achieves a reduction of result variability (relative to premium volume). Diversification by numbers cannot be blindly applied (due to the possibility of accumulation and dependence effects);
- across classes and lines of business: the above diversification by numbers can occur across lines and insurance classes. In this case the homogeneity of risks might not be given, but an additional diversification with respect to class- or line-specific background dependence can be achieved. An example is the diversification of class specific price cycles;
- geographically: this is most important in the case of natural perils coverage;
- markets: dependence on economic, social and technological background variables can be diversified (to a degree) by spreading the risk acceptance across diverse markets.

Assessment of portfolio diversification effects

7.5.11 In essence, portfolio diversification through independence is a probabilistic effect and an effective measurement of diversification effects requires probabilistic methods.

[85] Both peak risks and accumulation risks are managed with reinsurance protections.

7.5.12 By understanding the general approaches to diversification adopted by an insurer, it is possible to achieve at least a qualitative assessment by the examination of portfolio details such as policy numbers, spread across classes, geography and markets. Exposure control methods can be used to identify peak risks and critical accumulations. Where certain critical scenarios are known and where the impact can be assessed, scenario testing is applicable, but the significance of deterministic approaches is limited in this respect.

7.5.13 The current European solvency methodology gives little consideration to diversification. The only diversification-related feature is the scaling of factors, which assumes that larger insurers require a smaller capital charge relative to premium. This is in line with the above described size effect. Also, with regard to assets portfolios, there are admissibility rules (which vary between Member States in their degree of complexity), which limit the extent to which exposures to certain asset types, and to certain counterparties, can be used for covering technical provisions.

7.5.14 The importance of diversification was thoroughly discussed during the implementation of the US Risk Based Capital (RBC) methodology for non-life insurance. In that process certain modifications[86] to the initial proposal were carried out in the attempt to recognise diversification effects:

- covariance formula: this formula was introduced in order to take the independence of the various RBC risk categories into account (see Appendix 10.1 for details);
- concentration factors for provisions and underwriting: in order to take diversification in provisions and in loss development into account, the capital charges for provisions and for underwriting are adjusted with a concentration factor. The factor varies between 70% and 100% and is the lower, the more provisions and premium are spread over many classes[87];
- bond size adjustment factor: the factor for the capital charge for bonds decreases with an increasing number of issuers[88], thereby appreciating the diversification of (credit) risk in a large spread across issuers;
- asset concentration factor: the investments of the company are ordered by size and the capital charge factor for the ten largest investments is doubled, thereby penalising concentration of investment.

7.5.15 The adjustments demonstrate that the US approach gives more consideration to diversification effects than the EU approach does. At the same time it also demonstrates how difficult an appropriate assessment of the diversification effect is (see Appendix 7.1 for details).

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[86] Reference is made to the NAIC RBC requirements as at their first introduction for non-life insurance in 1994. For a detailed discussion see 'NAIC Property/Casualty Insurance Company Risk-Based Capital Requirements' by Sholom Feldblum.

[87] The loss concentration factor is 70% + 30% * (provisions in largest line of business) / (total provisions for all lines). The premium concentration factor is of similar design: 70% + 30% * (premium in largest line of business) / (premium from all lines of business).

[88] The adjustment factor is calculated as a weighted average across numbers of issuers. The following factors are applied: 250% for issues 1 to 50, 130% for issues 51 to 100, 100% for issues 101 to 400 and 90% for issues exceeding 401. The scaled factors are not applied individually to the issues, but a weighted average over the actual number of issues is calculated and applied.

7.5.16 In summary the main point is that a proper assessment of insurance diversification effects requires a detailed portfolio analysis. Not only are probabilistic models required for the analysis, but the predominantly used premium data is not, by itself, sufficient for the task. The insurance portfolio has to be broken down into segments and information about policy and risk counts, and exposure values and limits needs to be used.

ALM techniques

7.5.17 Asset Liability Management aims at the structuring of assets and liabilities so that the overall variability is reduced through off-setting asset and liability positions. Whereas diversification techniques aim at exploiting averaging effects (the 'law of large numbers'), ALM techniques are concerned with creating positions between assets and liabilities which off-set each other's development not only by chance, but by design.

Common ALM techniques

7.5.18 ALM techniques for insurance were first used in life insurance. Life insurance liabilities typically create foreseeable cash flow requirements and the dependence on economic and financial market performance is more pronounced than in non-life insurance. Prudent planning leads to asset strategies that should ensure the financing of the obligations and an immunisation of the variation of liabilities due to financial market variations. Techniques include:

- cash flow matching: this is the most rigid ALM technique. The cash out-flows from the liabilities are evaluated on a deterministic basis and asset positions are built that provide a secured cash in-flow that matches the out-flow one to one;
- duration matching: instead of matching liabilities one to one, duration matching estimates the sensitivity of the liabilities to interest rate movements and builds investment portfolios of similar sensitivity in order to off-set the liability value variation caused by interest rate movements. Duration matching is much less rigid than cash flow matching. Duration measures only the local sensitivity to interest changes, and although small interest rate changes are off-set, large shifts might cause a mismatch of asset and liability variation;
- matching the dependence on equity performance (with-profits): liabilities of with-profits policies are dependent on an underlying investment return, however the return to policyholders is smoothed relative to the actual underlying investment returns. Therefore, the assets and liabilities are in general not completely matched unless financing arrangements for the smoothing functionality are put into place;
- asset allocation rules: are related to diversification techniques. Assets and liabilities are jointly evaluated in a probabilistic model. The aim is to find an asset allocation rule that provides enough liquidity to meet the liabilities on average, but which does not have to meet them in each and every case (a certain degree of mismatching risk is accepted). The motivation for such ALM approaches is the observation that very rigid matching requires investment in low risk, low return securities. More aggressive investment might take the risk of mismatching into account, but will on average create higher returns, providing the liquidity needed to meet the liabilities without having to match the assets and the liabilities one to one. The probability of mismatching and the acceptance level have to be carefully considered;

- derivatives: for portfolio segments, which guarantee a minimum return to the policyholder, interest rate derivatives are used to secure the guarantee and to allow for an investment policy, which would not provide an exact match without the hedge position. Currency derivatives are applied to ensure that liabilities in foreign currencies can be met at a foreseeable rate;
- Dynamic financial analysis (DFA) based techniques: with the advent of probabilistic DFA models, ALM often covers a wider range of techniques. It encompasses the joint, model-based determination of assets, liabilities, supporting reinsurance and hedges, including the consideration of diversification effects.

7.5.19 The cash flow requirements created by non-life insurance liabilities are less foreseeable and the dependence on economic and financial market performance is less pronounced than in life insurance. The application of specific (micro) ALM techniques is therefore less common in non-life insurance.

7.5.20 Further ALM techniques deal with inflation and currency risk:

- inflation is seen as the major link between non-life liabilities and assets. A common strategy is to off-set the inflation of liabilities with equity investments;
- currency exposures can emanate from claims provisions or from future claims. Provisions can be matched by investments in the respective currency. For future claims the earned premium is sometimes taken as a proxy and the premiums are invested in their respective currencies (only in the case of balanced liability portfolios will this yield a satisfactory match; in the presence of high volatility, such as that caused by catastrophe exposure, the loss to premium ratio can become very large).

Assessment of ALM effects

7.5.21 For life insurance the assessment of ALM effects can be achieved on a deterministic scenario basis. The scenarios consist of specific asset value movements (for example, interest rate, equity and property) and the corresponding liability values are then established for every scenario separately. This evaluation has to consider mortality rates and lapse rates and is ideally done on a policy by policy basis.

7.5.22 Where the liability evaluation per scenario can be automated with a model, probabilistic analysis can be applied. Probabilistic analysis of the total asset and liability portfolio is not common, but individual classes and products are analysed in this way (for example, probabilistic analysis of the funding costs for with-profit products or of the interest rate sensitivity of the annuities portfolio).

7.5.23 The assessment of asset allocation rules and DFA-based techniques in life and non-life insurance requires a probabilistic model of the total assets and liabilities. Currency exposures can be assessed (to a degree) from the values of provisions in life and non-life business, and from earned premium amounts in non-life business.

7.5.24 Assessment of inflation exposure requires a detailed analysis of provisions and loss development assumptions for new losses. The assessment of the interaction of inflation and asset values requires the application of advanced economic/asset models.

7.5.25 The degree of sophistication in ALM techniques is highly variable. As indicated, advanced techniques tend to be found mainly among the largest and more sophisticated life insurance undertakings. In general, such techniques are less well developed in the insurance industry than in the banking industry, perhaps due to the fact that the concept of 'value at risk' is more familiar in banking. Advanced techniques require significant investment in management information and modelling techniques, but they bring significant benefits to the businesses which invest in them.

7.5.26 It is rarely possible to achieve precise matching of assets and liabilities for several reasons. Liability duration in respect of life insurance in particular may be long, especially where a guaranteed benefit is contingent on payment of further regular premiums or where the liability is in respect of distant retirement benefits. For such long duration liabilities, there may be no replicating asset. The recent decrease in government debt as a proportion of national income in several countries also has obliged life insurers to rely on more risky corporate securities or on risky assets such as real estate to 'match' long liabilities.

7.5.27 A further difficulty is that assets and liabilities are not necessarily stable, and may behave in unexpected ways in critical situations, as was evidenced particularly in the case of Long Term Capital Management (LTCM)[89]. There is the potential for liquidity to alter dramatically, or for the profile of liabilities to be changed by patterns of policyholder behaviour. There may also be scope for conflict between approaches to asset liability management in that, for example the hedging of economic value and of the disclosed balance sheet position may require different approaches. The significance of this last point would be less in a fair value accounting context which would highlight the effects of any mismatches.

Impact of ALM/portfolio diversification techniques on supervisory systems

7.5.28 Under most current supervisory regimes the effects of ALM and portfolio diversification are not explicitly recognised. As described above, diversification and asset liability management have a very significant impact on the financial position of an insurer. Most regimes do not recognise this in the capital requirements and the supervision of these aspects is generally done on a qualitative basis.

7.5.29 Portfolio diversification is not recognised in simple fixed ratio approaches such as the current EU regime. Factor-based RBC approaches try to rectify this, but such approaches are not well suited to taking diversification effects into account.

7.5.30 ALM effects are also not captured with fixed ratio or factor-based RBC. The UK and the USA apply some scenario testing for life companies. This is a suitable instrument for stress testing the asset and liability match. The calculation of the financial position under a given scenario takes the impact on assets and liabilities and the effect of derivatives into account. The effectiveness of such tests depends on the choice and definition of the scenarios, as well as on a prudent calculation of the scenario results. The calculation is not formally prescribed. This enables the companies to tailor the calculation to meet their

[89] LTCM is the company that failed in 1998. See 'Risk Management Lessons from Long Term Capital Management' by Philippe Jorion, University of California at Irvine; National Bureau of Economic Research (NBER).

own specific risk profile, but it also raises the requirement for a supervisory assessment of such calculations.

Supervisory techniques for taking account of ALM/portfolio diversification

7.5.31 The effects of ALM and portfolio diversification can be quantified, but this requires the application of advanced models. The incorporation of internal models into a supervisory regime would allow ALM and portfolio diversification to be recognised in the capital requirements.

7.5.32 Scenario testing can be a suitable instrument for the ALM assessment. Scenario approaches are currently only applied in some countries as a supplementary technique for life insurance. Suitable tests for non-life insurance can be designed as well. The implementation of scenario tests for non-life insurance is on the agenda of the FSA in the UK. In addition to scenario tests, advanced probabilistic approaches can give further information. Whereas scenario tests are useful for the identification of asset liability mismatches, advanced probabilistic models can evaluate how this mismatch affects the aggregate position.

7.5.33 The use of scenario tests to assess portfolio diversification is not a straightforward solution. Tests that would adequately assess diversification would require a large number of scenarios and the scenarios would have to be very carefully constructed. In essence portfolio diversification is a probabilistic feature and advanced probabilistic models are required for an adequate assessment.

7.6 Conclusions

7.6.1 Insurance undertakings are increasingly using various complex products and techniques to manage and control risks. In the area of ART, there can be significant financial impacts, which can be difficult to assess unless accounting treatments are appropriate and disclosures are sufficient. In the area of ALM and portfolio diversification and derivatives, there is a need to consider these techniques in conjunction with an undertaking's risk management approach; where techniques are properly controlled they can be valuable tools in the mitigation of the risks they are designed to address.

7.6.2 Financial reinsurance transactions represent a significant challenge to supervisors. The current European solvency system generally does not cope well with such products and techniques, which in many cases did not exist when the system was first devised. Supervisory authorities have generally recognised that financial reinsurance transactions are capable of undermining the solvency requirements. The accounting treatment of such arrangements is important, and an assessment of the impact on the financial position of an insurer is usually possible in those states which have accounting rules in place to ensure that the substance of transactions is properly reflected (together with adequate disclosure).

7.6.3 It should also be recognised that contracts are frequently designed to transfer appropriate levels of insurance risk to meet the definitions laid down by the standards and therefore qualify for insurance accounting. However, the majority of the risks in the contracts may relate to financing. The appropriate accounting treatment would ideally be to split or

unbundle the financing and insurance elements, but most current accounting standards do not require such treatment.

7.6.4 Many of the products and techniques are designed to mitigate risks. For example, it is not unusual for insurers to use derivative products as part of their hedging strategy. Provided that the use of such products is controlled and managed, it would seem appropriate, in a future solvency system, to reflect the fact that some products can limit downside risk. For example, in a system which included capital charges on assets, the use of recognised risk mitigation techniques could result in reduced charges.

7.6.5 Responses to our questionnaires to insurance supervisors in Member States reveal that supervisors tend to take an individual approach to reviewing significant unconventional transactions. The supervisory review of such arrangements and methods is important because the effects of transactions and the reasons behind them are not always obvious. Also, the underlying approach to risk mitigation and risk management usually needs to be understood, in order to gain a sound understanding of the effects.

7.6.6 It is rarely possible to achieve a precise matching of assets and liabilities. It is difficult for ALM effects to be included within fixed ratio or factor based solvency systems. The impact of any asset liability mismatches can best be assessed using scenario or advanced modelling techniques. In the case of advanced ALM techniques, it would be necessary for supervisors to review risk modelling, stress and scenario testing, to assess the impact that such techniques have on the undertaking's financial position.

7.6.7 As with other areas of this study, the appropriate supervisory approach is unlikely to be based on the impact on the solvency margin alone (however determined). Supervisory review of risk management procedures, ALM models and public disclosure of information will also form an important part.

8 Impact of future accounting changes

8.1 Terms of reference

8.1.1 *"Analysis of changes in accounting principles that could have an impact on technical provisions, their coverage, relevant assets and on the solvency margin system."*

8.2 Introduction

8.2.1 This chapter focuses on the following areas:

- the potential effects of moving from local generally accepted accounting practice (GAAP) to compliance with International accounting standards (IAS) as promulgated by the International Accounting Standards Board (IASB);
- the impact of possible changes in IAS being considered by the IASB;
- assessment of the potential effect on the solvency margin system.

8.2.2 Accounting is fundamental to consideration of solvency of insurance companies, as most regulatory systems are driven (at least to some extent) by the numbers appearing in the financial statements. Even where regulatory accounting differs from generally accepted accounting practice, the latter usually provides a starting point. As shown in the assets and technical provisions chapters, there is currently a high degree of inconsistency within the treatments adopted throughout the EU, arising from the options in both the Third Life and Non-Life Directives and the Insurance Accounts Directive. Harmonisation of accounting to comply with IAS will therefore remove a lot of the differences and ensure a more consistent basis for calculating net assets both within the financial statements and the regulatory returns.

8.2.3 The EU has already announced its intention that all listed companies will be required to prepare their consolidated financial statements in accordance with IAS by 2005. This requirement may be extended to both individual financial statements and the financial statements of unlisted insurance companies by some Member States. There is therefore a possibility that unlisted insurance companies will also need to comply with this regime, although such companies may be allowed longer for the transition to IAS-compliant financial statements. This raises the question of how moving onto IAS will impact on the financial statements of insurance companies, and also how this will impact on the regulatory regime.

8.2.4 One of the difficulties we have encountered in preparing this chapter has been the fact that there is currently no EU-wide basis of accounting, with each country having its own GAAP. Similarly, there is no consistent approach in either actuarial principles or in regulatory reporting. Rather than explain the implications for each country's regime individually, we have provided an indication of the likely impact on the financial statements and assessed the implications for solvency in broad terms.

8.2.5 The key consideration that will need to be addressed is whether prudential supervisors will accept the accounting principles applied in financial statements for the purposes of prudential supervision or whether they will require regulatory returns to be prepared on the basis of a different set of principles. We believe that, where possible, it is preferable for these to be harmonised. This removes the possibility of errors occurring through the maintenance of both memorandum and accounting records and improves the transparency of information provided to all parties, providing information that should meet the needs of a range of different users.

8.2.6 To the extent that the statutory and regulatory reporting are harmonised, the changes in accounting will need to be carefully considered to assess the implications on regulatory reporting. If the changes to the statutory reporting are not believed to be beneficial from a supervisory perspective, then supervisors will need to decide what financial information they require for supervisory purposes. One of the factors to be considered will include a cost benefit assessment of the various options. There are significant cost benefits to not requiring the preparation of additional information. The impact on the taxation system within the individual Member States will also need to be assessed.

8.2.7 We have prepared this chapter on the premise that the regulatory returns will be prepared on the same basis as the financial statements and that the regulatory system will therefore mirror the changes made due to accounting changes. We believe that this would be a logical development in order to achieve consistency and transparency in solvency requirements.

8.2.8 We have focused our considerations on the elements of existing IAS and proposed International Financial Reporting Standards (IFRS) that we believe would be most likely to have the most significant impact on the financial statements of insurance companies. However, this is likely to vary to some extent according to the individual circumstances of the insurer. This approach has been adopted as we believe that these are the areas that will have the most impact on the determination of capital resources available, and hence also have the widest implications for insurance supervision.

8.2.9 We have therefore concentrated in this chapter on the treatment of investments on the assets side of the balance sheet and of technical provisions on the liabilities side of the balance sheet. The most significant IAS or IFRS affecting these areas will result from application of:

- the existing standard on financial instruments (IAS 39, Financial Instruments: Recognition and Measurement) and the proposals put forward by the Joint Working Group (JWG);
- the Draft Statement of Principles (DSOP) on Accounting for Insurance Contracts.

8.2.10 The IASB is currently also working on amendments to IAS 39 (Amendments to IAS 39, Financial Instruments: Recognition and Measurement) with an international financial reporting standard (IFRS) anticipated in the second quarter of 2002. This chapter largely considers the existing requirements of IAS 39, although where possible we have indicated the changes that had been announced by the time of writing and the impact of these.

8.2.11 This chapter is structured as follows:

- IAS 39 (Financial Instruments: Recognition and Measurement);
- JWG proposals on fair value accounting;
- development of an IFRS on insurance contracts;
- likely impact of the above on reported solvency.

8.2.12 A brief overview of other existing international accounting standards and the IASB's planned agenda is included as Appendices 8.1 and 8.2.

8.2.13 The main implications for insurers arising from the application of IAS that are dealt with in this chapter are:

- most of the financial assets will be reported at fair value. Whilst this will introduce increased volatility in the total assets of an individual company from year to year, it will also increase transparency and provide more meaningful information reflecting current market conditions;
- the definition of insurance contracts (in both the existing IAS 32 and 39 and the proposed DSOP on Insurance Contracts) will lead to reclassification of some insurance contracts as financial instruments. This will reduce both technical provisions and reported premiums and claims, with a consequential impact (under the current solvency system) on the calculation of the solvency margin requirement;
- liabilities (other than those arising from insurance contracts and those held for trading) are required to be stated at amortised cost under IAS 39;
- the Insurance Contracts DSOP proposes that technical provisions will be measured at entity-specific value while IAS 39 is in force (or fair value if IAS have changed to require most other assets and liabilities to be included on this basis). This is to be consistent with the valuation of other financial assets and liabilities. Both of these are calculated on a prospective basis and provide 'best estimate' information;
- some other assets and liabilities (such as deferred acquisition costs, equalisation and catastrophe provisions) will cease to be recognised if the DSOP asset liability approach is adopted.

8.2.14 Assuming no change to the solvency regime, the impact of these changes can be viewed in outline as follows:

Overview of effects of IAS on current solvency regime

Net assets	**Solvency effect**
Assets IAS 39: more financial assets at fair value; movements in fair value to the profit and loss account (P&L) or equity; embedded derivatives separated and valued separately at fair value JWG: all financial assets and liabilities at fair value; all movements to P&L Other changes possible, e.g. to taxation balances → overall increased volatility in net assets → initial increase in net assets on first time application	**Excess over solvency margin requirement** Impact of changes in the valuation basis of assets and liabilities and changes to the solvency margin requirement → increased volatility
Technical provisions IAS 39: some insurance contracts will fall within its scope; embedded derivatives separated and valued at fair value DSOP: revised definition of insurance contract; some contracts will fall under IAS 39; insurance contracts within its scope to be valued at entity-specific value (if IAS 39 still in force) or fair value (if JWG or similar recommendations is in place) – both will mean significant changes to current valuation basis and removal of prudence: no unbundling of embedded derivatives → different numbers and volatile → initial decrease in technical provisions on first time application	**Solvency margin requirement** Will be affected by change in technical provisions and reclassification of certain contracts which do not meet the definition of insurance → overall increased volatility
Source: KPMG	

8.2.15 From a supervisory perspective, these changes will mean the removal of certain elements of prudence (and implicit capital requirements) that have previously been included in the valuation of assets and technical provisions (although it should be noted that it is not necessarily the case that technical provisions will be reduced; in some instances they could increase). This may mean that the existing regime for assessing capital adequacy will no longer prove adequate.

8.2.16 Without an amendment to the solvency system, there will be no capital requirement for those insurance contracts that are reclassified. We therefore believe that the regime will need amendment to introduce a capital requirement in relation to these contracts based on the risks to which they are exposed.

8.2.17 The increased volatility in technical provisions in the financial statements (unless supervisors require different numbers to be prepared) will also flow through into the calculation of the solvency margin requirement. The volatility in asset numbers will affect the net assets available to cover technical provisions and the solvency margin requirement. This will lead to both the capital requirement, and the excess over it, becoming far more volatile than has previously been the case.

8.3 IAS 39 (Financial Instruments: Recognition and Measurement)

8.3.1 IAS 39[90] defines a financial instrument as *"any contract that gives rise to both a financial asset of one enterprise and a financial liability or equity instrument of another enterprise"*. The standard applies to all financial assets and liabilities of the company, with some exemptions, including rights and obligations under insurance contracts defined in paragraph 3 of IAS 32[91]. However, it does apply to any embedded derivatives in insurance contracts.

8.3.2 Work towards a full review of IAS 39 (and progression of the Joint Working Group's recommendations) is not one of the current priority projects for the IASB. This means that IAS 39, albeit with some amendments, is likely to apply in 2005, when all listed companies in the EU become required to comply with IAS. A number of amendments to IAS 39 were discussed by the IASB Board in its November and December 2001 meetings and an exposure draft is due to be published shortly. Where applicable, in this chapter we cover both the current rules and the amendments discussed.

8.3.3 One of the amendments that may have a significant effect is providing insurance undertakings with an option to designate part of their asset portfolio as held for trading. Adoption of this option would enable more financial assets to be valued at fair value with movements in fair value reported in the profit and loss account.

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[90] Paragraph 8 of IAS 39.

[91] "*An insurance contract is a contract that exposes the insurer to identified risks of loss from events or circumstances occurring or discovered within a specified period, including death (in the case of an annuity, the survival of the annuitant), sickness, disability, property damage, injury to others and business interruption. However, the provisions of this Standard apply when a financial instrument takes the form of an insurance contract but principally involves the transfer of financial risks*". This reference is expected to be updated to refer to the Insurance Contracts standard when it is issued.

8.3.4 For insurance companies, IAS 39 is probably the most important of the standards currently in existence because of the significant investment portfolio that is held on the assets side of the balance sheet. If the insurance contracts project is approved along current lines, then we expect a clearer distinction between insurance contracts and other financial instruments. Until such time, the requirements of IAS 32 and IAS 39 remain applicable to insurance companies preparing their financial statements in accordance with IAS.

8.3.5 The definition of insurance contracts provided in IAS 32 requires insurance contracts which principally involve financial risk to be treated as financial instruments and dealt with under IAS 32 and 39. This is also confirmed by question 1-3 of the IAS 39 Implementation Guidance. Guidance on financial risk is included in paragraph 43 of IAS 32 as one of price risk (being currency risk, interest rate risk and market risk), credit risk, liquidity risk or cash flow risk. Examples of insurance contracts that could fall within the scope of IAS 32 and IAS 39 are some performance-linked contracts, contracts with guaranteed returns, administration type contracts and financial reinsurance contracts which involve little insurance risk transfer.

8.3.6 As well as its investment portfolio (including derivatives), an insurer's cash deposits and borrowings, embedded derivatives in insurance contracts and those insurance contracts which do not meet the definition of an insurance contract fall within the scope of IAS 39. It should be noted that IAS 39 currently requires embedded derivatives contained in insurance contracts to be dealt with under IAS 39, whereas the Insurance Contracts DSOP will not require unbundling of such contracts. Its proposals therefore deviate from the current rules. Of these the investment portfolio on the assets side and the excluded insurance contracts on the liabilities side are likely to be the most significant. Accordingly, we concentrate on these items. The treatment of any reinsurance contracts that fall outside this definition is considered within the financial liabilities section below.

Financial assets – measurement

8.3.7 All financial assets[92], including derivatives, are initially recorded at cost, including transaction costs. Subsequent to the initial recognition, they are classified as one of four categories[93], and it is this categorisation that determines the valuation basis to be applied, as set out in the following table:

[92] IAS 32 defines a financial asset as "*any asset that is cash; a contractual right to receive cash or another financial asset from another enterprise; a contractual right to exchange financial instruments with another enterprise under conditions that are potentially favourable; or an equity instrument of another enterprise.*"
[93] Paragraph 68 of IAS 39.

IAS 39 asset categorisation

Categorisation	Measurement	Recognition of movement
Loans and receivables originated by the enterprise and not held for trading	Amortised cost	On sale or earlier impairment[94]
Held-to-maturity investments	Amortised cost	On sale or earlier impairment
Financial assets held for trading[95]	Fair value[96]	In P&L
Available for sale financial assets	Fair value	In P&L or equity[97]
Source: IAS 39		

8.3.8 Amortised cost applies only where the investment has a fixed maturity date, in which case the cost of investment is amortised using the effective interest method. If these assets do not have a fixed maturity date, then the valuation basis to be applied is cost[98]. Neither the fair value nor (amortised) cost valuation basis includes any deduction for transaction costs that may be incurred on the sale of the asset concerned.

8.3.9 The 'held-to-maturity' category is subject to a tainting rule. This prohibits the use of this category where the company does not intend, or is unable, to hold the assets until maturity. The sale of a (not insignificant) portion of this category leads to a reclassification of the entire category to one measured at fair value, usually to 'available for sale'. This is likely to restrict the use of the 'held-to-maturity' category (and therefore amortised cost) in practice.

8.3.10 Classification of an insurer's portfolio is likely to result in a significant part of the investment portfolio being included at fair value and this will be a significant change for many European insurers.

8.3.11 Changes in fair value of financial assets held for trading have to be recognised in the profit and loss account. At the November 2001 IASB Board meeting, a proposal to widen the scope of the trading category was tentatively approved. When the rules are amended, this will enable an entity to measure any financial instrument at fair value, with changes in fair value recognised in the net profit or loss, by designating it irrevocably as held for trading.

[94] There is no movement in value if these investments are actually held to maturity.
[95] Derivatives (free standing or those embedded in another instrument) are always deemed held for trading unless they are designated as hedging instruments. If a derivative is designated as a hedge, special hedge accounting rules must be applied to prevent mismatches in reporting of the derivative and the hedged item. There are strict criteria which govern the use of hedge accounting.
[96] Fair value is defined in IAS 39 as "*the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction*". This definition is not dissimilar to the market value approach adopted now by some countries.
[97] As discussed elsewhere in this section, the IAS 39 improvement project may mean that the option to take movements to the P&L will become redundant.
[98] Paragraph 73 of IAS 39.

8.3.12 In the case of available for sale assets, an enterprise has a single, enterprise-wide option to either:

- recognise the entire adjustment in fair value in the net profit or loss for the period; or
- recognise the change in fair value in equity, thus the difference between (amortised) cost and fair value is recognised directly in equity.

The Board tentatively believes that an entity applying IAS/IFRS for the first time, where financial assets are remeasured to fair value (at the time of first time application) and classified as available for sale, cumulative fair value changes should be reported as a separate component of equity with subsequent recycling to net profit or loss when the asset is sold. However, for financial assets remeasured to fair value at time of first time application and classified as held for trading, the cumulative fair value changes should be reported in retained earnings with no subsequent recycling.

8.3.13 Where a financial asset contains an embedded derivative not closely related to the host contract, the embedded derivative is normally separated and accounted for separately as a derivative (see financial liabilities below for more detail of the requirements). If separation is not possible, then the entire financial instrument must be treated as a financial asset held for trading. An amendment to this rule was approved at the November 2001 IASB Board meeting, to the effect that an entity should have the option, rather than being required, to measure a hybrid instrument containing an embedded derivative that is not closely matched to the host contract at fair value, with changes in fair value reported in the profit and loss account. This will reduce the burden of separating embedded derivatives.

8.3.14 A financial asset is impaired if its carrying amount is greater than its estimated recoverable amount, being the net present value of future cash flows. This applies to both assets valued at amortised cost (held to maturity as well as loans originated by the company) and available for sale assets where the change in fair value is recognised in equity. More detailed guidance on what constitutes objective evidence of impairment for equity instruments is being considered as part of the review of IAS 39. At its November 2001 Board meeting, the IASB recommended that, given the difficulties in determining objectively when impairment losses on equity instruments have been recovered and related measurement and income recognition issues, such losses should not be reversed.

Financial assets – application by insurance companies

8.3.15 Chapter 5 of this study includes an analysis of the valuation bases currently used in Europe for the valuation of assets. As can be seen, there is a mixed approach of cost, amortised cost, market value and lower of cost and market value. The move to an IAS 39 categorisation will therefore affect every country, although the magnitude of the effect will depend on the bases currently applied.

8.3.16 The categorisation of financial assets according to IAS 39 is likely to mean that most of the investment portfolio will be classified as 'available for sale' under the current rules, but 'held for trading' under the revised rules – both requiring measurement at fair value. The widening of the ability of an insurer to designate its investments as trading could be used when, to aid matching of assets and liabilities (for example in relation to performance-linked investments), it is convenient to use fair value for all assets and liabilities with all movements in fair value passing through the profit and loss account.

8.3.17 For those countries that currently record investments at cost, such as France and Germany, the move to recording investments at fair value will be a significant change and will lead to increased volatility in the valuation of assets. Where the movements in fair value are taken to the profit and loss account, this will also lead to increased volatility in recorded profits and equity. Similarly, where the movements in fair value are taken to equity, there will be increased volatility, but only in the equity levels.

8.3.18 For such countries, the equity option within the 'available for sale' categorisation would give results more similar to those currently reported. These countries may also prefer to classify some investments as 'held-to-maturity', and so include them at amortised cost, but will need to be careful to ensure that the tainting rules are not triggered.

8.3.19 Insurers in some countries in Europe hold investments that will be caught by the embedded derivatives rule[99]. This will result in fair value movements on such embedded derivatives being taken to the profit and loss account, which differs from the current accounting applied.

8.3.20 Appendix 8.3 sets out our considerations of the classifications likely to be applied.

Financial assets – implications for insurance companies

8.3.21 There are several benefits to the use of the fair value basis, notably that the recorded amount for financial assets more accurately reflects the recoverable amount if they were to be realised. This increases the transparency of the financial statements. In particular, the accounts will clearly show the extent of mismatch between assets and liabilities.

8.3.22 As stated, currently there is the option to either include the movement in fair values of 'available for sale financial assets' in either the profit and loss account or equity reserves. As such, the impact of changes in values need not be recorded immediately, which would remove this volatility from the annual results.

8.3.23 The move to fair value will, however, remove any additional prudence brought in to the asset valuation, and prudential supervisors may wish to impose a new capital requirement to address the risk that the assets may not be recoverable at their recorded amount. This would take account of a number of different risks including market risk, counterparty risk and credit risk.

8.3.24 There may be concern that the volume of financial assets held by insurance companies could mean that insurers may be placed at a relative disadvantage in the capital markets due to the increased volatility in reported results, with insurers potentially being downgraded when the stock markets suffer a decline in asset values. However, the counter-argument is that the market will see through this. If capital disadvantage is to be avoided, there may need to be a means of separating the underlying business performance from the investment performance. This could lead to the publishing of two profit figures, similar to that already seen in the UK insurance market, where an additional profit figure based on the longer-term rate of investment return is given as a sub total in the profit and

[99] Some insurers have exposures to hybrid financial assets, such as bonds where the returns are related to the movements in fair value of equities and bonds with repayments related to the fair value of equities or an equity index.

loss account. It should be noted that the IASB is considering performance reporting in one of its high priority projects.

Financial liabilities

8.3.25 Financial liabilities are initially recorded at cost, including transaction costs. Subsequent to initial recognition, all financial liabilities (other than those held for trading (including both stand alone and embedded derivatives)) which are within the scope of IAS 39 will be required to be valued at amortised cost[100]. 'Held for trading liabilities' are recorded at fair value.

8.3.26 IAS 39 does not apply to obligations arising under insurance contracts, but does apply to derivatives that are embedded in insurance contracts and to any insurance contracts that do not meet the IAS 32 definition. All such insurance financial liabilities will be required to be valued at amortised cost.

Insurance contracts with little or no insurance risk

8.3.27 Where an insurance contract principally involves the transfer of financial risks, it falls within the scope of IAS 39. No guidance is given on what 'principally' means in this context. The Insurance Steering Committee has amended this definition in its proposed DSOP (see below) to help clarify the extent to which insurance risk must be present. However, currently the distinction between insurance contracts and financial instruments needs to be based on the definition of insurance contracts given in paragraph 3 of IAS 32. Insurance contracts which may fall within the scope of IAS 39 could be certain investment-linked contracts (such as unit linked contracts), guaranteed investment contracts (such as guaranteed growth or income bonds), administration type contracts (such as managed pensions scheme contracts) and financial reinsurance contracts (which are more akin to a financing arrangement than to the transfer of insurance risk). Some of these contracts are likely to have a long-term duration, with premiums either received as one lump sum up front or in instalments over the policy life.

8.3.28 Performance-linked contracts, such as some unit-linked contracts, contain an embedded derivative (see below), since the return and repayment of the premiums to the policyholder is linked to other assets, in many cases investment funds or equity indices. Where these derivatives are not closely related to the insurance contract (unless these insurance contracts are measured at fair value with movements in that fair value taken to the profit and loss account), the embedded derivative would have to be separated and measured at fair value. If the assets held to fund the obligations under such contracts are classified as 'available for sale' with changes in the fair value being reported in equity, a mismatch might result due to the fact that the obligations are measured at fair value. The improvements proposed to IAS 39 could help to overcome the mismatch in income recognition that currently results. Another alternative would be to apply hedge accounting if all of the criteria can be met.

[100] The amortised cost basis is defined as *"the amount at which the financial asset or liability was measured at original recognition minus principal repayments, plus or minus the cumulative amortisation of any difference between that initial amount and the maturity amount, minus any write-down (directly or through the use of an allowance account) for impairment or uncollectability"*.

8.3.29 Insurance or reinsurance contracts with little or no insurance risk would no longer be disclosed as technical provisions. As the contracts would be treated as financial liabilities, no premium income or expense due to changes in technical provisions or claims would be recognised. The liability under the contract would be presented as a financial liability, and disclosure with the requirements of IAS 32 would be applicable. It is not clear how any (albeit necessarily small) element of insurance risk would be valued under IAS 39, but this would need to be included in arriving at the valuation of the liability.

8.3.30 This change in treatment, if followed in the regulatory returns, would have knock-on implications on the calculation of the solvency margin requirement for both life insurance and general insurance business. The calculation for life business is directly related to the technical provisions, so if these are reduced through removal of investment contracts, then this has a direct impact on the calculation. For non-life business, the calculation is based on premiums and/or claims. The removal of these items from the profit and loss account therefore reduces the solvency margin requirement for general insurance. The reported solvency will therefore also be affected.

Embedded derivatives

8.3.31 Paragraph 22 of IAS 39 explains that *"a derivative may be a component of a hybrid (combined) financial instrument that includes both the derivative and a host contract - with the effect that some of the cash flows of the combined instrument vary in a similar way to a stand-alone derivative. Such derivatives are sometimes known as 'embedded derivatives'. An embedded derivative causes some or all of the cash flows that otherwise would be required by the contract to be modified based on a specified interest rate, security price, commodity price, foreign exchange rate, index of prices or rates, or other variable."*

8.3.32 An embedded derivative is required to be treated as follows:

"An embedded derivative should be separated from the host contract and accounted for as a derivative [under this Standard] if all of the following conditions are met:

i) the economic characteristics and risks of the embedded derivative are not closely related to the economic characteristics and risks of the host contract;
ii) a separate instrument with the same terms as the embedded derivative would meet the definition of a derivative;
iii) the hybrid (combined) instrument is not measured at fair value with changes in fair value reported in net profit or loss."

8.3.33 Some insurance contracts may have options written in to them, for example guaranteed early surrender rates or guaranteed conversion rates on maturity. It is not always clear whether such options are required to be separated as an embedded derivative. This will depend on the relationship between the option and the host contract. Where there is a clear relationship between them, then separation will not be required; where the option's economic characteristics and risk are not closely related to the insurance contract's economic characteristics and risks, then separation will be required. This is likely to require a careful review of the actual policy terms to determine firstly whether any guarantees, options or other embedded derivatives exist and secondly how they should be

treated. Guaranteed conversion rates are likely to meet the first two tests, but it is not clear that a guaranteed early surrender value will.

8.3.34 The third of the above conditions is likely to depend on whether the insurance contract falls under the insurance contracts standard, which is likely to require entity-specific or fair value reporting of such contracts, or under IAS 39, which requires valuation at amortised cost of many liabilities. If it is included at fair value with movements taken to the profit and loss account, then separation is not required.

8.3.35 Where an embedded derivative is required to be separated, it must be recorded at its fair value. There may be difficulty in obtaining a fair value for some of these items. For example, an option pricing model can be used for pricing guaranteed conversion rate type options, but it is not clear that there is a readily available market mechanism to derive a fair value for an early surrender option.

8.3.36 IAS 39 deals with the measurement of embedded derivatives, but does not address how they should be presented in the balance sheet. The disclosure requirements of IAS 32 would mean that the notes to the accounts would be required to disclose information about the fair value of each class of financial asset or liability in the balance sheet. Insurance contracts meeting the definition of a financial instrument would be one such class of financial liability.

8.3.37 It should be noted that the Insurance Contracts Steering Committee has stated its preference of not unbundling an insurance contract into constituent elements in the DSOP (see below).

Other IAS 39 rules (not covered)

8.3.38 IAS 39 also contains rules determining when the control over a financial asset or liability has been transferred to another party and rules on hedge accounting. Application of hedge accounting is not expected to be significant for most insurers and this has therefore not been considered within this chapter.

8.3.39 The main impact of IAS 39 on insurance companies can be summarised as follows:

Summary of effects of adoption of IAS 39 on insurance companies

Category	Implications	Potential effect on solvency
Assets	■ Most investments (including derivatives) will be recorded at fair value, which will lead to increased volatility in asset values and equity/reported profits for countries currently using a cost basis. Some assets may be valued at amortised cost under the 'held-to-maturity' category, but care will be needed to ensure that the tainting rules are not triggered. ■ Fair values are likely to exceed their current measurement, particularly where the investments are in equities, as the EU Directive requires all assets to be valued on a prudent basis. Countries currently adopting a market value basis are unlikely to be affected to a significant extent. ■ Changes in fair value will be recorded as part of the profit or loss for the year for trading assets and profit or equity for available for sale assets, depending on the enterprise wide option adopted. ■ Derivative elements embedded in another asset shall generally be separated and treated as a trading asset. ■ No allowance can be made for future selling costs. ■ Cash deposits and loans originated by the insurer (such as policy loans) will be valued at amortised cost.	■ No impact on calculation of the required minimum margin of solvency. ■ The increase in asset values in countries currently using a cost basis will mean that the reported surplus over the solvency margin requirement will also increase. ■ Increase in value of assets will increase surplus assets, thereby removing implicit margins. ■ Margin of solvency over the solvency margin requirement is likely to fluctuate significantly year on year dependent on investment performance.

Technical provisions	■ Some insurance contracts that principally involve the transfer of financial risk will fall within the scope of IAS 32 and 39. Liabilities in relation to such contracts will not be included in technical provisions, although it is not clear whether any (albeit small) insurance element will remain included. ■ Valuation of such contracts will most likely be at amortised cost which will result in a different valuation from that currently used. This may change when the revisions to IAS 39 are finalised. Where embedded derivatives exist within the contract, these have to be separated and measured at fair value under certain conditions. ■ Valuation includes commission payments (transaction costs). ■ There are concerns regarding the different valuation bases applied to investment-linked contracts and their underlying investments. ■ Financial reinsurance contracts principally involving the transfer of financial risk will have to be treated as a financial instrument and comply with IAS 32 and 39.	■ Change in valuation of technical provisions will affect the solvency margin requirement calculation for life insurance business if the regulatory returns are prepared on the same basis. ■ If investment contracts are not treated as technical provisions, then this will mean the removal of premiums and claims from the P&L, which would reduce the solvency margin requirement for non-life business (assuming the same treatment is followed in the solvency calculation). ■ Different treatment of financial reinsurance may mean that the solvency benefit of entering into such contracts is removed.
Source: KPMG		

8.3.40 IAS 39 will lead to significant changes to net assets in the following areas:

- increased volatility in the valuation of assets for those countries that currently record investments at cost, such as France and Germany. Countries such as the UK and Denmark that currently adopt market value bases of asset valuation should not experience significant changes to recorded asset values;
- increased volatility in equity (and reported profits where fair value movements are taken to the profit and loss account) arising from the inclusion of fair value movements on trading assets and embedded derivatives;
- restriction in the ability to use amortised cost basis for the valuation of fixed interest securities;
- recategorisation of insurance contracts that have little or no insurance risk from technical provisions to other liabilities, coupled with a removal of premiums and claims from the profit and loss account;
- other changes to the valuation of remaining technical provisions, particularly where these contain embedded derivatives.

8.3.41 This is likely to mean that some of the prudence that currently exists in both the valuation of assets and technical provisions will be removed. This will also remove any implicit capital margins in the valuation of assets within the solvency system (assuming the same bases of valuation are applied).

8.3.42 There are also knock-on implications for the calculation of the solvency margin requirement (for both life and non-life business) and overall, IAS 39 will result in the margin of solvency of an insurance company being more volatile in the future, particularly where investments are held in equities.

8.3.43 At present, there does not appear to be a natural link between the valuation of assets and liabilities in the case of investment-linked type insurance contracts, where the policyholder's return is directly linked to the performance of the underlying investments. We believe that the liabilities will be valued, at least in part, on a fair value basis due to recognition of the linking as an embedded derivative. This may cause mismatches if the entity has adopted an equity option to the valuation of 'available for sale' assets to which the liability is linked. Similar concerns will arise if the linking is to a category of investment included on an amortised cost basis. Under either of these scenarios, the profit and loss account would include the movement in the fair value of the liability, but none relating to the linked assets. If the assets and liabilities are not treated on a consistent basis, there is a danger of the insurance company's results being distorted. The proposed improvement to IAS 39 could remove such concerns.

8.3.44 The main advantage of a move to IAS 39 is that the financial statements will provide a more meaningful picture of the year end position. The mixed position regarding where the movement in fair values will be recorded may impede the extent to which individual companies can be compared. However, an individual company's progress over time will be much more transparent than may have been the case historically. By accounting for certain insurance contracts that principally involve the transfer of financial risk (as opposed to insurance risk) under IAS 39, readers can get a better idea of the risk profile of the company and the management of these risks. This will have significant implications for some companies, for example, a UK managed pensions fund company could find the majority of its insurance business no longer disclosed as such.

8.3.45 Overall, we believe that the introduction of IAS 39 within the prudential supervision system offers many advantages. However, it will be important that prudential supervisors are able to apply some restrictions to prevent the increase in surplus assets from being available for distribution. This may mean that the solvency margin requirement needs to be recalibrated to increase requirements on capital and technical provisions. Alternatively, it may be better to develop an alternative calculation of the capital requirement for insurance companies, that considers all the risks to which the insurance company is exposed.

8.4 Joint Working Group of Standard Setters: Draft standard and basis for conclusions on financial instruments and similar items

Background

8.4.1 IAS 39 was a first step towards the requirement to adopt fair value accounting for more financial instruments. The JWG have continued this work and have issued their paper on financial instruments, which recommends that all financial instruments (other than insurance contracts which are within the scope of the proposed insurance standard) are measured at full fair value. This represents a significant change from the IAS 39 requirements, in particular regarding the move to inclusion of financial liabilities at fair value.

8.4.2 It is not expected that any standard based around this paper will be in force by 2005. Accordingly, the implications of the JWG proposals are discussed in outline only. It should be noted that the Steering Committee working on the Insurance Contracts DSOP (see below) have attempted to link their proposals with the JWG recommendations.

8.4.3 The proposed move to full fair value could further increase the volatility in equity and annual results (as the paper recommends that all changes in fair value are included in the income statement).

Measurement of financial instruments

8.4.4 The definition of financial instruments appears to clarify the existing definition in IAS 39 and it does not appear that it widens the scope. Similarly, the exclusions to the standard have no real changes of significance for insurance companies. However, the definition of

fair value has been modified and it is clear that the new definition relates to the exit price[101].

8.4.5 The paper sets out the principles to be adopted for estimating the fair value of financial instruments in a hierarchical structure. Under these proposals:

- the best estimate of fair value is from observable market exit prices for identical instruments;
- if none are available, then market exit prices for similar financial instruments, with appropriate adjustments for differences, should be used as the next best alternative. As stated, the JWG believes that suitable markets exist for most products;
- finally, where there are no observable market prices, fair value should be estimated by using "a valuation technique that is consistent with accepted economic pricing methodologies. Such a valuation technique should incorporate estimates and assumptions that are consistent with available information that market participants would use in setting an exit price for the instrument."[102] Present value concepts are central to the development of valuation techniques.

Application to insurers

Assets

8.4.6 As most investments of insurance companies would be recorded at fair value under IAS 39, the JWG recommendations do not add significantly more volatility to the valuation of assets held by insurance companies. Differences will, however, arise in relation to any assets included at amortised cost under the categorisation system within IAS 39. Areas that may need to be considered further are:

- assets such as fixed rate investments and deposits, which may need to reflect credit risk and interest rate risk;
- mortgage portfolios and loans granted on insurance policies, where values may need to be calculated using models similar to those used by the banking industry.

8.4.7 For assets held to match technical provisions, there should be consistency between the treatment of these items.

Non-insurance liabilities

8.4.8 Financial liabilities would also be required to be included at fair value. This is a significant change from IAS 39, where nearly all liabilities are currently included at amortised cost.

[101] Defined in paragraph 28 of the JWG paper as *"an estimate of the price an enterprise would have received if it had sold an asset or paid if it had been relieved of a liability on the measurement date in an arm's-length exchange motivated by normal business considerations".*

[102] Taken from the summary to the draft standard.

8.4.9 The measurement of financial liabilities such as borrowing would need to take account of the company's own credit assessment[103]. This would result in different amounts recorded dependent on the company's own credit rating. This is seen by many as counter-intuitive, particularly where the changes in fair value are unlikely to affect the company's cash outflows. Prudential supervisors would need to consider whether the effect of this should be reversed for solvency reporting purposes.

Insurance liabilities

8.4.10 It is possible that some current insurance policies, particularly those where there is little insurance risk, may not meet the definition of insurance contracts now proposed by the Insurance Contracts Steering Committee (see below). Instruments not meeting the definition of an insurance contract are likely to have to comply with any standard which results from the JWG paper.

8.4.11 The exclusion for insurance contracts[104] is the same as that used in the IASB Insurance Steering Committee, Issues Paper: Insurance, November 2000 and IAS 32. It is expected that any final fair value standard and the final insurance contracts standard would contain harmonised definitions.

8.4.12 For those contracts that do not meet the exemption criteria, an issue that will need to be addressed is when the insurance company has a 'contractual obligation' to the policyholder[105]. This will depend on the legal environment and what is considered to be a contract.

8.4.13 There may also be difficulty in determining the fair value of these contracts. The Insurance Contracts DSOP proposes a method of valuing insurance contracts. If it is accepted that this can be applied for contracts falling under the JWG paper also, this would appear to avoid these issues.

Hybrid contracts

8.4.14 The JWG paper defines hybrid contracts as *"contracts which have one or more sets of rights and obligations that, if they were separated from the contract, would be accounted for as financial instruments that fall within the scope of this Draft Standard, and one or more sets of rights and obligations that do not fall within the scope of this Draft Standard".*

[103] Paragraph 118 of the JWG paper states "*the estimated market exit price of a financial liability should reflect the effects of the same market factors as the price of a financial asset, including the credit risk inherent in the liability.*"

[104] Paragraph 17 of the JWG paper defines this as *"An insurance contract is a contract under which one party (the insurer) accepts an insurance risk by agreeing with another party (the policyholder) to make payment if a specified uncertain future event occurs (other than an event that is only a change in a specified interest rate, security price, commodity price, foreign exchange rate, index of prices or rates, a credit rating or credit index or similar variable)".*

[105] Paragraph 31 of the JWG paper states that an enterprise should recognise "*a financial liability when, and only when, it has contractual obligations under a financial instrument that results in a liability*".

8.4.15 Insurance contracts with both insurance and non-insurance elements could therefore meet the definition of a hybrid contract. The definition could also capture insurance contracts with embedded options, such as guaranteed conversion rates. It is not totally clear how such contracts would be treated.

8.4.16 The Steering Committee suggests that if the insurance element is included at fair value, then the whole contract would be treated as if it were insurance. If not, the contract would be separated into components with each of its constituent elements subject to different rules. The insurance part would be treated under the Insurance Contracts standard and the non-insurance part treated as if it were a free-standing financial instrument[106]. If the separate sets of rights and obligations in a hybrid contract cannot be reliably identified and measured, than the entire contract would be accounted for in accordance with the JWG paper.

8.4.17 The Insurance Contracts DSOP (see below) addresses this concern by requiring insurance contracts to be valued at fair value if a standard based on the JWG recommendations is in place.

8.4.18 Any options forming part of the contract will need to be treated as an 'embedded option' under the standard. Paragraph 100 of the JWG paper deals with the valuation of embedded options, but paragraph 101 states "*this requirement applies only to the enterprise that holds the option. The writer of the option would report the instrument at fair value based on observed transactions or, if necessary, at an estimate of that value determined by a valuation technique.*" This implies that some form of option pricing model should be used to value all such options written into contracts.

Credit insurance

8.4.19 Credit insurance will fall within the definition of financial guarantees and any such arrangements would be subject to the requirements of this paper. A decision will need to be reached as to whether credit insurance would be better falling under any insurance contracts standard or under the financial instruments standard, with definitions drafted accordingly. The Steering Committee has expressed its preference for credit insurance to fall within a financial instruments standard.

[106] Paragraph 74 of the JWG paper.

Key differences between IAS 39 and the JWG proposals

8.4.20 A summary of the key differences between IAS 39 and the JWG proposals is summarised below:

Comparison of IAS 39 and JWG proposals

Category	IAS 39	JWG proposals
Definition of fair value	Similar to market value in an arm's length transaction, using bid price for an asset held or liability to be issued and offer price for an asset to be acquired or liability held.	Market exit price. Hierarchy exists for estimating fair value. Preferred approach is to use the market exit price of: ■ the instrument itself ■ an identical instrument ■ a similar instrument ■ a valuation technique
Financial assets	Amortised cost or fair value depending on classification. Likely bases for insurers are: ■ investments - fair value ■ cash deposits - amortised cost ■ mortgage and policy loan portfolio - amortised cost.	All financial assets included at fair value, with movements taken through the profit and loss account. Use of present value calculation models for valuation of mortgages and loans.
Financial liabilities	Apart from liabilities arising from trading activities, all financial liabilities are included at amortised cost.	All liabilities included at fair value, with movements taken through the profit and loss account. Borrowings will no longer be stated at face value.
Insurance policies not within the scope of the Insurance Contracts standard	Amortised cost.	Fair value – concerns regarding use of models on a portfolio basis. Existing models may be able to be used, but using realistic assumptions, including market data where available.

Hybrid instruments	Only derivatives classed as a hybrid are measured at fair value, with movements taken through the profit and loss account.	Definition extended to include all financial instruments that are embedded in another instrument. These are all required to be measured at fair value. Items newly caught include various policyholder options built into insurance contracts.
Own debt	Amortised cost.	Fair value, including an assessment of the company's own credit risk.
Source: KPMG		

8.4.21 Overall, the move from IAS 39 to the use of full fair values will further increase the volatility of assets, liabilities and reported profits. The JWG were aware of this consequence but felt that where volatility does exist, the reported results should reflect this.

Effect on solvency

8.4.22 As shown in the table above, there are significant implications of a move to full fair value accounting, particularly on the liability side of the balance sheet. The implications for solvency of the assets side are virtually unchanged from that set out in the IAS 39 summary and so are not repeated here.

8.4.23 On the liability side, the move to full fair value will mean that the recorded liabilities for contracts not caught by the insurance standard will reduce, due to the use of realistic, as opposed to prudent, assumptions. This will, at least, have the benefit of allowing the extent of mismatch of investments and liabilities to be more clearly seen, particularly if the Insurance Contracts standard also proceeds with a recommendation of fair value type valuations of insurance contracts.

8.4.24 In addition, other liabilities such as bank borrowings and debt securities issued by the firm will be restated as a result of taking other factors such as interest rate risk and credit risk into account. Accordingly, any subordinated debt that currently counts towards the solvency margin will also change in value and become volatile reflecting market conditions. More importantly, all debt issued by the company will need to take account of the insurer's own credit risk.

8.4.25 Working on the premise that these changes would be reflected in the regulatory reporting, these changes would have major implications on solvency – not only on the calculation of the solvency margin requirement, but also on the magnitude of the excess of solvency over that number. This will arise due to the greater allowance for various risks in the pricing of assets and liabilities that have not previously been taken into account. Both of these measures will become much more volatile in a full fair value regime, and this may make it more difficult to assess whether an insurance company is experiencing difficulty.

8.4.26 We believe that the current prudential supervision regime regarding the calculation of the solvency margin requirement may need to be amended to reflect the accounting change to include all financial assets and liabilities on a fair value basis. We believe a new system will need to be devised that takes account not only of insurance risk, but also the wider risks to which the insurer is exposed. This would enable the accounting changes and the capital requirements to move in harmony with each other.

8.5 Development of an International Financial Reporting Standard on Insurance Contracts

8.5.1 The Insurance Steering Committee published its Issues Paper in December 1999. This has now been superseded by the Draft Statement of Principles (DSOP) which the IASB began discussing in November 2001 and is still deliberating. All but two chapters (Chapter 7: Performance-linked insurance contracts, Chapter 13: Presentation) have been published on the IASB website. The board's decisions will form the basis for an exposure draft, tentatively scheduled for release in late 2002.

8.5.2 As a working hypothesis to guide its further work, the Board has agreed in broad terms with the principles in chapters 1 and 2 of the DSOP. However, the Board has not yet reached a decision that the asset/liability approach should be adopted for insurance contracts. As subsequent chapters in the DSOP are based on the asset/liability model, this is a key decision.

8.5.3 We consider a number of areas that may raise particular concerns for prudential supervisors in their supervision of the financial position of insurance companies. We also consider the potential implications, on both reported balance sheet numbers and on solvency.

8.5.4 The Steering Committee seeks to differentiate insurance contracts from other financial instruments held by insurance companies, which it believes should be dealt with by IAS 39 or any successor standard on financial instruments. As a result, our considerations of financial instruments under both IAS 39 and the Joint Working Group recommendations will not be changed by the proposed insurance contracts standard. The insurance contracts project does address all aspects of assets and liabilities arising from insurance contracts and has significant implications for future reporting in the financial statements. The recommendations also address the treatment of reinsurance contracts, so whilst the greatest impact will be on the liabilities side of the balance sheet, the assets side of the balance sheet will also be affected.

8.5.5 The use of different rules for financial statements and solvency purposes may mean that some of the changes proposed will not affect the solvency reporting requirements. However, where possible we have given an indication of whether the proposed change is likely to increase or decrease the current valuations.

8.5.6 The disclosure proposals have not yet been finalised, and this chapter of the DSOP has not been considered by the Board. We do not perceive that changes in reporting format would have a significant effect on either the valuation of assets or technical provisions. However, since the solvency margin requirement for non-life business is based on premiums and claims information under present rules it is important that this information

is still available, although this would not be important if the solvency monitoring system is amended.

Definition of insurance contracts

8.5.7 The definition of an insurance contract has been amended, in principle 1.2, to the following:

8.5.8 *"An insurance contract is a contract under which one party (the insurer) accepts an insurance risk by agreeing with another party (the policyholder) to compensate the policyholder or other beneficiary if a specified uncertain future event (the insured event) adversely affects the policyholder or other beneficiary (other than an event that is only a change in one or more of a specified interest rate, security price, commodity price, foreign exchange rate, index of prices or rates, a credit rating or credit index or similar variable)."*

8.5.9 This is a refinement of the definition currently used in IAS 32 and IAS 39. This has been done to recognise that it is the element of risk and uncertainty in insurance contracts that lead to accounting difficulties. One of the integral parts of this definition is that the contract must contain insurance risk[107]. Insurance risk is defined as "*risk other than financial risk*"[108].

8.5.10 In order to qualify as an insurance contract, principle 1.3 of the DSOP sets out a qualitative and quantitative test that needs to be passed[109].

8.5.11 This revised definition is likely to mean that some (in the Steering Committee's view, *"a significant proportion*"[110]) contracts that have the legal form of insurance contracts will no longer be treated as such, because there is either no or only minimal insurance risk. This could apply, for example, to "*many life insurance contracts in which the insurer bears little or no mortality risk, some group life or motor contracts in which the policyholder bears all the insurance risk through experience rating mechanisms, and many financial reinsurance contracts[111]".*

[107] Paragraph 1.24 of the DSOP provides guidance on insurance risk, that "*at least one of the following is uncertain at the inception of the contract: (i)whether a future event specified in the contract will occur; (ii) when the specified future event will occur; or (iii) how much the insurer will need to pay if the specified future event occurs*."

[108] Paragraph 1.28 of the DSOP, which goes on to say that "*Financial risk is the risk of a possible future change in one or more of a specified interest rate, security price, commodity price, foreign exchange rate, index of prices or rates, a credit rating or credit index or similar variable*".

[109] "*A contract creates sufficient insurance risk to qualify as an insurance contract if, and only if, there is a reasonable possibility that an event affecting the policyholder or other beneficiary will cause a significant change in the present value of the insurer's net cash flows arising from that contract. In considering whether there is a reasonable possibility of such significant change, it is necessary to consider both the probability of the event and the magnitude of the event*."

[110] Paragraph 1.31 of the DSOP.

[111] Paragraph 1.31 of the DSOP.

Asset/liability model

8.5.12 The Steering Committee intends to follow the principles set out in the IASB Framework in determining the policy recommended for accounting for insurance contracts. It proposes the use of the asset/liability model in preference to the deferral and matching model presently in use. This means that only insurance assets and liabilities that meet the IAS Framework's definition and recognition criteria can be recognised.[112] Accordingly, some balance sheet items, for example the deferred acquisition costs asset and catastrophe and equalisation provisions, will no longer be permitted to be recognised as they fail to meet the definitions of assets and liabilities set out in the Framework[113]. This will clearly affect the net assets of the company.

8.5.13 Insurance assets and liabilities are therefore recognised when contractual rights and obligations under insurance contracts exist. In accordance with principle 2.2[114], this is assessed on an individual contract-by-contract basis of contracts in force at the reporting date. However, the measurement of recognised insurance assets and liabilities is based on books of insurance contracts (see below). It should be noted that most reinsurance contracts do not extinguish the cedant's contractual obligations under the direct insurance contract and accordingly, the cedant's direct insurance liability will remain on the balance sheet.

Valuation of insurance contracts

8.5.14 The key valuation principles included in the DSOP are as follows:

- use of a prospective valuation basis (fair value or entity-specific);
- calculations on an expected present value basis;
- use of explicit assumptions;
- limited links with assets;
- consideration of future renewals under certain conditions;
- provisions to be based on a book of like contracts;
- use of discounting;
- provision for risk and uncertainty;

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[112] Paragraph 49 of the Framework defines an asset as a *"resource controlled by the enterprise"* and a liability as a *"present obligation of the enterprise arising from past events, the settlement of which is expected to result in an outflow from the enterprise of resources embodying economic benefits."*

[113] Principle 4.10 requires that "*an insurer should not recognise catastrophe provisions relating to possible future claims beyond the end of the contracts included in the closed book. Similarly, an insurer should not recognise equalisation provisions to cover random fluctuations of claims expenses around the expected value of claims*" and principle 4.11 requires that "*acquisition costs should be recognised as an expense when they are incurred*".

[114] An insurer "*should recognise (i) an insurance asset when, and only when, it has contractual rights under an insurance contract that result in an asset; and (ii) an insurance liability when, and only when, it has contractual obligations under an insurance contract that result in a liability*". For this purpose, principle 2.2 defines insurance assets and insurance liabilities as "*assets and liabilities arising under an insurance contract*".

- single valuation basis for life and general insurance.

8.5.15 Each of these areas are considered below.

Prospective valuation basis

8.5.16 The DSOP proposes the use of a prospective valuation basis (which focuses on the future cash inflows and outflows from the current book of insurance contracts at the calculation date), as this provides more informative performance reporting, as changes in circumstances are reported more quickly.

8.5.17 One consequence is that an insurer will report a net profit or loss on initial recognition of an insurance liability if the measurement of that insurance liability differs from the initial premium paid by the policyholder less acquisition costs. The Steering Committee considered whether some form of deposit floor should be applied, for example to prevent insurance contracts from being recognised as an asset, but concluded that this was not required.

Fair value or entity-specific basis?

8.5.18 The Steering Committee considered two main alternative approaches to valuation - a fair value[115] approach (using market estimates) and an entity-specific[116] approach. Both entity-specific and fair value valuation bases are prospective valuation bases. The main difference is that in the entity-specific model the liability is established by considering the transactions between the policyholder and the company over the policy term (reflecting the actual experience of the company) whereas the fair value model requires an estimate of the immediate assignment value with a third party. The definition of entity-specific value is not dissimilar to the Financial Accounting Standards Board, (U.S) description, except that no consideration is made of the insurer's own credit standing[117]. The Steering Committee recognises that conceptually, fair value should reflect the insurer's own credit standing, but has not concluded on whether this should be included or not.

8.5.19 The Steering Committee recommends that the basis applied should be consistent with the measurement basis adopted for the insurer's assets, i.e.:

- while IAS 39 is still in existence, the use of entity-specific bases for valuing insurance liabilities and assets;
- if IAS 39 has been replaced by a standard requiring fair value measurement for the substantial majority of financial assets and liabilities, the use of fair values for measuring insurance liabilities and assets.

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[115] Fair value is defined in principle 3.1 as "*the amount for which an asset could be exchanged or a liability settled between knowledgeable, willing parties in an arm's-length transaction. In particular, the fair value of a liability is the amount that the enterprise would have to pay a third party at the balance sheet date to take over the liability*".

[116] Entity-specific value is defined in principle 3.3 as "*the value of an asset or liability to the enterprise that holds it, and may reflect factors that are not available (or not relevant) to other market participants. In particular, the entity-specific value of a liability is the present value of the costs that the enterprise will incur in settling the liability with policyholders or other beneficiaries in an orderly fashion over the life of the liability*".

[117] Principle 4.8 of the DSOP.

8.5.20 It is not clear whether the Board will accept the Steering Committee's conclusions in Chapter 3. The Board has decided that given the traditional approach to performance reporting (deferral and matching) and the asset/liability approach differ not only in presentation format but more fundamentally with respect to when profit or loss from insurance contracts should be recognised they need to spend more time considering the associated issues.

Expected present value basis

8.5.21 Principle 4.1 states that *"the starting point for measuring insurance assets and insurance liabilities should be the expected present value[118] of all future pre-tax cash flows arising from the contractual rights and obligations associated with the closed book of insurance contracts"*. The reference to 'starting point' is because this does not address any adjustments that could be made to cash flows to reflect risk and uncertainty (see below).

8.5.22 Accounting estimates of present values have traditionally been deterministic in nature in that they discounted a single point estimate of the most likely cash flows. The DSOP proposes a move to a stochastic approach, capturing the full range of possible outcomes. To be consistent with IAS 37 (Provisions, Contingent Liabilities and Contingent Assets), an insurer should also consider any constructive obligation arising from informal practices[119]. Any differences between actual experience and earlier assumptions are recognised as they arise, so that the liability at any given time is the best estimate of the current value of the insurer's obligations.

8.5.23 The Steering Committee believes that relatively simple modelling may give a reasonable approximation in many cases, without the need for a large number of detailed simulations. This will aid smaller entities who might otherwise find this cost prohibitive.

Use of explicit assumptions

8.5.24 The DSOP requires an explicit approach to assumptions[120]. Accordingly, the valuation bases is likely to be based on gross premium (i.e. based on total premium inflows with separate, explicit deductions for estimated future expenses) rather than net premium methods. Such methods provide greater transparency and produce estimates that should be more understandable.

8.5.25 Where available, both fair value and entity-specific valuations should take account of market estimates, such as interest rates. Company-specific items, such as expenses and mortality experience, should be based on the company's experience for both fair value and entity-specific valuations, except where there is "*contrary data indicating that market participants would not use the same assumptions as the insurer*", in which case, fair value should reflect that market information.[121] Any cash flows that would only arise in the entity itself should be excluded from the fair value of the insurance assets and liabilities.

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[118] The DSOP requires expected present value to be calculated as "*the estimate probability-weighted arithmetic average of the present values arising from each scenario, without considering any adjustment for risk and uncertainty*".

[119] Paragraph 4.21 of the DSOP.

[120] Principle 4.4 requires expected present values to be based on "*reasonable, supportable and explicit assumptions*".

[121] Principle 4.5 of the DSOP.

Link with assets

8.5.26 As explained in the IAS 39 section above, it is not totally clear how performance linked assets and liabilities should be treated. The draft DSOP has addressed this issue and requires that the "*value of insurance liabilities should not be affected by the type of assets held or by the return on those assets (unless the amount paid to policyholders is directly influenced by the return on specified assets, as with certain performance-linked contracts)*"[122].

8.5.27 Even though future cash flows from investments are not taken into account in measuring non-performance-linked contracts, the prospective valuation bases proposed require recognition of both the future cash inflows from explicit management charges that will be levied on policyholders under the insurance contract and the cash outflows incurred by the insurance company for the management of those investments[123].

Future renewals

8.5.28 In assessing the future cash flows arising from the current portfolio, an assessment is needed of the extent to which future policyholder receipts should be taken into account. Future renewals should only be included to the extent that "*policyholders hold uncancellable renewal options that are potentially valuable to the current policyholder. A renewal option is potentially valuable if, and only if, there is a reasonable possibility that it will significantly constrain the insurer's ability to reprice the contract at rates that would apply for new policyholders who have similar characteristics to the holder of the option*".[124]

8.5.29 The guidance provided confirms that contracts containing surrender penalties should be treated as having such a valuable option, as it may affect the policyholder's decision as to whether or not to surrender the contract. To the extent that such potentially valuable options exist, future cash flows under the existing contracts will include all cash flows arising until the end of the period affected by the valuable renewal option.

Unit of account

8.5.30 The impact of risk and uncertainty will to some extent depend on the size of the book to which it is applied. Principle 5.5 sets out the unit of account to be applied. This requires that "*measurement of insurance contracts should focus on books of insurance contracts that are subject to substantially the same risks, rather than on individual insurance contracts. Measurement of the book of contracts should reflect all benefits of diversification and correlation within that book of contracts (to the extent that they are readily determinable), but should not reflect the benefits of diversification and correlation outside that book of contracts.*" This has been modified slightly from the measurement criteria proposed in the Steering Committee's earlier Issues Paper.

8.5.31 Thus, although the decision as to whether to recognise or derecognise an insurance contract is made on an individual policy basis, valuation is to be done on a portfolio basis.

[122] Principle 3.2 of the DSOP.
[123] Paragraph 4.78 of the DSOP.
[124] Principle 4.2 of the DSOP.

Discounting

8.5.32 Principle 6.1 proposes that the starting point for determining the discount rate should be a risk-free rate, and that this is adjusted to reflect risks not reflected in the cash flows from the insurance contracts. General practice, where discounting does take place, is to use an appropriate rate based on the yield on the assets held. Chapter 4 includes discussion of current practices of discounting technical provisions and the selection of discount rates.

Provision for risk and uncertainty

8.5.33 Principle 5.1 requires that both the entity-specific and fair values of insurance liabilities and assets should always reflect risk and uncertainty. Guidance is provided that risk and uncertainty "*refers to a two-tailed probability distribution, in which the outcome may be either more favourable or less favourable than the expected value*"[125]. The adjustment for risk and uncertainty should be unwound over time as the insurer is released from risk.

8.5.34 The Steering Committee would prefer that such an adjustment be made in the cash flows, although alternatively it can be in the discount rate applied.[126] The DSOP does not preclude use of a combination of the two methods, provided there is no double counting.

8.5.35 The Steering Committee has not provided guidance on how the provisions for risk and uncertainty can be determined where there is no deep or liquid market. An international actuarial committee has recently been established to consider developing guidance in this area.[127] It is important to recognise that companies should ideally have systems which can be used to determine the provisions for risk and uncertainty in order to price new business. The lack of such systems in most insurance companies internationally supports observations made in the study that risk assessment and measurement systems are generally not well developed and are still evolving.

Single valuation basis

8.5.36 The Issues Paper originally proposed that the accounting model for general insurance and life insurance contracts should be separate but based on the same underlying principles. The DSOP has moved away from this and now proposes that "*there should be a single recognition and measurement approach for all forms of insurance contracts, regardless of the type of risk underwritten*"[128]. Such an approach aids comparability and removes any difficulty in deciding whether a particular insurance contract is better described as a general or life contract.

Other matters

8.5.37 There are a number of other matters covered by the DSOP, of which the following points are felt to be the most relevant to this study.

[125] Paragraph 5.5 of the DSOP.
[126] Principle 5.2 of the DSOP.
[127] Within the IAA, an IAS Insurance Accounting Standard committee has been established. A sub-group is tasked with drafting a set of actuarial standards covering those areas where detailed guidance is not expected to be provided within the accounting principles.
[128] Principle 2.1 of the DSOP.

Embedded derivatives

8.5.38 Principle 1.6 of the DSOP proposes that insurance companies "*should not account separately for the components of an insurance contract that bundles together:*

a) an insurance element and a non-derivative investment element; or
b) an embedded derivative and a host insurance contract".

8.5.39 This differs from the current requirement under IAS 39 (and the JWG recommendations) (see above). At its November 2001 meeting, the IASB accepted this principle as a working hypothesis given the proposal in chapter 3 of the DSOP for measurement at entity-specific or fair value. Principle 5.6 addresses the valuation criteria to be applied to the non-insurance elements of such contracts. This requires option-pricing models to be used to measure options and guarantees contained in insurance contracts.

Recommendations regarding other IAS

8.5.40 Where some of the participating net assets are valued at other than fair value, the DSOP proposes that the *"policyholders' effective interest in such assets should be measured on the basis of the carrying amount of those assets, rather than their fair value"*[129] to avoid the creation of a mismatch. In order to limit the extent of such assets, the DSOP proposes that insurers should exercise their option to use fair values under IAS 40 (Investment Property) and IAS 16 (Property, Plant and Equipment).

Options

8.5.41 Where a contract contains a guarantee in either absolute terms, or set by reference to an external index or other variable, it is not a performance-linked contract as there is no obligation on the insurer to hold the corresponding assets, those guarantees are a form of option which should be valued using option-pricing models.

Reinsurance

8.5.42 There is little change to the existing requirements. The need to assess the level of insurance risk will be essential in determining the accounting treatment to apply to financial reinsurance contracts. Where there is no "*reasonable possibility*" that this could "*cause a significant change in the present value of the insurer's net cash flows from the contract*", it will not be able to be classified as an insurance contract. Instead, it would probably need to be treated as a loan originated by the insurer under IAS 39.

Performance-linked contracts (chapter 7)

8.5.43 Chapter 7 of the DSOP introduces the term 'performance-linked contracts'. This chapter has not yet been finalised, and is due to be one of the last chapters to be published on the IASB website. Accordingly, we have not considered these in this study.

[129] Paragraph 7.47 of the DSOP.

Effect on technical provisions

Scope

8.5.44 The main intention of the DSOP is that the accounting for insurance contracts should follow their substance, rather than their legal form. As discussed, this will lead to the potential removal of some insurance contracts (both life and general insurance policies) from the scope of the proposed standard. Those contracts falling outside the scope will be subject to the accounting under IAS 39 (or any successor standard) discussed earlier in this chapter.

8.5.45 As the contracts falling outside the scope of the DSOP have little or no insurance risk, the question also arises of where these would be included in the balance sheet. The substance of most of these contracts tends to be that they contain significant elements of investment or financing, are more akin to deposit accounts or relate to contracts for administration services. It is our view that such contracts would need to be excluded from technical provisions in the balance sheet. Careful consideration will be needed as to whether this treatment should also be reflected in the regulatory returns submitted to prudential supervisors.

8.5.46 As the relative scale of insurance risk is the main determinant of the accounting to be followed, a key issue for supervisors will be their ability to assess the different levels of risk that exist in particular contracts.

Valuation

8.5.47 The DSOP proposes that insurance assets and liabilities are calculated using a prospective valuation basis and explicit assumptions. This includes the use of option-pricing models to value any guarantees, options or similar items included in the policy terms. The definitions of insurance assets and liabilities are based on the definitions in the IAS Framework. This will mean that some insurance assets and liabilities currently included in the financial statements (most notably, deferred acquisition costs asset and catastrophe and equalisation provisions) will no longer be recognised.

8.5.48 In order to limit the extent of mismatch between the valuation of insurance contracts and other parts of the balance sheet, the DSOP proposes that the valuation basis should be based on entity-specific assumptions whilst IAS 39 is still in force, but that a fair value basis should be applied if a successor to IAS 39 recommends the use of fair values. It also recommends that various options in other standards (investment property and property, plant and equipment) should be compulsory in order to move more of the balance sheet onto a fair value basis.

8.5.49 The use of best estimates and provision for risk and uncertainty on a discounted basis is likely, initially, to lead to a reduction in the recorded liabilities in relation to policyholder contracts and the removal of excessive prudence currently applied in arriving at the valuations. However, inclusion of a provision for risk and uncertainty (based on the market perception of risk and uncertainty) will retain an element of prudence.

8.5.50 The DSOP recommends that a best estimate approach is adopted in setting the assumptions, requiring all possible scenarios to be considered, rather than the use of a single point estimate as mainly occurs now.

8.5.51 Catastrophe provisions would be excluded if based on explicit assumptions and the closed book approach suggested, and equalisation provisions would not be permitted. Removal of these items could result in companies being exposed to significant claims arising that are 'out of the norm'. Variances in claims development and catastrophe situations in respect of the closed book of policies, are considered as components of the provision for risk and uncertainty. However, this provision should not be seen as a replacement for the equalisation and catastrophe provisions.

8.5.52 The valuation of insurance contracts that will fall under IAS 39 is outlined above. IAS 39 requires almost all financial liabilities to be included at original cost less any amounts repaid and any amortisation. However, insurance liabilities relate to the acceptance of risk, whereas the IAS 39 definition relates more to liabilities that arise in connection with transactions in assets and as such, a cost based valuation basis does not seem appropriate for insurance liabilities.

8.5.53 There could be tax implications arising from a change in treatment, particularly where there is a different methodology for assessing the tax liability of an insurance company than applies to the generality of companies. Any change in the calculation of technical provisions, release of hidden reserves, reclassification of insurance contracts and non-inclusion of deferred acquisition cost assets and equalisation provisions could have an effect on the taxation charge.

Effect on solvency

8.5.54 Overall, the changes proposed are likely to reduce the level of prudence currently included in the valuation of technical liabilities within the financial statements. The use of reasonable, supportable and explicit assumptions, including market information where available, is likely to lead to increased volatility in recorded technical provisions. However, this information should be more meaningful to readers of the accounts, as it will reflect the actual situation at the year-end, rather than being based on known prudent assumptions.

8.5.55 The combination of higher asset values and lower technical provisions and a reduction in premiums and claims will mean that traditional measures of solvency will not be appropriate, although it may be possible to cover the latter through the addition of additional margins in the solvency calculation.

8.5.56 Prudential supervisors will need to assess whether the valuation bases proposed should also be adopted in the regulatory reporting for solvency purposes. We believe that the advantages of doing so outweigh the disadvantages. The main disadvantages to following the same treatment are the volatility that will arise in the reported numbers from year to year and the subjectivity that may exist in some of the assumptions. Apart from the obvious cost saving of not having to perform two different valuations, the main advantages of adopting the same bases can be summarised as:

- the use of a prospective valuation basis means that all cash flows arising from the insurance contracts are recognised;

- all assumptions are explicit, and the use of market based assumptions where available will increase consistency of valuation bases across different insurers;
- the discounting of liabilities at a risk-free rate compared with the fair value of financial assets will enable the extent of mismatch to be more easily determined;
- the use of explicit values, combined with disclosure of the range of possible outcomes, will enable a better understanding of the risk profile of the insurer and the extent to which the company is placed to deal with any risks that may crystallise;
- the explicit valuation of guarantees and options will prevent these from being ignored while they are 'out of the money'.

8.5.57 Consideration will be required as to whether insurance contracts no longer treated as such should be included on the same or a different basis for prudential supervision purposes.

- If they are treated on the same basis for prudential supervision purposes, then under the existing system, the solvency margin requirement will most likely decrease (apart from general insurance business in run off). This may mean that additional requirements, calculated on a different basis to reflect the different risk profile, may need to be imposed for the purposes of prudential supervision;
- if they are brought back into the calculation of the solvency margin requirement, then a decision will be needed as to whether the amounts should be included at their accounting value (derived from IAS 39) or whether they should be restated to the basis currently applied.

8.5.58 We believe that traditional solvency measures will not be relevant for determining the appropriate level of capital required in respect of insurance contracts (especially for those that are no longer part of technical provisions). These measures are based on limited aspects of insurance risk, and all other risk factors are ignored. Our preference would be for an alternative calculation based on the risks to which the contracts are exposed (such as credit risk, interest risk, mismatch risk) to be determined. It will be important to ensure that such a risk based solvency system is able to cope with the volatility that will exist in net assets.

8.6 Likely impact of the financial instruments and insurance contracts proposals on solvency

8.6.1 The changes discussed above reflect changes expected in the general accounting requirements. This does not necessarily need to be reflected in the solvency reporting. However, to the extent that the same changes are made to the regulatory reporting used for prudential supervision, the potential effect on solvency can be considered. As discussed above, the benefits of doing so may well outweigh the disadvantages.

8.6.2 The rest of this section assumes that the accounting changes are reflected in the reporting to prudential supervisors.

Assets

8.6.3 Under the existing EU Directives, the solvency margin requirement is calculated by reference to premiums and claims (non-life business) and policyholder liabilities (life

business). The changes to asset valuations discussed above will therefore have no effect on the calculated solvency margin requirement of either life or non-life business (under the current system). Asset valuations will, however, affect the margin of solvency over that calculated amount.

8.6.4 There is currently no consistent method of valuation applied to assets throughout Europe. For those countries that currently include assets in the solvency assessment at cost, for example France, a move to full fair values would result in higher asset valuations (in general) and increased volatility of the margin of surplus over the solvency margin requirement. Any implicit capital requirement built into asset valuations will therefore be removed on first compliance with IAS.

8.6.5 If the asset liability model replaces the deferral and matching model, no allowance will be able to be made for deferred acquisition costs.

Liabilities

8.6.6 The liabilities side is more critical to considerations of the effect on solvency, because changes in the policyholder liabilities will have a direct effect on the calculation of the solvency margin requirement for life business and an indirect effect on the calculation for non-life business. The effects of this on solvency are documented in the Insurance Contracts DSOP (see above) and are not repeated here.

Summary

8.6.7 The combined effects of the changes discussed in this chapter can be summarised as follows:

Summary of overall effects of IAS 39, JWG recommendations and the Insurance Contracts DSOP

Financial assets	■ Under the current IAS 39, most investments will be at fair value, but held-to-maturity investments and other loans and receivables originated by the enterprise will be at amortised cost. For the main category of investments that are fair valued, there is an option of whether to take the movements in fair value to profit and loss account or equity. ■ All included at fair value under JWG recommendations, with all movements in fair value taken to the profit and loss account. ■ In either case, the implicit capital requirement that is built into the solvency regime though the prudent valuation of investments by some countries will be lost.

Financial liabilities (IAS 39/JWG)	■ IAS 39 – apart from short-term items relating to trading activities, all are included at amortised cost, so little effect on solvency regime. ■ All at fair value under JWG recommendations. This includes taking account of own credit rating in assessing own debt (and debt securities) issued. Accordingly, this will impact on the magnitude of any subordinated debt counted towards the solvency margin requirement. ■ Neither IAS 39 nor the JWG recommendations address the issue of performance linking. It is not clear how any insurance contracts falling outside the insurance contracts DSOP would be treated. For this reason, the DSOP proposes that its recommendations for performance-linked contracts are also applied to any insurance contracts that fall outside its scope.
Insurance contracts (Insurance Contracts Standard)	■ Some insurance contracts will cease to be treated as such, and will instead fall under IAS 39/JWG proposals. In either case, this will reduce the reported technical provisions, premiums and claims, with consequential effects on the calculation of the solvency margin requirement. ■ Technical provisions will be calculated on an expected value basis (through consideration of the full range of possible outcomes) based on realistic assumptions (as opposed to prudent assumptions) and a prospective valuation basis. Stochastic techniques therefore need to be applied. This is likely to lead to a significant reduction in recorded amounts. It will also bring more volatility into the reported numbers due to the use of current best estimate assumptions. ■ Where insurance contracts include any option-type features, option-pricing models should be applied to these elements. This does not mean that the insurance contract should be unbundled into its constituent elements. ■ The DSOP does not permit any deposit floor to be applied in the valuation of insurance liabilities. Accordingly, an asset may be able to be recognised on the initial sale of an insurance contract.
Solvency margin requirement calculation	■ This will be reduced through the exclusion of certain insurance policies from the definition of insurance contracts. ■ The use of best estimate technical provisions based on realistic assumptions will remove prudence from these numbers and increase their volatility. This volatility will be reflected in the calculation of the solvency margin requirement.

Effect on margin of solvency	■ Assets – increased volatility and prudence removed (for some countries). ■ Technical provisions – prudence removed and exclusion of some contracts altogether. ■ Other liabilities – no significant change under the current IAS 39, but volatile under JWG due to inclusion at fair value. Recommendations of DSOP will remove some assets and liabilities from the balance sheet. ■ Overall, there will be increased volatility throughout the balance sheet. This has knock-on implications to the calculation of the solvency margin requirement, which will also therefore become volatile. This will mean that the margin of solvency is unlikely to be comparable over time and unless the regime is revised, this is unlikely to be a good indicator of an insurer's true solvency position.
Source: KPMG	

8.7 Conclusions

8.7.1 As discussed in the introduction to this chapter, accounting is fundamental to any solvency system as accounting requirements drive the net assets position in the financial statements which is the starting point for the solvency system[130]. Under the current solvency system, changes in accounting rules for technical provisions will also impact on the calculation of the solvency margin requirement.

8.7.2 Preparing financial statements in accordance with IAS as described in this chapter will provide greater transparency and more useful information to users, with technical provisions based on explicit assumptions, current information and best estimate information. It will also reduce the inconsistencies in the valuation of assets and liabilities that currently exist in Member States. However, this study is concerned with prudential supervision, and the key question that will need to be addressed is the extent to which accounting changes should be replicated in the assessment of insurers' solvency position.

8.7.3 Currently, in considering solvency, many prudential supervisors have adopted requirements in excess of those set out in the Third Life Directive. This may cause difficulties in assessing the relative financial strength of insurance companies across the EU, and of different insurers within a group. With the growth in global financial groups, there may be advantages to harmonising the approach to prudential supervision. Removal of the many options by use of IAS compliant regulatory returns may be a means of achieving this.

8.7.4 Use of IAS within the solvency system would mean that most financial assets would be included at fair value (although use of amortised cost for some bond portfolios could still

[130] This assumes that most solvency systems work on the basis of net assets (determined in accordance with regulatory requirements) less capital requirement = margin of solvency.

occur). The insurance contracts DSOP recommendations on the use of entity-specific or fair value methodology for determining technical provisions have been drawn to match the valuation rules of other financial instruments as closely as possible. Compliance with IAS will therefore enable the extent of mismatch of assets and liabilities to be clearly seen.

8.7.5 Some subjectivity will be included in the determination of technical provisions, which will be the case with any system. The DSOP recommendations for prospective valuations on reasonable, explicit assumptions and best value estimates will ensure that the full range of possible outcomes is considered. Whilst the provisions are 'best estimate' numbers, a higher percentage of possible outcomes can be allowed for through the provision for risk and uncertainty. Prudential supervisors will need to assess the level at which this is set (that is, how much of the probability distribution curve should be covered when monitoring insurers' solvency). There is currently a lack of guidance on how provisions for risk and uncertainty should be determined, particularly in the absence of a deep and liquid market. An international actuarial committee has been established for this purpose.

8.7.6 Adoption of IAS within the solvency system will remove a certain amount of implicit capital that currently exists in the valuation of both assets and technical provisions. It is important to recognise that the actual solvency position of the company will not necessarily be affected merely through changes in accounting requirements, but a mechanism needs to be determined to replace these implicit amounts of capital with an explicit capital charge. This will require some amendment to the existing solvency system requirements to ensure that capital required to be maintained is not distributed.

8.7.7 In addition, IAS 39 and the DSOP may result in some items currently included in technical provisions being reclassified. This will mean that the current formula used for calculating the solvency margin requirement will no longer capture any risks associated with these contracts, unless they are moved back to technical provisions for solvency monitoring purposes. This may not be a sustainable position in the longer term as these items, by definition, are not subject to significant insurance risk. A solvency requirement calculated based on insurance risk for such contracts does not therefore seem the best capital measure. A better method would be to base the capital requirement on the risks to which these contracts are exposed, such as interest risk, credit risk and operational risk. In the shorter term it may be possible to base the capital requirements for such products on the Basel Pillar I approach, on the assumption that these may be regarded as 'banking' products.

8.7.8 It would be possible to replace the current system with a system that considers all the risks to which an insurer is exposed. This could involve some form of risk based capital system. Such a system has the advantage that all the capital requirements are captured in one explicit figure, which could then be compared with the net assets as disclosed in the financial statements. This could result in greater alignment between financial statements and regulatory reporting and could lead to improved consistency and comparability between different companies and Member States. Supplementing the financial statements by increased disclosure of the risks faced and how they are dealt with within the model would enhance the information provided to supervisors.

9 Use of rating agencies and market mechanisms

9.1 Terms of reference

9.1.1 *"Analysis of the potential assistance that supervisors could obtain from rating agencies. The possible role of market mechanisms to facilitate prudential supervision (e.g. issuing a certain amount of subordinated debt to establish a market rating) should be analysed and commented upon."*

9.2 Introduction

9.2.1 This chapter focuses on the potential use of ratings and market mechanisms in prudential supervision.

9.2.2 There are two types of rating that may be of potential assistance in prudential supervision:

- the financial strength rating of the insurance company;
- the capital issues rating of debt securities.

9.2.3 The objective of all the financial strength ratings is to indicate the financial capacity of the insurance company to meet its liabilities under policyholder contracts. Therefore, the rating is, prima facie, directly relevant to protection of policyholders through solvency and hence prudential supervision. The ability to pay claims is a critical consideration in deciding to insure with a particular company.

9.2.4 Financial strength ratings are widely used:

- by independent financial advisers, as one factor in deciding which company's product is suitable for a prospective policyholder;
- by insurance brokers in deciding with which company to place its business;
- by corporate buyers of insurance;
- for reinsurance security assessment by cedants;
- by investors and banks as a source of information in assessing credit risk.

9.2.5 Ratings are either requested on a voluntary basis by the insurance company being rated or by a third party. Where third parties have requested a rating, for example by an insurance broker in deciding where to place its risk, the ratings are performed based on publicly available information only. However, where an insurance company requests the rating (voluntary rating) considerable additional qualitative and quantitative information provided by management is analysed (interactive rating).

9.2.6 Insurers place high importance on their rating as it ultimately determines the financial market's perception of their financial strength and ability to meet policyholder liabilities and hence affects their competitive position. The amount of capital they need will be determined by the amount of capital necessary for the minimum rating they would like to receive. A downgrading of an insurance company rating can result in falls of new business which may lead to the need to reduce expenses where there are high fixed overheads. It may, in certain cases, have an even more catastrophic effect on the prospects of an insurance company. The falls in new business levels could result in the insurance company being unable to charge higher premium rates. This in turn may prevent it from being able to recover losses and in some circumstances may lead to the insurance company becoming insolvent. Due to the importance that insurance companies give to their financial strength ratings, it is appropriate to consider the assistance that can be gained from these ratings by supervisors in prudential supervision.

9.2.7 Supervisors can potentially gain the following assistance from the financial strength ratings. These are discussed below:

- a general indication of financial strength. Further using the risk based capital adequacy models used by two of the agencies as a basis for developing an appropriate risk based capital model for insurance companies within the EU;
- an indication of the level of supervisory effort that should be directed at an individual insurance company. A lower rating would indicate a greater need for more active supervision;
- an indication of reinsurers' security to determine an appropriate capital charge. This is discussed in chapter 6;
- a means of sharing information that the rating agency has gained through its rating assessment of an insurance company, enabling supervisors to understand the rating agency's assessment of the insurer's risks which can act as a check for the supervisors' own understanding of the risks;
- a means of serving as an alert to issues of regulatory concern, when ratings are updated due to significant events. For example, following the terrorist attacks in America on 11 September 2001 some insurance companies had their ratings down graded to reflect the ability of insurance companies to meet their exposure arising from these events.

9.2.8 The other type of rating that could be of potential use in prudential supervision is the capital issue (credit) rating of debt securities held by insurance companies. The solvency measure used by supervisors should reflect the risks to which the company is exposed. The capital issue ratings could be used to assess the riskiness of debt security investments and used as a factor in determining the amount that a particular investment could count towards solvency. Alternatively this could be achieved through determining the amount of an explicit capital charge that would need to be held under a risk based capital model. Chapter 5 discusses this in more detail.

9.2.9 Currently in the EU, ratings are not widely used in insurance prudential supervision. In Spain the regulations require that in order for deposits with credit institutions and fixed income securities to be used to cover technical provisions they must have a credit rating of BBB or above. In Italy ratings are used in certain index linked contracts. An insurer can only purchase bonds which are rated AA to back certain liabilities. In some Member States the financial strength rating is used informally as a source of information when considering a direct insurer's reinsurance programme.

9.2.10 Outside the EU, in Canada fixed percentage factors are applied to balance sheet assets relating to reinsurance recoveries according to the ratings assigned by rating agencies to determine the capital requirement in relation to asset default risk. In New Zealand insurers are required to carry a credit rating from an accredited agency in order to underwrite catastrophe business. In Australia ratings are used to assess capital requirements for life reinsurers in respect of their retrocessions to overseas parents. For non-life insurers ratings are used to assess risk based capital charges against counterparty exposures (investment and reinsurance exposures).

9.2.11 Banking supervisors currently do make use of credit ratings in prudential supervision. This is restricted to identification of investment grade corporate bonds in the Market Risk Amendment to the Basel Accord of 1996 and the European Capital Adequacy Directive (96/3/EC). Under these arrangements, investment grade corporate bonds (qualifying bonds) carry a substantially lower specific risk capital charge compared with other bonds.

Possible role of market mechanisms in prudential supervision

9.2.12 Pillar 3 of the draft Basel Capital Accord reflects the banking supervisors' belief that pressure for banks to have adequate risk management systems, thereby protecting depositors, should come from the market (shareholders and rating agencies) and not just from the supervisor. By requiring banks to disclose information on their risk management systems shareholders and rating agencies respond through buying or selling shares, often on the advice from analysts, which affects the share price, or through making changes to the ratings. Banks are encouraged to avoid any detrimental effect on their share price or rating by maintaining adequate risk management systems thereby protecting depositors and hence aiding prudential supervision.

9.2.13 By requiring adequate disclosure of risks, risk management systems and financial strength, shareholders and rating agencies can respond by putting indirect pressure on insurance companies to maintain adequate risk management systems and sufficient capital strength, thereby protecting policyholders. Some companies may react to the rating by changing their systems in order to enhance their ratings.

9.2.14 To the extent that an insurance company can demonstrate a healthy financial condition through disclosure, market mechanisms can effectively reward companies. This manifests itself through the market placing business with the better capitalised insurance companies. When there are issues in the insurance market there is a 'flight to quality', as has been seen recently in the reinsurance market following the terrorist attacks in America on 11 September 2001, with the market wishing to place their risks with the better capitalised insurance companies. Therefore the provision of sufficient information to the market to assess the financial strength of insurance companies enables the market to better assess where to place its risk. Financial strength is determined not only by the amount of capital, but by the risks that the company is exposed to. By providing this information, policyholders are better protected, as they can choose, based on the information on financial strength and risks faced, which is the more appropriate insurance company. This will also aid prudential supervision.

9.2.15 In this study we have considered what would be appropriate disclosures for insurance companies.

9.3 Financial strength ratings - methodologies used by rating agencies to rate insurance companies

9.3.1 We summarise here the methodologies and processes used by rating agencies to rate the financial strength of insurance companies. The rating agencies considered are Standard & Poor's (which has the greatest coverage in the EU), A.M. Best (which is the main rating agency used in the US) and Moody's (which is the leading debt rating agency).

9.3.2 The areas of potential assistance that supervisors could obtain from the financial strength ratings are considered together with an assessment of their strengths and weaknesses. We also consider the scope for sharing information between the rating agencies and the supervisors.

Methodology

9.3.3 All three of the agencies considered in this study publish financial strength ratings for insurance companies. These are broadly defined as being opinions on the ability of the insurer to meet the obligations arising from its insurance policies.

9.3.4 The financial strength rating methodologies are summarised in Appendix 9.1.

9.3.5 Each of the agencies use a combination of qualitative and quantitative analysis. Of the three ratings agencies, one relies most heavily on qualitative analysis. The other two use a capital adequacy model for assessing the capital position as part of their rating process. Within this model there is scope for qualitative opinion but the model is essentially quantitative. The underlying modelling approach is similar to the risk based capital approach used by the National Association of Insurance Commissioners in the US, which is discussed in chapter 10 and Appendix 10.1. One of the agency's models is discussed in more detail below.

9.3.6 There are some differences in the way that the agencies treat group companies. One agency does not assign group ratings, assigning ratings to the legal entities instead, although certain companies within a group may be assigned a notional group rating. The other two agencies do assign group ratings. In deciding their ratings, all three agencies examine all intra-group financial arrangements and the degree of financial support that a subsidiary can expect.

9.3.7 Two of the agencies give opinions based only on publicly available figures. In addition they both give ratings for companies which involve extensive additional information from the insurer's management (interactive ratings). One agency only provides ratings at the request of the company being rated. Ratings are updated yearly, or after any significant event. The interactive ratings are kept continually under review and updated whenever necessary.

9.3.8 The ratings process includes a comprehensive overview of the market in which the insurer operates. All three agencies consider the sovereign risk as well as local factors including the legal and regulatory environment, the competitiveness of the market, the products sold and distribution channels available.

9.3.9 The rest of the analysis is specific to the insurer and includes in-depth examination of their operating and financial performance.

9.4 Potential assistance of financial strength ratings in prudential supervision

Measure of capital strength

9.4.1 One of the key objectives of prudential supervision is the protection of policyholders through setting capital requirements and monitoring individual insurers compliance with these standards. The ratings could be used as a measure of financial strength.

Strengths

9.4.2 The objective of all the financial strength ratings is to indicate the financial capacity of the insurance company to meet its liabilities under policyholder contracts. Therefore, the rating is, prima facie, directly relevant to protection of policyholders through solvency.

9.4.3 A key issue is that an insurance company has sufficient capital to cover all types of risks facing the company. For the interactive ratings the analysis undertaken by the rating agencies is very thorough and assesses a wide range of factors.

9.4.4 It can be argued that the assessment of prospective risks and events is more important than the assessment of an historical solvency position. The ratings assessment goes well beyond looking at the current capital position. It looks at aspects that are likely to affect the insurer's financial strength including factors appropriate to market sectors and countries of operation. The ratings agencies look at the spread of risk and the risk of significant adverse events. The analysis is qualitative, although quantitative techniques do exist for analysing these risks (see chapter 10).

9.4.5 The two agencies which use a capital adequacy model set out the capital adequacy ranges within bands for particular rating levels. These ranges will be helpful to the supervisor when considering the financial stability of a particular insurance company. They will need to be supplemented by the supervisor's own assessment of the financial strength from data provided by the insurance company. Descriptions of one of the rating agencies' rating levels is given below.

Standard & Poor's capital adequacy ranges per rating level

Capital adequacy	Indicative rating level	Assessment of capital adequacy
Below 100%	BB or lower	Vulnerable
100% - 125%	BBB	Good
125% - 150%	A	Strong
150% - 175%	AA	Very Strong
Above 175%	AAA	Extremely Strong

Source: Enhanced Criteria to Evaluate European Insurers' Capital Adequacy (October 5 1998, Rob Jones, London)

9.4.6 Where the rating methodology is essentially qualitative, and a capital model is not used, the rating levels are described quantitatively only e.g. AAA means exceptional security and AA means excellent security.

Weakness

9.4.7 There have been failures in the past of insurance companies with a secure rating, for example Health Insurance Holdings in Australia.

Capital strength model

9.4.8 Capital models are used by two of the agencies which are similar to the RBC methodology used by the National Association of Insurance Commissioners in the USA. A summary of one of the agency's models is included in Appendix 9.2.

9.4.9 We consider whether the capital adequacy models could be used as a basis for developing a risk based capital model for insurance companies for the purposes of prudential supervision. In particular, we consider the model set out in Appendix 9.2.

9.4.10 The capital adequacy model used is relatively complicated. The model falls under the risk based capital approach as described in the comparative analysis of solvency methodologies in chapter 10. Therefore all general advantages and disadvantages stated in that chapter apply to the specific rating agency model.

9.4.11 The model analyses the risks faced by insurers and includes examination of:

- asset risk (credit risk and volatility (market) risk);
- pricing risk (mortality, morbidity, persistency and expense risk);

- underwriting risk;
- reserving risk;
- general business risk (including regulatory risk).

Strengths

9.4.12 The main advantage of using a solvency regime based on this model over the current EU solvency model is that such a model would reflect a larger set of risks. The EU non-life approach has been widely criticised as it does not reflect asset and provisioning risks. Both risks are reflected in the rating agency model.

9.4.13 The model allows a comprehensive assessment of the risks faced by insurers. It allows the risk assessment to be geared to the portfolio of business being considered and the assets a company holds and takes account of most financial risks. There is a set of risk factors which is applied uniformly across all insurers. The method is also capable of being changed from time to time to update the relative likelihood and impact of the various risks.

9.4.14 The method may improve insurers' own understanding and management of risks. Risk and capital strength may therefore be given a higher priority by insurers.

9.4.15 The method would not place onerous calculations on small insurers because these insurers typically have limited lines of business in relatively mature and well understood markets.

Weaknesses

9.4.16 Examples of the disadvantages of such a methodology, in common with other risk based capital models are:

- the selection of the factors is subjective and arbitrary. For example, the base risk for assets is set fairly arbitrarily and then a specific risk element is added for different types of assets, which varies relative to the perceived relative risk of the type of asset. This limits the weight that can be placed on a rating by a prudential supervisor;
- the factors cover a wide range of financial risks but a reflection of all aspects of the insurance market in different Member States would require an impractically large number of factors. (For example, business risk in the UK is higher for pensions business than for other business due to the regulatory situation surrounding such business; this is not necessarily appropriate for other Member States);
- there are issues of granularity. This is whether the analysis of the risk components for each risk category is sufficient, so that the risk factors applied adequately reflect the risk of the category being considered, for example underwriting risk. One rating agency calculates the required capital for underwriting risk by using exposure proxies of the major classes of business. Applying one risk factor to, for example, property business as a whole, does not adequately reflect the different risk profiles of personal, commercial and industrial property lines, which are completely different. Other factors for which further analysis would be desirable include reflecting the type of industry for industrial lines and geographical location for personal lines. These are just the first

two levels of possible granulation and further levels can exist depending on the risks within the portfolio;

- the exposure proxy for underwriting risk for non-proportional reinsurance business is taken as premiums, which is not an adequate proxy of risk as the premium is not proportional to the exposure.

9.4.17 Even though the approach attempts to quantify the financial risk some important aspects cannot be captured appropriately by factor approaches, for example matching risk, the effect of reinsurance, the asset spread and the liability spread. The rating agencies only assess these aspects qualitatively.

9.4.18 The model does not cover 'aggregate risk' in that none of the factors applied to different lines of business are interactive. For example, mortality risk for an insurer writing both temporary insurance and annuity business is less of an issue than for an insurer selling only one of these lines.

9.4.19 Further, the method does not deal easily with differing valuation methods. If it was applied EU wide there would have to be considerable adjustments at a national level so that, for example, risks already covered in national reserving and stress testing regulations were not double counted. The move to International Accounting Standards (IAS) could remove this difficulty.

Supervisory effort

9.4.20 In terms of directing supervisory effort for prudential supervision, it is not sufficient to consider the solvency position. An assessment of other areas needs to be made, including the competency of management, the effectiveness of risk management systems and an assessment of the other risks that might impact on the solvency of the insurer.

9.4.21 In the UK, the Financial Services Authority (FSA) has adopted a risk based approach to supervision. The FSA's operating framework is to consider the risk that individual firms or industry issues pose to its statutory objectives. An assessment of the impact and the probability for the risk crystallizing in each firm is undertaken. The impact for each firm is largely determined by its size, whereas the probability for each firm is based on internal control assessment. The risk assessment of an individual firm will then determine the level of supervisory effort.

9.4.22 In order to be able to use the financial strength ratings as an indication of the level of supervisory effort the ratings analysis would need to assess the criteria on which supervisory effort is determined.

Strengths

9.4.23 For interactive ratings the analysis undertaken by the rating agencies is done in considerable depth and assesses many of the areas that the supervisor would need to consider when assessing the level of supervisory effort.

Weaknesses

9.4.24 For the ratings to be used as an indication of supervisory effort that should be directed at an individual insurance company, it is essential that all prudential regulatory risks are assessed and reflected in the rating. The rating agency assessment can only be as good as the information supplied by the insurance company. In particular, if the risk management systems are poor the rating agency cannot be expected to be able to assess all the risks of the insurance company and this would undermine the rating.

Sharing information and as a means of alerting issues

9.4.25 Both the rating agencies and the supervisor need information on the risks facing an insurance company. During the course of the rating assessment a significant amount of analysis is available which would give useful background information to a prudential supervisor. This could be used informally as a starting point, where it exists, to be supplemented by the supervisor's own analysis of the insurance company from direct contact with the insurance company. It is not clear whether rating agencies would be prepared to share their analysis with the regulator. In addition, there may well be confidentiality issues.

9.4.26 Where a rating is changed, or credit watch or similar alerts are issued expressing any concerns, this can serve as a means of alerting the supervisor to new issues or development in existing issues. However, relying on the rating to notify issues is a reactive approach and the supervisor should be proactively assessing the risks of any particular company. It can be argued that the supervisor should be aware of the issue before the rating agencies. In many countries there is a requirement on companies to notify issues to the regulator.

Strengths

9.4.27 Interactive ratings, requested by the company being rated, are kept continually under review and updated whenever necessary. Ratings requested by third parties, based only on publicly available information, are updated yearly, or after any significant event.

9.4.28 There is a significant amount of quantitative and qualitative analysis available which would potentially provide good background information for the supervisor.

9.4.29 Meetings could be held between the supervisor and the rating agency, with or without the insurance company being rated, following a rating assessment so that the supervisor understands the key issues underpinning the rating. The benefit of this is that the supervisor can check his understanding of the issues facing the company, ensuring he is aware of all the issues. It would not be a two-way exchange of information as clearly the supervisor will not be able to share his knowledge.

9.4.30 Such meetings would result in costs for the rating agency that would need to be borne by either the insurance company concerned, the rating agency or the regulator. By restricting the meetings to just high risk insurance companies the costs to the industry, rating agencies and the supervisors can be minimised.

Weaknesses

9.4.31 Any reliance on the rating agencies to alert the supervisor to issues of regulatory concern would potentially encourage a reactive approach to supervision, which would not be desirable.

9.4.32 As discussed above, the quality of any rating is restricted by the information available to the person preparing the rating. Whilst the agencies can reflect market issues, the rating agency is reliant on the insurance company informing it about issues specific to the insurer. As there is no obligation on the insurance company to notify all issues immediately, if issues are arising at the insurance company the ratings will clearly not be automatically updated. Further, if information is subsequently shared with the regulators the insurance company may be more sensitive about the information passed to the rating agency. This could reduce the quality of the rating.

Use of financial strength ratings in assessment of reinsurance recoveries

9.4.33 This is discussed in chapter 6.

9.4.34 The rating process and methodology for reinsurers is very similar to that for direct insurers. The main difference is that there is a greater focus on underwriting risk and exposure from significant events and the spread and aggregation of risk. Reinsurers can be exposed to high severity, low frequency events to a much greater extent than direct insurers.

General issues in using rating agencies

9.4.35 There are some general issues that need to be borne in mind when considering any potential use of financial strength ratings in prudential supervision.

Voluntary nature of ratings

9.4.36 Given the voluntary nature of these ratings not all insurance companies have a financial strength rating. Therefore any formal use of such a rating within prudential supervision would require all insurance companies to engage the services of a rating agency which would be a considerable cost to the industry. The agencies base their fees on the complexity and size of an organisation. There would also be internal costs to the insurance company in providing information to the rating agencies.

Independence

9.4.37 Some ratings are requested and paid for by third parties. However, with regard to the potential use of the ratings by supervisors, where the ratings are paid for by the company being rated there is a potential conflict of interest which could be a perceived lack of independence. We understand that one of the rating agencies does attempt to deal with the independence issue by keeping the pricing and analysis relationships separate.

Quality of information

9.4.38 Clearly the quality of any rating is restricted by the information available to the person preparing the rating. The rating agency is reliant on the insurance company informing it of developments and issues. Whilst this is not a failing in the ratings itself, this important limitation should be recognised and prevent any formal use of such ratings by prudential supervisors.

9.4.39 Two of the agencies prepare ratings at the request of third parties. These ratings are performed based on publicly available information only. One rating agency then makes the rating available to all of its subscribers. However where an insurance company requests the rating (voluntary rating) considerable additional qualitative and quantitative information provided by management is analysed (interactive rating). Both of the agencies make a distinction between ratings assessed purely on public information (denoted by 'pi' with the rating for one of the agencies). We understand that one of the agencies prepares about 600 such pi ratings compared to about 250 interactive ratings worldwide (excluding the US). Care is needed to ensure that the level of analysis behind the rating is correctly understood.

9.4.40 Where ratings are based only on public information the quality and comparability of the analysis will be limited by the lack of transparency of the public information and the varying degrees of disclosure in the different jurisdictions. These issues together with the considerably lower level of analysis, as compared to interactive ratings, make these ratings less reliable and this reduces the assistance that a supervisor could obtain from public information only ratings.

Reliability

9.4.41 The ratings are based on a variety of quantitative and qualitative information. There are considerable subjective assessments which are made in arriving at the rating. As the methodology is not audited, it would not be appropriate for a prudential supervisor to rely solely on any rating to assess the prudential regulatory risk without some form of external review.

Timing of rating

9.4.42 As is the case with all solvency calculations, most, if not all, of the data on which quantitative analysis is performed is historic. However, it should be noted that the overall rating takes into account management's forecasts. Thus the quantitative aspects would be out of date by the time the regulators see the rating. Threats to solvency from prospective developments, arising subsequent to the rating, would therefore not be reflected.

Comparability

9.4.43 The European insurance market is not covered by standardised financial and regulatory reporting regimes and even within Member States there are varying approaches taken to certain accounting issues. The ratings agencies do endeavour to make adjustments to reflect these differences however there is necessarily a further element of subjectivity in any adjustments. This may render comparability between firms within the EU difficult. The move towards the required use by listed insurers of IAS by 2005 will help to mitigate

this issue. Member States have the option to require unlisted companies to prepare accounts under IAS. If this option is exercised in all Member States then comparability should be greatly enhanced within the EU.

Rating definitions and symbology

9.4.44 Different rating agencies have different definitions of the same rating, e.g. AA, and some have different symbology. Therefore care is needed to ensure the ratings are interpreted correctly.

9.5 Potential use of capital issue (credit) ratings

Capital issue (credit) ratings of insurance companies

9.5.1 Rating agencies provide credit ratings on debt security issues. The credit rating of any particular issue reflects the credit risks inherent in the debt security. It takes account of the issuing company's ability to meet the terms and conditions of the particular debt security (the payment of interest and the repayment of capital), any security given and the risk of default.

9.5.2 Whilst a poor rating of a debt security issue is likely to indicate that there is a threat to the solvency of the issuer and hence the protection of policyholders, a strong rating may not necessarily indicate that the risk to policyholder protection is low. This will depend on the rights of policyholders and debt holders for each individual debt security. For subordinated debt (which is discussed below) the repayment ranks after all other claims, including policyholder claims. However, the rights of policy holders and the debt holders will vary for different debt securities. Therefore, the risks inherent in the credit rating on a capital issue (other than subordinated debt) may be different from those the prudential supervisor will be monitoring, although we understand the debt rating will normally be lower than the financial strength rating.

9.5.3 Generally, throughout the EU, the issue of debt securities in the insurance industry is not common. Indeed, where there are such issues it is usually holding companies of insurance companies that have made the issue rather than the insurance companies themselves. However see below on subordinated loan stock.

9.5.4 Widely divergent ratings can be given for different instruments issued by the same issuer and therefore the rating of one or more capital issues may not give an objective insight into the credit standing or solvency of the borrower. For example Eastern Airlines secured debt was rated still fairly highly after Eastern Airlines collapsed whilst the unsecured debt was rated very poorly.

Use of credit ratings in the assessment risk of debt securities investments

9.5.5 Credit ratings could be used to determine the riskiness of debt securities and hence how much should count towards solvency, either through restrictions or explicit capital charges (see Chapter 5).

9.6 Possible role of market mechanisms in prudential supervision

9.6.1 Market mechanisms can play an important role in prudential supervision by putting pressure on the insurance company from shareholders, rating agencies and commercial policyholders to manage its risks adequately and maintain a sufficient level of capital, thereby protecting policyholders.

9.6.2 We consider disclosure of information particularly about the risks facing insurance companies and financial strength. We also consider the forced issuance of subordinated debt to obtain a rating.

Disclosure of risks and solvency

9.6.3 For the market to assess the risks facing an insurer and the impact on the financial strength of an insurance company it needs to understand what the key risks are and how they are managed. The market also needs to know how sensitive the solvency position is to the underlying risks and assumptions. We have considered what disclosure of risks of financial instruments is required by Pillar 3 of the draft Basel Capital Accord for banks, IAS 32 (Financial instruments: Disclosure and Presentation) and IAS 39 (Financial Instruments: Recognition and Measurement) and how this may be applied to insurance companies. The main risk for a bank is asset risk, whereas insurers are exposed to asset and liability risk. Chapter 3 provides a comparison of the risks that banks and insurance companies are exposed to. The International Accounting Standards Board (IASB) Insurance Steering Committee's views on disclosures in financial statements are also considered.

9.6.4 The current financial reporting systems do not include disclosure requirements of risk, sensitivity analysis and reinsurance programmes. Sometimes this information is provided directly to prudential supervisors.

9.6.5 In order to manage shareholder expectations and policyholder protection, insurance companies need to demonstrate that their financial risks are being well controlled. Providing such information just through the regulatory return is not sufficient. Financial statements need to give sufficient information on the risks to solvency and how they are being managed.

9.6.6 It is important to recognise that disclosures in financial statements should be used in conjunction with the other supervisory techniques discussed in this study.

Pillar 3 of the draft Basel Capital Accord

9.6.7 A fundamental aspect of the revision of the Basel Capital Accord, is the proposal to require banking groups to disclose more information on a regular basis in both their financial statements and regulatory returns. The Basel Committee believes that the assessment by the market of banks through disclosure will provide a powerful influence on an individual bank's behaviour and capital planning. The proposals which are of most relevance to insurance include detailed disclosure on capital structure and risk exposures and assessment. These are summarised below.

Capital structure and adequacy

9.6.8 This would include:

- the main terms and conditions of capital instruments, particularly for innovative instruments;
- capital planning policies and contingency measures;
- the amount of various types of capital;
- items deducted from regulatory capital;
- the quantum of capital requirements under various risk categories (e.g. credit, market and operational risk) analysed by the systems used for assessing capital requirements (e.g. basic, standard or advanced).

Risk exposures and assessment

9.6.9 This would include:

- definitions of default and impairment (policy on provisioning);
- credit rating agencies used;
- the extent and scope of any models accepted for regulatory use;
- the quantum of exposure in each risk;
- the extent of various risk mitigation techniques.

IAS disclosure requirements

9.6.10 IAS 32 and IAS 39 (see chapter 8) are the main IAS dealing with financial instruments, with disclosure requirements primarily contained in IAS 32. Both standards contain exemptions for rights and obligations under insurance contracts. However, the disclosure requirements will apply to any non-insurance financial instruments issued by insurance companies. Some of the key requirements are set out below:

IAS 32 (Financial instruments: Disclosure and Presentation)

This standard requires the disclosure of risk management policies in relation to financial instruments. In particular, disclosure is required of:

- the financial risk objectives and policies;
- for each class of financial asset, liability and equity instrument, the extent and nature of the instruments, including significant terms and conditions that may affect the amount, timing and certainty of future cash flows;
- information on interest rate and credit risk exposure, including the maximum credit risk exposure and also significant concentrations of risk.

IAS 39 (Financial instruments: Recognition and Measurement)

Apart from accounting policies, this standard requires disclosure of the methods and assumptions applied in estimating fair values of financial assets and liabilities.

Minimum disclosure for insurance companies

9.6.11 Insurance companies are exposed to a significant number of risks. The financial statements of insurers are generally not well understood due to the complexity of the business and the interaction of risks. Currently, the disclosure requirements do not give the reader a fair assessment of the risk profile and the maximum exposure risks posed to the insurance company. Without this disclosure the financial strength of a company cannot be adequately assessed.

9.6.12 Significant disclosure requirements are likely to be implemented from IAS, the aim of which is to enhance transparency of financial statements. The IASB Insurance Contracts Steering Committee has tentatively concluded that the disclosure requirements of IAS 32 and 39 should, in principle, be provided in relation to insurance contracts[131]. However, it was recognised that additional guidance would need to be provided on how the requirements could be provided in an informative and concise way. The Steering Committee tentatively agreed that disclosure should be provided by insurers including the following:

- key assumptions in determining technical provisions;
- sensitivity analysis of change in key assumptions and value at risk measures;
- claims development for non-life insurers.

9.6.13 In extending the disclosure of IAS 32 and IAS 39 to insurance contracts and reinsurance arrangements, insurance companies will need to provide information on significant terms and conditions of policies underwritten as well as reinsurance arrangements.

9.6.14 Set out below are some suggested disclosures which will assist various users in understanding the financial strength and risk profile of insurance companies. Such an approach would also be consistent with the banking disclosure requirements.

Solvency

- the level of solvency;
- the key risks impacting on solvency, the risk management policies for these risks;
- the adequacy of the solvency margin through stress and scenario testing;
- the amount of capital that is not distributable;
- what assets have been disallowed in arriving at the solvency position;
- under an explicit capital charge approach, an analysis of the capital charge by category of risk together with the basis on which the calculation had been performed;
- where ratings have been used in the assessment of capital, the rating agencies used.

Liabilities

- key assumptions and methodology used in determining technical provisions;
- sensitivity analysis of assumptions;

[131] Obligations under insurance contracts are exempt from the requirements of IAS 32 and 39.

- ranges of exposures for specified confidence levels;
- for non-life business, for each class of business, gross maximum exposure to losses, reinsurers' share and net maximum exposure to losses;
- for non-life business, net maximum probable loss by geographical area and type of event;
- for non-life business, claims development assessing the provision established in prior periods or run-off data;
- for life business, effect of experience variations during the year and effect of changes in assumptions.

Reinsurance programmes

- principal terms of contracts including conditions, exclusions and cover limits;
- possibly reinsurance recoveries analysed by level of credit rating and rating agency used.

Operational risk

- general discussion on the management of operational risk.

Other

- other uncertainties, guarantees and commitments.

9.6.15 In addition to the above disclosure, it is worth considering whether there is value in disclosing economic capital.

Economic capital

9.6.16 Economic capital refers to a company's own assessment of the capital required to run its business according to its own objectives. Companies calculate economic capital in order to assess the overall capital adequacy, and also as a basis for performance measurement and pricing. For these purposes the economic capital is allocated to business units and products and the return on economic capital is used as a benchmark.

9.6.17 Economic capital is determined on the basis of the company's own objectives. The concrete definition of economic capital varies therefore from company to company. A formal objective is in most cases based on a desired financial position, which should be maintained even in the event of adverse conditions. The financial position can be expressed in many ways, for example in terms of a financial strength rating, ability to write new business volumes, maintaining a multiple of regulatory capital or a mixture of such criteria. Accordingly, advanced risk modelling techniques (as discussed in chapter 3) are usually necessary, in order to provide a reasonably objective assessment of economic capital needs. In contrast to regulatory capital, which is normally based on the notion of avoiding policyholder loss in the case of adverse developments, economic capital is based on the criteria that business can be continued to a satisfactory standard in the case of adverse development. The underlying definition for economic capital is more explicit than most supervisory capital definitions and the assessment is guided by the capital definition.

9.6.18 Economic capital assessment contains many company specific elements and most implementations are different from current supervisory capital assessment approaches. Nevertheless it would be informative for a supervisor to understand the basis of the calculation of economic capital. Economic capital is assessed on an on-going (i.e. non-run-off) basis. It incorporates projections of future business over a specific time horizon.

9.6.19 Subjective elements that will vary from company to company are the specific selections of the financial strength indicator, the applied risk measure (ruin probability or expected shortfalls), the desired security level and the time horizon under consideration.

9.6.20 There may be benefits in making disclosure of economic capital requirements in a company's financial statements on a voluntary basis. Due to the subjectivity of the calculation it would be important to disclose the assumptions and sensitivities of the calculation.

Possible forced issuance of subordinated debt

9.6.21 By requiring all insurance companies to issue subordinated debt all companies would have a rating for such debt. As is discussed below, this rating is essentially a financial strength rating but by another means and hence could be used by the market as an indication of the financial strength of an insurance company.

9.6.22 Subordinated debt is a debt the repayment of which ranks just before equity and after all other claims on the insurance company – most notably policyholder liabilities. The debt bears interest and normally has a very long term. Both mutuals and proprietary companies have issued subordinated debt. It is generally issued without a fixed maturity date.

EU Directive regulations

9.6.23 Article 25 of the Third Life Directive[132] requires that in arriving at the solvency position the maximum amount of subordinated debt that may be deducted as a liability is 50% of the required margin, no more than 25% of which shall consist of subordinated debt with fixed maturity. If the EU Commission were to decide to adopt the approach of forced issuance of subordinated debt in excess of half the solvency margin requirement, the Directive would need to be modified to eliminate the solvency disadvantage.

Strengths

9.6.24 By requiring insurers to issue a certain amount of subordinated debt, all insurers could obtain a credit rating for the debt. As the subordinated debt ranks before equity and after all other creditors including policyholders the credit rating is effectively assessed after considering whether there is sufficient strength to meet policyholder liabilities. The rating is, therefore, essentially a financial strength rating and could be used by the market as an indication of the financial strength an insurance company.

9.6.25 Another possible benefit of the forced issuance of subordinated debt is that through the pricing of the subordinated debt by the market the supervisor could assess the market perception of the inherent risk of the particular insurance company, whilst recognising

[132] Council Directive 79/267/EEC.

that the market can only reflect risk of which it is aware and which receives a premium in the market price (this is according to the theory that only the non-diversifiable market risk element is included in the market price).

Weaknesses

9.6.26 In principle there should be some consistency between the financial strength rating and the subordinated debt rating. However, as insurers generally only issue up to half the solvency margin requirement in order to get the full solvency advantage, the level of debt in issue may not be material relative to the financial strength of the company. It is therefore possible that the rating agencies may be able to justify a higher rating on the debt in comparison to the financial strength rating. Such a justification may be that as the term of the debt is so long the capital repayment is insignificant in comparison to the level of interest payment. Thus the rating reflects the risk of default of payment of interest more than repayment of the capital and the relevance to financial strength weakens. The result is that the rating becomes more of a short term measure in comparison to policyholder security which is long term.

9.6.27 Strongly capitalised life companies are unlikely to consider the payment of interest on subordinated debt a good use of policyholders' money when it could better be used by being invested elsewhere. There would be substantial transaction costs to the insurance industry. The forced issuance of subordinated debt might also be regarded as an inappropriate intervention in a commercial market.

9.7 Conclusions

Potential use of ratings in prudential supervision

Financial strength ratings

9.7.1 Whilst there are some weaknesses, the financial strength ratings can provide some informal assistance to supervisors. However, less reliance should be placed on ratings prepared only on public information. In each case it would not be appropriate for the supervisor to solely rely on the rating. Instead, the supervisor should form his own opinion from information received direct from the insurance company but can use the financial strength rating, where one exists for a particular company, as an additional source of information. The financial strength rating can provide the following assistance:

- as a measure of capital strength. The supervisor should understand the reason for any difference in his assessment and that reflected in the rating;
- an indication of the level of supervisory effort that should be directed at an insurance company. Supervisors should arrive at their own assessment of the individual insurance company risk to their prudential regulatory objectives using data direct from the insurance company;
- as a means of alerting supervisors to issues. Supervisors should be alert to changes in ratings and use the ratings to double check their understanding of the risks facing a particular company. For high risk insurance companies the supervisors may decide to have a meeting with the rating agencies, with or without the company being rated, to

understand the rating agencies' assessment of the risks and the key issues in arriving at the rating and any changes to the rating.

9.7.2 In relation to reinsurance recoveries, the financial strength rating could be used as an indication of the credit risk and used to determine a risk capital charge in a risk based capital approach. This is discussed further in chapter 6.

Capital issue (credit) ratings

9.7.3 Capital issue (credit) ratings could be used to assess the credit risk or debt security investments of insurance companies and used to determine a capital charge under a risk based capital approach. This is discussed in chapter 5.

Use of ratings to determine capital charges

9.7.4 For any use of ratings to determine capital charges a list of accredited rating agencies should be produced or a list of accreditation criteria developed. The draft Basel Capital Accord includes rating agency accreditation criteria on which these could be based. A summary of the proposed criteria are given in Appendix 9.3.

Possible role of market mechanisms in prudential supervision

9.7.5 Introduction of disclosure requirements is likely to be controversial (based on Basel experience). However, the EU Commission should consider the suggested disclosure in order to maintain a consistent approach to the banking industry and to increase transparency to policyholders. By giving appropriate disclosure in the financial statements and regulatory returns the market can better understand the risks to solvency and how these are managed. This approach can therefore put pressure on insurance companies to maintain adequate solvency and risk management systems, thereby protecting policyholders.

9.7.6 Despite the limitations in the assessment of economic capital, there does appear to be some value in encouraging companies to disclose their economic capital to the market to facilitate the assessment of the capital strength of a company.

9.7.7 The forced issuance of subordinated debt is unlikely to be an effective market mechanism to facilitate prudential supervision.

10 Comparative analysis of solvency margin methodologies

10.1 Terms of reference

10.1.1 *"A summary comparative analysis of advantages and disadvantages of solvency margin methodologies (or other approaches) currently used in major non-EU countries, in particular the US, as compared to the EU model."*

10.2 Introduction

10.2.1 This comparative analysis is mainly concerned with the assessment of solvency margin methodologies and in particular the advantages and disadvantages that are inherent in the design of solvency methodologies. The comparison in this chapter focuses on the EU (fixed ratio approach) versus the US (Risk Based Capital), but we have also included more sophisticated approaches.

10.2.2 Solvency assessment is a wider issue than just determining capital requirements. Supervisory review and disclosure are important components of it. These aspects cannot be completely divorced from the discussion of capital requirements, nevertheless, they are not the primary focus of this chapter.

10.2.3 Any scheme for determining capital requirements consists of a general calculation design and a set of parameters. Independent of the general design features, any approach can be invalidated by a bad parameter choice, so that either weak companies are not identified, because the capital requirements are generally too low or all companies are burdened with excessive capital cost, because the parameters are generally too conservative. The choice and level of parameters is an issue of paramount importance for a solvency margin method, but is beyond the scope of this analysis.

10.2.4 The evaluation of the solvency margin encompasses the establishment of the minimum required and of the total available capital. The latter is highly important and is affected by variations in rules concerning valuation and admissibility of assets and liabilities. These issues are covered in chapters 4 and 5.

10.2.5 This chapter considers the basic concepts of the four methodologies described in the International Association of Insurance Supervisors (IAIS) report on "Solvency, solvency assessment and actuarial issues" and some of their practical applications. The methodologies discussed are fixed ratios, risk based capital (RBC), scenario based approaches and probabilistic approaches. Further details on the models in use are described in Appendix 10.1.

10.2.6 The chapter also considers current developments in the countries reviewed in this report and a summary of our comparative analysis of the issues surrounding the four methodologies (a detailed commentary is set out in Appendix 10.2). The conclusion to the chapter draws on the results of the comparative analysis together with the findings in other chapters of the report to suggest how prudential supervision might be developed to reflect a more risk based approach. Appendix 10.3 includes further discussion of a possible future framework, based on a three tier approach to capital requirements.

10.3 Current approaches to determining solvency margin requirements

10.3.1 There are essentially four main types of solvency methodologies used by supervisory authorities:

- fixed ratio;
- risk based capital (RBC);
- scenario based approach;
- probabilistic approach.

The following table provides an overview of the extent of use of the four models in the EU, US, Canada and Australia.

Use of solvency models

Region/Country	Fixed ratio	Risk based capital	Use of models
European Union	Life and non life companies	Finnish regulation uses a factor based RBC approach to supplement the requirements of the EU directives.	UK regulator uses resilience testing (Scenario based)[133]
US		Life and non-life companies	Use made in some states e.g New York State (Scenario based).
Canada	Non life companies (until 2002)	Life companies and non-life companies beginning in 2003	DCAT – Dynamic Capital Adequacy Test projects the future impact on the solvency statistics under various adverse scenarios. This is required for all federally registered companies including both life and non-life
Australia		Life and non-life companies	Internal models permissible for non-life companies if approved by regulator
Source: KPMG			

[133] Use of scenario based approaches in other European Companies is currently being investigated.

10.3.2 Further details of the methods applied in the EU, US, Canada and Australia are provided in Appendix 10.1. An example calculation of the RBC life model used in the United States is also included in Appendix 10.1.

Fixed ratios

10.3.3 A fixed ratio method is a formulaic method which attempts to calculate a solvency margin requirement based on a fixed proportion of a proxy for exposure to risk. This is often an item from the insurer's balance sheet or profit and loss account.

10.3.4 The EU model for non-life companies uses premiums and claims as proxies to risk in its calculation. The model for life companies on the other hand uses technical provisions and the capital at risk. Similar models exist in other countries. Further details are provided in Appendix 10.1.

Advantages and disadvantages of fixed ratios

10.3.5 One of the main advantages of the fixed ratio approach is that it is simple to apply, with the result that no significant compliance costs are incurred. In addition, the results are easy to understand and, because the formula uses factual, historical data, this approach avoids subjectivity.

10.3.6 The use of fixed ratios does, however, have disadvantages. Under this approach, it is difficult to draw up a useful capital definition which can then be related to the objective of the prudential supervisor. As a result, the capital requirements which are derived from the formula may be considered to be arbitrary. Secondly, current implementations of this approach focus only on certain types of risks, usually relating to underwriting, while other types of risks are not usually taken into account. Due to the structural weakness of the fixed ratio approach, it is difficult to extend the scope of risks considered. Despite the focus on underwriting risk, allowances for reinsurance risks and exposures are not adequately reflected in the calculation, and neither are the benefits of reinsurance and hedging arrangements. The use of premiums and provisions as exposure bases can create distortions in the results, and provide incentives for under-provisioning. A further disadvantage is that fixed-ratio methods do not give credit to companies who have already taken into account prudent provisions. In such cases, the fixed ratio method requires additional solvency margins to be maintained based on the higher technical provisions.

10.3.7 Current implementations of the fixed ratio approach are also not sufficiently sensitive to the company-specific risk profile, which cannot easily be remedied due to the underlying structural weaknesses of the approach. There is no enhancement or credit for the company's own internal risk management process, and inadequate consideration is given to diversification and size effects. Finally, the fixed ratio approach is not explicitly dynamic (forward-looking).

10.3.8 In view of the difficulties inherent in the fixed ratio approach, some regulators have sought a more sophisticated risk based capital approach.

Risk based capital (RBC)

10.3.9 Risk based capital (RBC) is a method of assessing the solvency of both life and non-life insurance companies. The objective of the RBC model is to calculate capital requirements which reflect the size and overall risk exposures of an insurer. This calculation of capital is then compared to reported statutory capital (as reflected on the balance sheet) and action is taken by the regulators where required.

10.3.10 Assets and liabilities are risk weighted in calculating the threshold level of capital required by an insurer. Thus, the required solvency margins will reflect the nature of business written and the assets held to meet those obligations.

10.3.11 RBC has some commonality with fixed ratio approaches in that sub-results are established by applying factors to exposure proxies, for example asset risk, underwriting risk etc. RBC uses more risk proxies and factors than the fixed ratio method and these are aggregated with a more sophisticated mathematical formula.

US Model

10.3.12 The US regulators adopted the RBC model to better predict troubled insurers and to require regulators and companies to take specific action once a company triggered a certain level[134]. The RBC model for life insurers was implemented by the National Association of Insurance Commissioners (NAIC) for 1993 year ends; the property-casualty model was implemented in 1994. State legislative bodies generally adopted the models for use in their state shortly thereafter.

10.3.13 The objective of the RBC approach is to incorporate the main risks faced by insurance companies into the capital requirement calculation. Various risks are considered and different risk-bases are used in the calculations for life and non-life insurance. Different factors are applied to the corresponding items on the financial information to calculate the capital required for each risk (see below for life and non-life). Further details on how these factors are used in the calculation are included in Appendix 10.1.

10.3.14 In order to take into account the correlation between the various types of risk, a covariance calculation is also applied to determine the appropriate risk-based capital. The result obtained after the application of the covariance formula gives the Authorised Control Level Risk Based Capital. The Authorised Control Level Risk Based Capital is then compared to the Total Adjusted Capital (extracted from the balance sheet).

10.3.15 The margin levels (the ratio of the Total Adjusted Capital to the Authorised Control Level Risk-Based Capital) are usually required to be 200%.

Life insurance

10.3.16 The following table provides an overview of the main risks considered within life RBC calculations, the proxy used as the data source in the calculation, and the types of factors that are applied to the data. For life insurance the factors applied do not vary from company to company and they are fixed by supervisors.

[134] Background to the introduction of the RBC model in the US can be found in Appendix 10.1.

Life RBC factors

Life insurance	Source of calculation	Factors used
C1: Asset risk	Investment value	Varies according to asset type
C2: Insurance risk (mortality and morbidity)	Capital at risk (difference between sum assured and provisions held)	Different weights applied to different levels of capital at risk
C3: Interest rate risk	Provisions held in respect of early surrender of the policies, depending on benefits granted to policyholders	The factors applied to interest rate risk will depend on the benefits granted to the policyholder on surrender of the policy
C4: Business risk (other risks)	Premium income	For business risk, different fixed factors are applied for life products and for health and accident products

Source: KPMG

10.3.17 An example calculation is provided in Appendix 10.1.

Non-life insurance

10.3.18 The following table provides an overview of the main risks considered within non-life RBC calculations, the proxy used as the data source in the calculation, and the types of factors that are applied to the data.

Non-life RBC factors

Non life insurance (Property/Casualty)	Source of calculation	Factors used
R1 and R2: Asset risk	Investment value	Varies according to asset type
R5: Underwriting risk	Net premiums written	Market indicators provided by NAIC are combined with the company's indicators into one factor
R4: Reserving risk +R3	Outstanding claims	Same factor as underwriting risk
R3: Credit risk	Reinsurance recoveries and other receivables	Standard 10% factor
R0: Off-balance sheet items	Growth rate, guarantees held for affiliates and contingent liabilities	Fixed weights are used depending on the riskiness of the categories considered

Source: KPMG

Description of Finnish solvency margin requirements

10.3.19 The Finnish regime can be classified as a factor-based RBC approach. The Finnish regulator refers to its approach as a 'formula based model' or 'probabilistic formula based model'. The RBC solvency test is supplementary to the requirements of the EU Directives.

10.3.20 The solvency capital consists of an insurance risk solvency requirement and of an investment risk solvency requirement. The insurance solvency requirement is set at a level that ensures solvency with a 99% probability over the next year, fixed investment returns assumed (this equates to a ruin-probability-based capital objective, on a going-concern basis). In the second phase the investment solvency requirement is calculated. The requirement is based on the assets needed to cover the technical provisions and the insurance solvency requirement. The approach is calibrated to ensure that the assets are able to cover the provisions and the insurance solvency requirement with a 99% probability over one year. The final requirement is then set at 80% of the sum of the two requirements.

10.3.21 The insurance risk solvency requirement is calculated (with a formula) by applying parameters to company specific data. The company data includes: net earned premiums, average claims ratio, average number of claims and maximum net retentions. The data is collected by groups of insurance classes.

10.3.22 The formula further uses the average of the claim size distribution and the variance of the claim number distribution. These parameters are estimated from industry data, but a company can apply for the use of parameters derived from its own data. (As mentioned above, the average claim number is always provided by the company.)

10.3.23 The formula for the insurance solvency requirement was developed in a study which used a probabilistic model (Monte Carlo simulation). The parameters estimated from the common industry statistics represent the volatility of the insurance classes. The probabilistic model made use of economic and insurance industry data. The model was applied in order to take the effect of annual fluctuations and long-term cycles into account. A solvency requirement for the estimated maximum catastrophe exposure is added to the insurance risk requirement.

10.3.24 For the investment solvency requirement, assets are taken at market value and are classified into bonds, equities, real estates, loans, short term money market instruments and other investments. The formula applied makes use of the mean return, the standard deviations and the mutual correlations. The parameters are fixed in regulations.

10.3.25 The evaluation of the Finnish system (below) is based on a high level description provided by the Finnish supervisory authority. In our classification the Finnish approach is best described as a factor based approach, and as such it shares the general disadvantages of such approaches as described in this chapter. However, the Finnish model has some features which help to lessen some of the general disadvantages. A more detailed investigation, beyond the scope of this study, could evaluate the extent to which these disadvantages have been overcome. It should be recognised, however, that such approaches can become complex when applied to a complex market (such as the EU).

Advantages

10.3.26 The approach is based on a clear numeric objective. This enables the appropriateness of factors to be evaluated and provides guidance on how to calibrate them. The use of a probabilistic model in the parameter calibration can potentially help to overcome some of the typical disadvantages of factor-based approaches (this is however only possible in a small and relatively homogenous market, see below under 'limitations').

10.3.27 The approach is risk-sensitive. Insurance risk is calculated on the data grouped by insurance classes. The capital charge increases with the volatility of the classes. More company-specific risk data than in common RBC systems is used (claims count, net retentions, claims ratio).

Limitations

10.3.28 The calibration of the parameters made use of a probabilistic model. This enables the parameters to be linked to a specific ruin probability. However, the actual solvency calculation uses a factor-based formula. Therefore, important company-specific effects due to size, business mix, reinsurance and asset and liability match are only recognised appropriately if the company profile is not too different from the market average used in the calibration.

10.3.29 In a relatively small market such as Finland it may be possible to find appropriate parameters, which balance the deviations from the market average for most companies. For a more complex market, the factors modelled with a probabilistic model for the market average can become inappropriate for the majority of companies. For these markets, the use of a probabilistic model for the parameter calibration is less likely to provide a remedy for the weaknesses of factor-based approaches (recognition of the interaction of insurance and investment risk, of the inter-dependence of insurance classes, of non-proportional reinsurance and of ALM issues).[135]

10.3.30 The underlying model for the insurance requirement is based on claims incurred, which would cover the changes in provisions as well. Nevertheless, it appears that provisioning risk is not dealt with explicitly, and that actual provision amounts do not enter the calculations.[136]

Advantages and disadvantages of RBC

10.3.31 The RBC approach is considered to be an enhancement to the fixed ratio approach for a number of reasons. The consideration of risk elements is more refined than for fixed ratios, and the RBC approach includes explicit consideration of risk categories. It attempts to capture other relevant risks, including asset risk and general business risks in addition to underwriting risk. The RBC approach also provides some flexibility for adjustment of exposure bases to reflect deviations from market standards. It allows consideration of variations in factors over time and for company-specific adjustments.

10.3.32 One of the advantages of fixed ratios is their simplicity and, although the RBC methodology is not simple to apply, it does not require complex systems and models to generate the calculations. The requirements for data under this approach are significant but not excessive and the calculation is based on factual and historical data. As a result, there is no subjectivity in the application of the methodology.

10.3.33 The RBC approach does, however, have disadvantages. Firstly, in common with fixed ratios, the RBC approach cannot support a useful capital definition, and the resulting capital requirements are therefore to some extent arbitrary. The lack of a capital definition, coupled with the use of square roots, means that the results can be difficult to understand. In addition, operational and general business risks are not adequately taken into account, and reinsurance risks are not adequately reflected in the model. Indeed, the US RBC approach has little predictive power for insolvency, indicating that the requirements do not reflect the risks appropriately. The use of premiums and provisions as exposure bases can create incentives for under-rating and under-provisioning. Under-provisioning has a threefold effect of increasing the available capital basis, reducing the

[135] The Finnish supervisory authority indicated that diversification and size effects are taken into account in the coefficient and in the formula. When the model was built the impact of different types of reinsurance was also studied. Certain types of reinsurance are not properly taken into account (particularly stop loss arrangements, where companies may apply for adjustments to be made to the basic rules). ALM effects are not recognised and are addressed by other means. Also, market averages may not always be appropriate and companies may apply to use their own parameters.

[136] The Finnish supervisory authority commented that provisioning risk is only taken into account in accepted reinsurance. There are other requirements that an insurance company has to fulfil, related to the monitoring of the adequacy of claims provisions.

exposure basis for the reserving requirement, and reducing the specific adjustment factor for reserving risk.

10.3.34 The structural weakness of the RBC approach is that the interaction of different risks (dependence and independence) is not adequately taken into account. Further, the approach does not give adequate consideration to diversification and size effects and, as with the fixed ratio approach, it is not dynamic and forward-looking. This structural weakness undermines to some extent the advantages mentioned above.

10.3.35 Weaknesses with the RBC approach have led to the development of a third approach, based on scenario modelling.

Scenario-based approaches

10.3.36 Scenario based models attempt to analyse the impact of specific risk variables to company specific exposure. Capital requirements are calculated based on the worst-case outcome from a set of scenarios applied to the insurance company's financial model. The financial model is typically dynamic (but could be static) and produces deterministic cash flow and balance sheet projections. Scenarios will usually consist of various sets of futures loss experiences, premium income, provision development, catastrophic and large losses, inflation and interest rates, returns on assets etc.

10.3.37 Applications of these models are seen in Canada, UK and the United States. Currently these methods are applied in addition to existing requirements defined under fixed ratio or RBC calculations. The UK and US models (New York state) are described in Appendix 10.1.

Advantages and disadvantages of scenario based approaches

10.3.38 Scenario based approaches are considered to have advantages over both fixed ratios and RBC because the use of scenarios allows for a straightforward and intuitive interpretation of results, and capital requirements are more clearly defined. Scenarios also provide flexibility in the scope of risks considered, and this advantage is not impaired by structural weaknesses in the approach itself.

10.3.39 A clear and flexible framework for considering risk-interaction is provided, and there is also greater recognition of reinsurance and hedges than under fixed ratios or RBC. In addition, most models tend to be dynamic and forward looking and the more advanced approaches provide a suitable tool for internal risk management as well.

10.3.40 There are disadvantages in the use of scenario based approaches. Firstly, the capital definition is dependent on the specific scenario set; the approach therefore hinges critically on the completeness and relevance of the scenarios used, and this can mean that the results of the approach are arbitrary. The likelihood of adverse development is not explicitly considered, and neither are size and diversification effects.

10.3.41 The models can be complex but need not be so. The more sophisticated versions impose considerable data requirements. The potential for subjectivity can also make comparability difficult. Testing of more complex scenario based approaches usually requires computer modelling with the result that compliance costs can be high and, whilst

simpler versions can be codified, more advanced versions cannot. However, even the less complex scenario approaches are technically superior to factor based approaches, but they also have significant practical advantages over the more complex methods. Appendix 10.3 includes further discussion of the potential advantages of scenario based approaches.

10.3.42 Therefore, even though scenario based approaches can be considered an improvement on both fixed ratio and RBC approaches, they still have technical disadvantages. In an attempt to address these, a fourth type of approach has been developed – namely, probabilistic approaches.

Probabilistic approaches

10.3.43 Probabilistic modelling approaches attempt to cover the full range of risk variables which are sampled from statistical distributions in a simulation procedure. This therefore considers a wider range of outcomes, the likelihood of adverse development and the interaction of risk variables.

10.3.44 The results consist not only of outcomes related to specific scenarios, but give the full probability distribution of possible outcomes. The requirements are calculated from features of the capital distribution using ruin-probability or expected policyholder approaches (or other risk measures).

Advantages and disadvantages of probabilistic approaches

10.3.45 Probabilistic approaches offer greater flexibility. In particular, the capital definition underlying the requirements can be varied with relative ease and, unlike the three approaches described earlier, probabilistic approaches specifically consider the interaction of different risks. Probabilistic approaches have the additional advantage of attempting to combine and refine distinct risk categories. These approaches also have an improved ability to recognise the effects of reinsurance and hedges and, because most models are dynamic, their use substantially enhances internal risk management procedures.

10.3.46 Just as with other approaches, there are some disadvantages. Firstly, the capital definitions of probabilistic approaches are more difficult to understand than scenario-based definitions. Secondly, the results sample from a range of simulation processes and so an intuitive understanding of the results generated by probabilistic approaches is difficult.

10.3.47 This is the most complex of the four approaches and the data requirements are quite demanding. Further, where the required data is not widely available, these approaches can be highly subjective. Their complexity also means that the application of these approaches is expensive. Lastly, it is difficult to standardise or codify probabilistic approaches.

10.4 Current developments and proposed changes[137]

Regulatory changes in Australia

10.4.1 The Australian regulatory environment for non-life insurance is undergoing a period of rapid change. The Australian Prudential Regulation Authority (APRA) has introduced new Prudential Standards for determining the Capital Adequacy requirements for non-life insurance companies. We understand that there are no major changes proposed in the life sector.

10.4.2 Under the new regulatory requirements the MCR will be calculated using either:

- the internal model based method; or
- the prescribed method.

10.4.3 The MCR is subject to a minimum of A$5 million.

10.4.4 A combination of both methods described below could be used depending on the mix of business of the company, and the relative sophistication of the company's internal models. The companies are provided with a choice of which method to use.

Internal model based method

10.4.5 Insurance companies will be encouraged to develop internal models that reflect their own risk profile and the nature of their business. In any case the models should include most of the risks faced by the insurance company even when these risks are difficult to measure or model statistically. These models would be subject to the regulator's approval. This method is in line with stage 3 of Pillar I of the new draft Basel Capital Accord.

The prescribed method

10.4.6 For companies that are unable/unwilling to develop internal models the MCR is determined by prescribed formulae in the Prudential Standards. The MCR will be the sum of the charges for insurance risk (outstanding claims risk and premium liability risk), investment risk (value of assets risk and off-balance sheet risk, including market risk and credit risk), and concentration risk which takes into account the exposure to a single event (maximum event retention is used as a measure of the concentration risk). This method is equivalent to stage 2 of Pillar I of the new draft Basel Capital Accord.

10.4.7 To date there are only a limited number of general insurance companies that are using internal models to monitor their solvency as part of risk management. As the industry moves close to the new APRA regulatory guidelines it is likely that more sophisticated methods of risk assessment will be developed.

[137] Developments in the banking industry, in particular the draft Basel Accord, are discussed in chapter 3.

10.4.8 Generally, Australian banks and life assurers are further advanced in developing sophisticated methods of risk assessment and risk management, as both are subject to risk weighted solvency and capital adequacy requirements.

10.4.9 Some Australian general insurers are developing interactive models that consider the capital their business requires, taking into account the risk profile, asset exposures and levels of catastrophe protection acquired, and also looking at the diversification effects of expanding business into different geographical regions and lines of business.

10.4.10 Typical problems that have been identified to date include:

- no easy measure of insurance risk;
- balancing the capital for short and long tail business;
- measuring the impact of whole account protections;
- developing a mindset where business units take an active interest in risk monitoring and prevention, and appreciate the impact of their actions upon their allocated solvency requirement;
- building models that are adequately flexible to the changing nature of the insurers' business.

10.4.11 The models that are in development are being built with the requirements of the regulator in mind. Whilst the proposed new general insurance solvency standards allow for internal models to be approved, it is expected that the number of companies that will be able to build a comprehensive model will be limited. It is likely that a number of companies will build models which look at parts of the overall risk profile and for the balance will use the regulator's model.

10.4.12 There are also questions in the Australian general insurance industry as to whether the regulator will have the resources to investigate and challenge internal models.

10.4.13 It should be noted that the capital adequacy requirements together with the use of modelling techniques, form part of the overall supervisory approach. The reform of insurance regulation in Australia involves new legislation with various new provisions. The main objective of the General Insurance Reform Act 2001 is to *"protect the interests of insurance policyholders in ways that are consistent with the continued development of a viable, competitive and innovative insurance industry."* Provisions are included to promote the prudent management of insurance undertakings, including, inter alia, requirements concerning the effectiveness of risk management strategies and techniques.

Regulatory changes in Canada

10.4.14 The current fixed-ratio approach for non-life companies, referred to as the minimum asset test (MAT) will be replaced by a risk-based approach in 2003. The minimum capital test (MCT) is similar in structure to the minimum continuing capital and surplus requirement (MCCSR) regime applicable to life insurers, and specifies capital requirements for different categories of assets, liabilities and off-balance sheet exposures.

10.5 Comparative study of different methodologies

10.5.1 In making comparisons of different solvency margin requirement methodologies, it is necessary to identify the key objectives for establishing such requirements. It is also important to recognise at the outset that some of the regulatory objectives may be in conflict with the business requirements for capital efficiency.

10.5.2 The supervisory objective in defining capital requirements is to provide a buffer against adverse development and also to provide a basis for a solvency indicator with an early warning predictive capability. It is therefore desirable that this requirement is closely related to the company specific risk profiles. Although this requirement is important, it is noted that a refined and adequate recognition of risk imposes complexity, which affects the cost and the feasibility of the methodology.

10.5.3 We compare the merits of the four main solvency methodologies discussed against the following criteria. This comparison covers both the theoretical merits of the approaches and views on how the approaches operate in practice. This is because perceived benefits might not always be achieved in practice due to practical difficulties associated with their implementation.

Criteria used for assessment of solvency methodologies

Criteria	**Definitions of criteria**
Capital definition and objective	Whether the approaches possess a clear objective, relationship to risk and an underlying capital definition.
Extent of risks recognised	The range of risks considered and whether there is scope for additional risks to be incorporated.
Risk interaction	Whether the approaches take risk dependence and independence into account.
Recognition of deviations in risk profiles	The extent to which deviations in the risk profiles of different companies for the same risk can be factored in.
Recognition of dynamic aspects	Whether the approaches reflect developments over time or whether they are backward-looking.
Recognition of hedges and reinsurance	Whether the effects of such arrangements are recognised in the capital requirements.
Predictive power	The extent to which the approaches have predictive power to identify potentially insolvent companies.
Complexity	How complex these approaches are.
Data	The extent of data requirements and the possible limitations that available data may impose on the approaches.
Subjectivity	The extent to which subjective assumptions are incorporated into the models.
Compliance cost	The resulting compliance costs that arise from using these methodologies.[138]
Standardisation and codification	The extent to which the different approaches can be standardised and codified.
Strengthening of risk management	The extent to which the different approaches strengthen the risk management processes of companies.

Source: KPMG

[138] Capital cost is not driven by the chosen approach, but is determined by choosing specific parameters in the implementation. Therefore, we only discuss the cost of compliance.

10.5.4 The table below summarises the results of our analysis.

Comparative analysis of solvency methodologies

Aspect	Fixed ratios	US RBC	Scenario based approaches	Probabilistic approaches
Capital definition and objective	The methodology lacks an underlying capital definition. The overall supervisory objective of capital adequacy is unclear.	There is no underlying capital definition. The relation of the supervisory objective to the capital adequacy requirement is unclear.	Clearer capital definitions are possible. A clear relationship with supervisory objectives can be established.	These approaches offer the best framework for a clear capital definition.
Extent of risks recognised	Focus is usually restricted to underwriting risk.	Attempts to capture all relevant risk. However, it fails to consider the combined impact of distinct risk categories effectively and does not incorporate non-financial risk.	The approaches are flexible regarding the extent of risk. The focus of application is on financial (including underwriting) risk. The lack of reliable models for non-financial risk is not overcome.	Similar to scenario-based approaches. In addition, the probabilistic approach offers distinct advantages in its ability to combine distinct risk categories.
Risk interaction	The fixed ratio limits itself to only a few risk exposure proxies, such as premiums and claims.	RBC attempts to take risk interaction into account, but is weak in meeting this objective.	A relatively clear and flexible framework to include risk interaction is provided.	The same considerations as for scenario-based approaches apply. In addition, the independence and dependence of the various risks can also be captured.

Aspect	Fixed ratios	US RBC	Scenario based approaches	Probabilistic approaches
Recognition of deviations in risk profiles	The methodology does not recognise the specific liability and asset portfolios of companies. Size and diversification effects are poorly reflected.	The US RBC approach is more sensitive to specific risk-profiles, but the structural weaknesses make the adequacy of the capital requirement variations debatable. Size and diversification effects are poorly reflected.	These offer a flexible tool for the recognition of specific risk profiles. The recognition of size and diversification may need to be additionally incorporated to the company-specific scenario. It is not an inherent part of the model.	These offer a flexible tool for the recognition of specific risk profiles. Size and diversification effects can be more explicitly recognised.
Recognition of dynamic aspects	The approach is static.	The approach is static.	Some static approaches can be found, however most models constructed are dynamic.	Some static approaches can be found, however most models constructed are dynamic.
Recognition of hedges and reinsurance	The effects of hedges and reinsurance are poorly recognised.	The effects of hedges and reinsurance are poorly recognised.	Greatly improved ability to recognise the effects of hedges and reinsurance.	Greatly improved ability to recognise the effects of hedges and reinsurance.
Predictive power	The predictive power is relatively weak.	The predictive power is better than fixed ratios but inferior to scenario based and probabilistic approaches.	Currently untested, however some studies show that the additional use of these approaches can improve the predictive power mainly as a result of structural improvements in the recognition of risk.	Currently untested, and at present difficult to evaluate. However, as it contains similar characteristics to scenario-based approaches, it should possess similar predictive powers.

Aspect	Fixed ratios	US RBC	Scenario based approaches	Probabilistic approaches
Complexity	The fixed ratio methods are generally easy to calculate and understand.	The US RBC approach has a relatively simple underlying design, but the number of factors applied, the adjustments for the company specific experience, adjustments for risk concentration and the covariance formula create complexity.	Simple versions are possible, but most models incorporate complex dynamic scenarios. This therefore requires a higher degree of actuarial involvement.	Probabilistic approaches are the most complex of the four scenarios. This makes it difficult to understand the results. The results are aggregations of simulation output, which are difficult to understand intuitively.
Data	The requirements are minimal.	The requirements are more demanding but not excessive. Some adjustments (for asset concentration and for company specific provision development) require specific data preparation.	Sophisticated versions impose considerable data requirements. The lack of data to meet these requirements could lead to a greater degree of subjectivity in the application of the model.	The data requirements are the most demanding of the four approaches. A similar problem to scenario-based approaches arises on the extent of subjectivity included should necessary data requirements not be met.
Subjectivity	The model leaves no room for subjectivity.	The application leaves no room for subjectivity.	Sophisticated versions require a number of assumptions relating to parameter and data sets which create considerable subjectivity.	Sophisticated versions require parameter and data sets which create considerable subjectivity.

Aspect	Fixed ratios	US RBC	Scenario based approaches	Probabilistic approaches
Compliance Cost	Costs are not significant.	Costs are not significant.	Simple scenario based stress tests do not require significant additional costs compared to RBC approaches. Advanced approaches may impose significant costs for implementation, maintenance and application.	The application of these models imposes significant costs for implementation, maintenance and application.
Standardisation & codification	Easy to codify.	Relatively easy to codify, but some training needs to be given to the users.	Simpler versions can be codified. More advanced versions are more difficult to codify.	Codification is quite difficult.
Strengthening of risk management	Little enhancement value to internal risk management practices.	Relatively little enhancement value to internal risk management practices – divorce of economic capital (i.e. capital actually required to run the business) requirements and regulatory capital requirements.	Advanced approaches will have positive effects for risk management. These methods allow the companies to improve their evaluation of the individual risk. This allows management explicitly to consider their strategies on risk management.	Similar to scenario based approaches.
Source: KPMG				

10.5.5 A more detailed comparative analysis of the approaches is set out in Appendix 10.2.

10.6 Conclusions

10.6.1 Our comparative analysis recognises the tension between certain of the regulatory objectives for a solvency margin methodology. For example, there are evident benefits in the simplicity of the fixed ratio approach; it is easy to codify and apply, and its results are easy to understand. However, the rigidity of the fixed ratio approach provides insufficient reference points for prudential supervisors and leaves much to their subjective judgement.

10.6.2 As the Müller Report[139] recognised, the scope of risks taken into account by the EU fixed ratio approach is narrow and the approach is not sensitive to the capital requirements with respect to company-specific profiles. The structural weaknesses in the approach mean that it cannot be developed to incorporate all the risks facing an insurer.

10.6.3 The US RBC approach goes some way to addressing these issues in that it aims to incorporate all relevant risk, albeit that the approach is fairly limited. Further improvements can be achieved by incorporating the advanced approaches of internal risk models. Insurance regulators in Canada and Australia are encouraging insurance companies to develop internal risk models to determine their capital requirements. However, regulators should recognise the subjectivity inherent in using risk modelling for determining capital requirements for supervisory purposes; this will require a certain level of scrutiny and understanding of such models by the supervisor.

10.6.4 Other chapters of this report indicate the primary need for a risk based approach in determining the solvency margin requirement for companies and this approach should take into account diversity in the market, both in terms of the nature of the business undertaken, the size of firms and, how implementation of the methodology might work in practice.

10.6.5 This is particularly important as the apparent benefits in more sophisticated solvency margin methodologies may be undermined by the practicalities of implementation. For example, data requirements greatly increase with the complexity of the solvency margin approach, particularly in relation to scenario based and probabilistic approaches; if this data is not available or not collected, approximations may be used which cast doubt on the validity of the risk assessment. Given the practical difficulties which characterise advanced models (probabilistic approaches), there are significant advantages to be found in scenario based approaches. Whilst not achieving the theoretical technical 'correctness' of probabilistic models, and provided they are not designed to an excessive level of complexity, scenario based approaches can be applied to a reasonably diverse population of insurance undertakings without prohibitive practical difficulties and costs.

10.6.6 Generally, the application of sophisticated model-based approaches across a large and diversified insurance industry is likely to encounter significant practical problems. This would be the case in particular at an international level. A framework which fits the diversity of the entire European wide insurance industry may need to consist of a number of different tiers, to recognise the varying degrees of sophistication, and the varying size and complexity of insurance undertakings in different Member States. Appendix 10.3

[139] The Müller Group Report (1997).

includes further consideration of a possible framework, combining a simple factor based approach with scenario based and advanced model based approaches in a three tier system.

10.6.7 Whilst outside the scope of our comparative analysis, the choice of parameters for capital requirements in a simple factor based approach, using conservative risk factors should cover:

- insurance risk (exposures less reinsurance);
- future underwriting losses (catastrophe reserves and provisioning risk);
- credit risk (including reinsurance assets);
- market risk (including interest rate risk).

10.6.8 Operational risk and asset liability matching risk also need to be addressed, but given the significant difficulties involved, for a simple factor based system it may be preferable to address these risk areas through other prudential rules and supervisory review. It may be possible to leave some flexibility for supervisors to impose additional capital requirements for those risks which are not capable of being included in a risk based model. For example, supervisors may be able to impose charges on operational and asset liability risk, based on their assessment of the business.

10.6.9 The draft Basel Capital Accord proposes some significant changes to the capital requirements for banks. The possibility of banks being able to obtain recognition for their own risk models in assessing the capital requirements is a significant step forward in encouraging companies to enhance their risk management processes. A similar approach tailored specifically for insurance companies would help to overcome the drawbacks of many of the solvency margin methodologies discussed. This is not without practical problems and maybe better suited to the larger insurance undertakings, with a less sophisticated (but nevertheless risk based) approach for small undertakings.

10.6.10 In line with the draft Basel Capital Accord, we would suggest that the three pillar approach to capital adequacy, as illustrated below, would more closely align regulatory capital requirements with the risks that insurers face, whilst providing insurance companies and their supervisors with a number of options for the assessment of capital adequacy.

A possible three pillar approach for insurance undertakings

Pillar I	**Pillar II**	**Pillar III**
Financial Resources	Supervisory Review	Market Discipline
Minimum capital requirements set for firms generally using a risk based approach assessed by reference to underwriting information, and assets and liabilities in the financial statements. Options for firms to graduate to scenario approaches and internal (probabilistic) models. Group solvency requirements taking account of additional risks at group level. Other prudential rules (assets and liabilities).	Assessment of the strength and effectiveness of risk management systems and internal controls including review of: - exposures (including the reinsurance programme); - internal risk models; - stress testing of technical provisions and assets; - fitness and propriety of senior management; - asset /liability mismatch.	Disclosures recommendations and requirements create transparency by allowing market participants to assess key information on scope of application, capital, risk exposures, risk assessment and management processes, and capital adequacy of the insurance undertakings. Disclosures on risks: - risks; - key sensitivities and scenario analysis on assets and technical provisions.